STRUCTURAL IMPACT ASSESSMENT

40 Richmond Hill, TW10 6BE

Project Number: 9249

Revision A

Prepared by David Coles

17 March 2023

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1.0 INTRODUCTION

Blue Engineering was instructed by DKN Jamm Architects to undertake a Structural Impact Assessment for the proposed structural works to 40 Richmond Hill.

The report is required to address the structural issues raised in the planning refusal document produced by London Brough of Richmond upon Thames.

The Structural Impact Report is to address the following;-

- How the works for the replacement of the existing external stairs within the existing light well are undertaken and that they will not impact on the existing closet wing.
- How the frameless glass structure is installed and connected to the closet wing.

2.0 AUTHORS'S EXPERIENCE

David Coles is a Chartered Structural Engineer (MIStructE) and has over 25 years experience in the refurbishment of London's commercial and residential buildings. David has been involved with many listed and historic buildings most notably the Grade 1 listed Mentmore Towers in Buckinghamshire designed by Joseph Paxton for the Rothschild Family. David is undertaking the structural design of the works and supervising the management of the project within the practice.

3.0 EXISTING PROPERTY

40 Richmond Terrace is part of a terrace of houses listed grade II and the site lies within the Richmond Hill Conservation area.

The Heritage Statement report by Gareth Jones Heritage Planning dated 9 April 2021 states that the terrace dates from the 1840's. The building can be seen on the 1879 OS archive map and 1897 OS archive map. The 1879 map shows that number 40 was originally an end of terrace property, with a large property called Elleker House situated to the south eastern side with an extensive garden area. On the 1897 map Elleker House has been replaced with a block of Edwardian terraced houses and a large building with a Gothic Castle fenestration which is currently The Old Vicarage School and assumed to be a former Vicarage.

Number 42 appears to have been built adjacent to the end of terrace flank wall with its own flank wall.

Number 40 is a four storey property, with the lower ground floor, being approximately 2.2m below ground level. The property is formed of load bearing brick work externals walls with timber floor joists spanning front to back which are most likely to be continuous from front to back and are supported on the internal spine wall within the middle of the property.

The lower ground floor is formed of a ground bearing slab.

The roof is duo-pitched and formed of timber rafters with purlins and purlin props propped off the ceiling joists and binder beams.

The spine wall is 225mm solid brickwork at lower ground floor level and then timber stud from first floor to second floor ceiling level.

At the front of the property are brick vaults at lower ground floor with a light well providing light to the front of the lower ground floor.

At the rear of the property is an outrigger (closet wing) with the lower ground floor section with the south eastern flank wall inset into the building compared with the ground floor level. It is assumed that the lower ground floor outrigger was built before the ground and first floor levels. It is not known why the ground floor flank wall was not built off the lower ground floor flank wall, but it's assumed it was to gain more space.

The boundary wall with number 42 is a London Stock garden wall and appears to be a substantial retaining wall. From the 1869 archive map Elleker house was approx. five meters from the boundary and so it is assumed there was space to build the retaining wall on the boundary. Between the retaining wall and the flank wall is the existing courtyard which has steps that lead up to the rear garden.

4.0 EXISTING LOAD PATHS

The timber roof rafters span between the external walls and are propped off the ceiling joists which span between the external walls and the spine wall. The ceiling joists will act as a ceiling diaphragm with the lath and plaster ceiling, if original, or with a new plaster boarded ceiling, if the ceiling has been replaced. The ceiling diaphragm transfers the lateral loads from wind or notional horizontal loads into the return walls.

The second, first and ground floor joists span front to back and are supported in the middle of the property by a "spine wall". The spine wall is formed of timber studs from underside of ceiling joists to the second floor level to the underside of the ground floor where it is supported on a 225mm thick brick wall.

The floor joists at each level form a floor diaphragm transferring the lateral loads from wind or notional horizontal loads into the return walls.

At lower ground floor all of the floors are of ground bearing slab construction.

The vertical loads are resisted by the load bearing masonry walls bearing onto assumed brick corbelled foundations below the lower ground floor.

It is assumed that the existing foundations are approximately 450mm below existing lower ground floor level which is approximately 2.2m below existing ground level.

The lower ground floors external walls act as retaining walls (except the south eastern flank wall adjacent to the courtyard) resisting the soil pressures and imposed surcharge loading. The walls will span vertically between the ground floor diaphragm and the ground bearing slab and horizontally between the party walls and the internal masonry walls. The precompression from the upper stories of brick work above also provides resistance to the lateral forces.

A local borehole record from The British Geological Survey's Geo index TQ17SE162 which is located approx. 20m south of the property indicates that made ground is present to 15' (4.5m) overlying stiff to very stiff clay to depth.

Its likely that the terraced houses were built with a lower ground floor so that the foundations could be located within the virgin clay soil which may occur at a higher level at the site as reviewing other local boreholes the ground conditions are variable due to being located near to the River Thames.

It is assumed that the depth of the foundations is approx. 450mm below the ground bearing slab to the lower ground floor which is usual for properties of this age.

5.0 PROPOSED STRUCTURAL WORKS.

Removal and replacement of existing external stairs from lower ground floor to ground floor to the courtyard area

It is proposed to remove the existing courtyard staircase and replace it with a staircase formed of reinforced concrete supported on masonry support walls which would bear onto an RC slab which would span between mass concrete strip footings.

The strip footings would be placed away from the existing foundations and compressible material would be placed around the existing corbelled brick foundations so no load in placed into them from the new RC slab.

The RC staircase is to have a half landing where the staircase turns ninety degrees and then spans to the south eastern flank wall. At the flank wall the staircase will be supported off a new load bearing blockwork wall to the house side and a steel post to the garden side. The steel post will also act as a buttress to the retaining wall due to the return wall (that is to be removed to create the door opening to the storage under the stairs) will currently acts as a buttress wall.

As the existing retaining wall will have been designed as a retaining wall the staircase can be removed without any temporary works.

New Frameless glass structure

The new frameless glass structure that will weather proof the courtyard will fix to the existing south eastern flank wall, the existing rear wall to the main body of the house, the new cavity wall adjacent to the boundary with no 42 and it will bear onto the top of the existing retaining wall.

The glass will bear onto a steel angle which has a steel bearing plate welded to the vertical leg. The bearing plate will bear 50mm into a horizontal bed joint which has been carefully raked out. The angle will also be fixed via a 5mm diameter screw will wall plugs provided within the wall.

Should the glazing ever be removed the holes within the brickwork could be repaired by infilling with brick dust (to match the existing bricks) mixed with epoxy resin.

The new cavity wall will gain its lateral stability through steel wind posts installed within the cavity.

The glazing will provide a very small increase in load to the existing walls which they will be able to resist adequately.

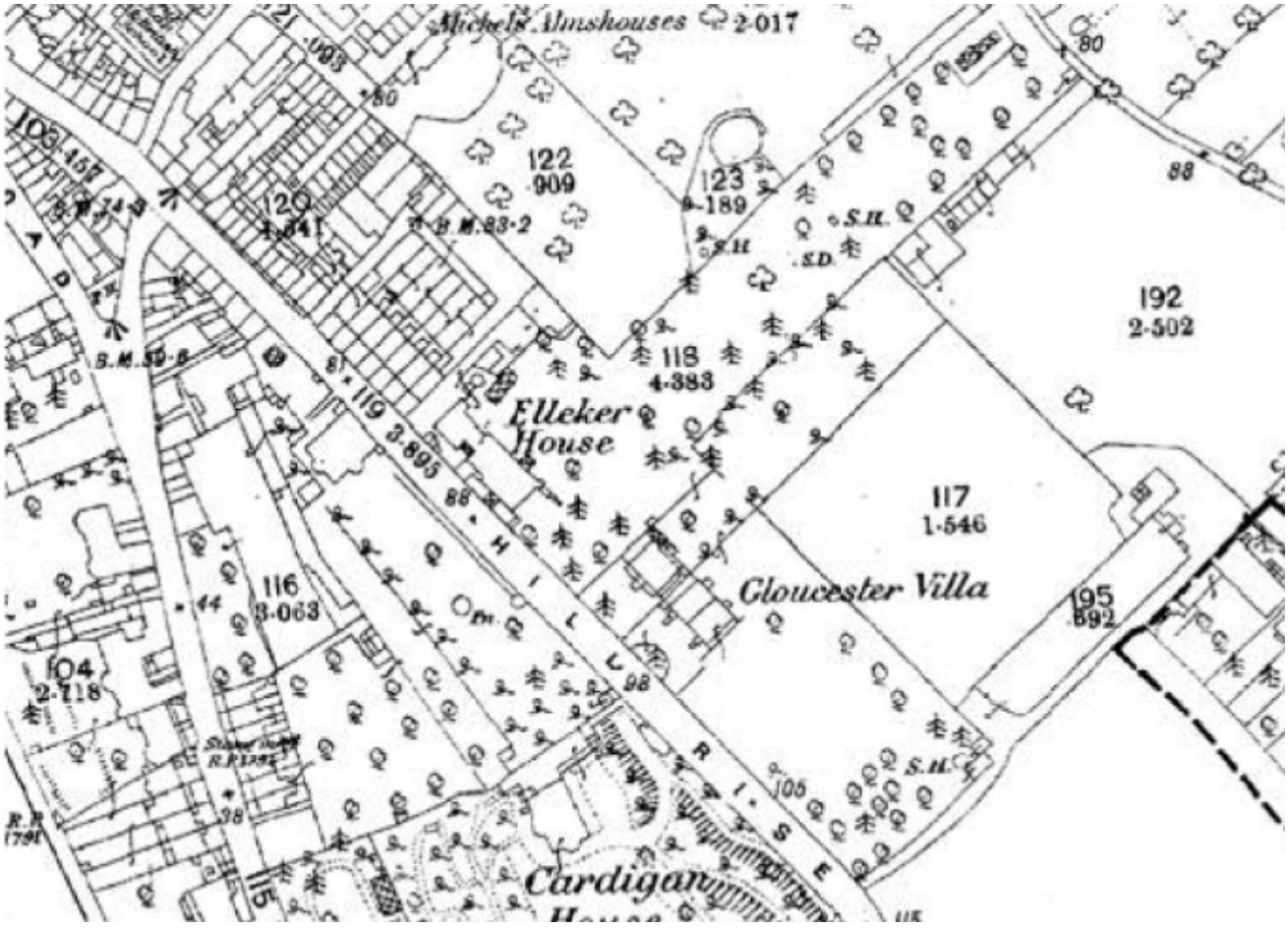
6.0 CONCLUSION

The proposed structural works to 40 Richmond Hill have been designed to protect the existing structure of the building and as long as the works are executed as per the proposals they will not cause any distress to the listed building

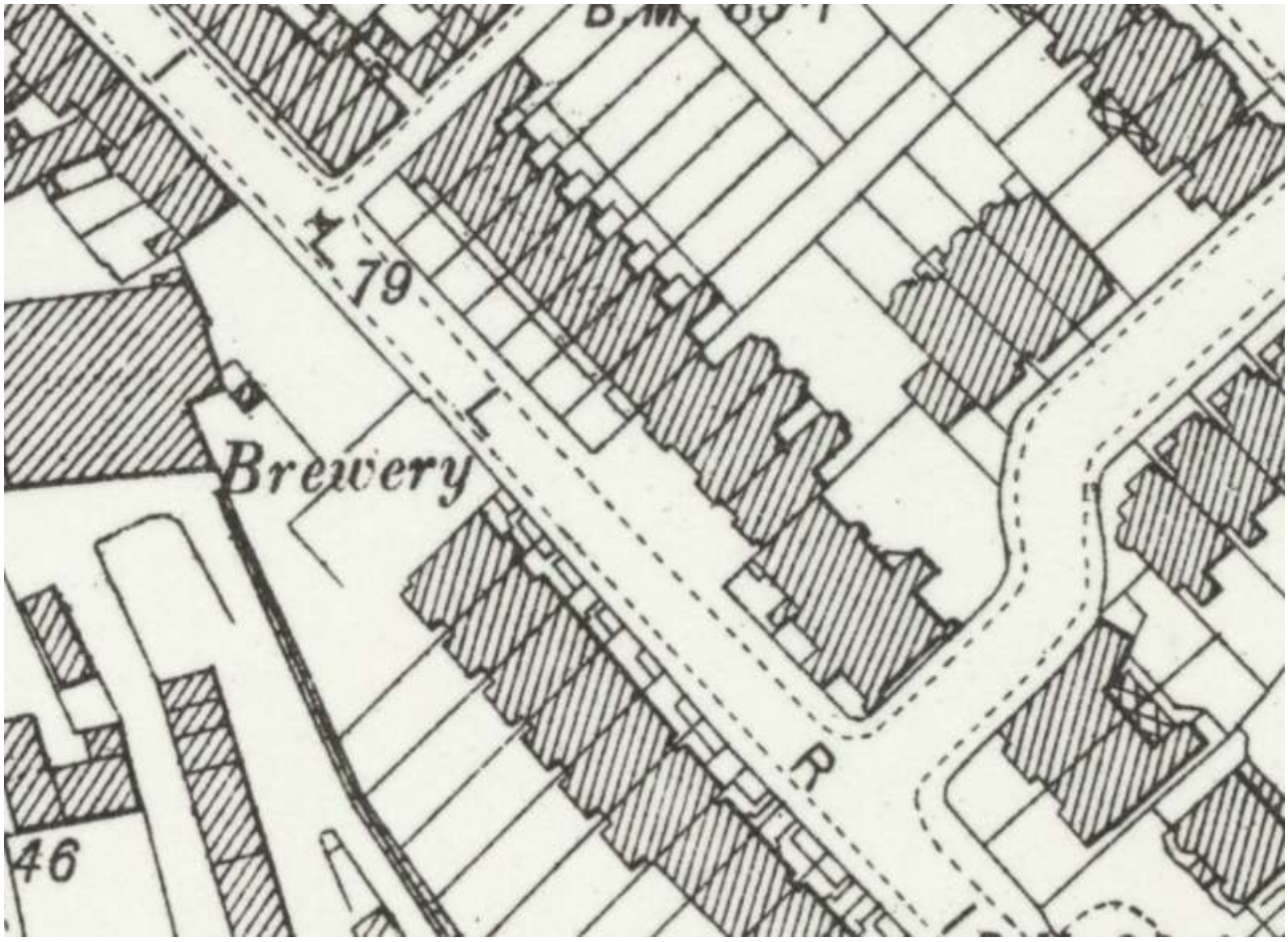
David Coles BEng Hons CEng MIStructE
Partner Blue Engineering

Appendix A Desk Study Information

1867 OS Archive Map



1879 OS Archive map



1898 OS Archive Map

APPENDIX 1 SHEET 1

1807 7434

TQ175E 162

BOREHOLE NO. 1

Ground Level 84.1 O.D. +25.63 m

Diameter of Boring 8 inch

Water Struck None

Method Shell and auger

Standing Water Level None (15/5/68 &

Start 10/5/68 Finish 11/5/68

REMARKS:

Description of Strata	Thickness	Depth	Reduced Level	Disturbed Samples	Undisturbed Samples and Insitu Tests
Made ground (Brown clay, stones and brick fragments	15'0"	15'0"	69.1	J7208 2'6"	U7209 3'6"
				J7210 7'6"	U7211 8'6"
				J7212 12'6"	U7213 13'6"
Stiff to very stiff brown clay with occasional silty sandy patches	12'0"	27'0"	57.1	J7214 17'6"	U7215 18'6"
				J7216 22'6"	U7217 23'6"
Stiff to very stiff grey clay	53'0"			J7218 27'6"	U7219 30'0"
				J7220 32'6"	U7221 33'6"
				J7222 37'6"	U7223 38'6"
				J7224 42'6"	U7225 43'6"
				J7226 47'6"	U7227 50'0"
TOTALS					

NOTES: Descriptions in accordance with C.P.2001 "Site Investigations"
J Jar Sample B Bulk Sample W Water Sample

BGS Borehole log

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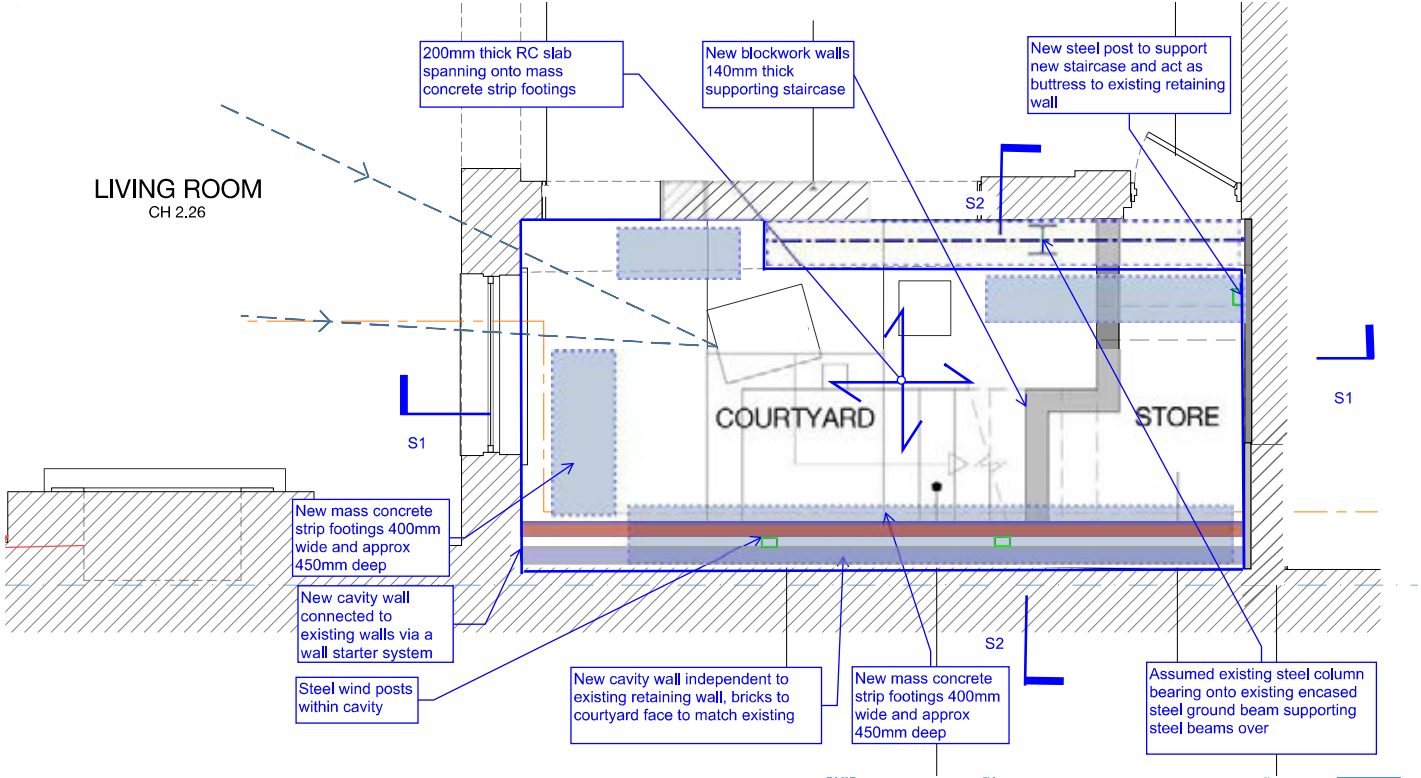

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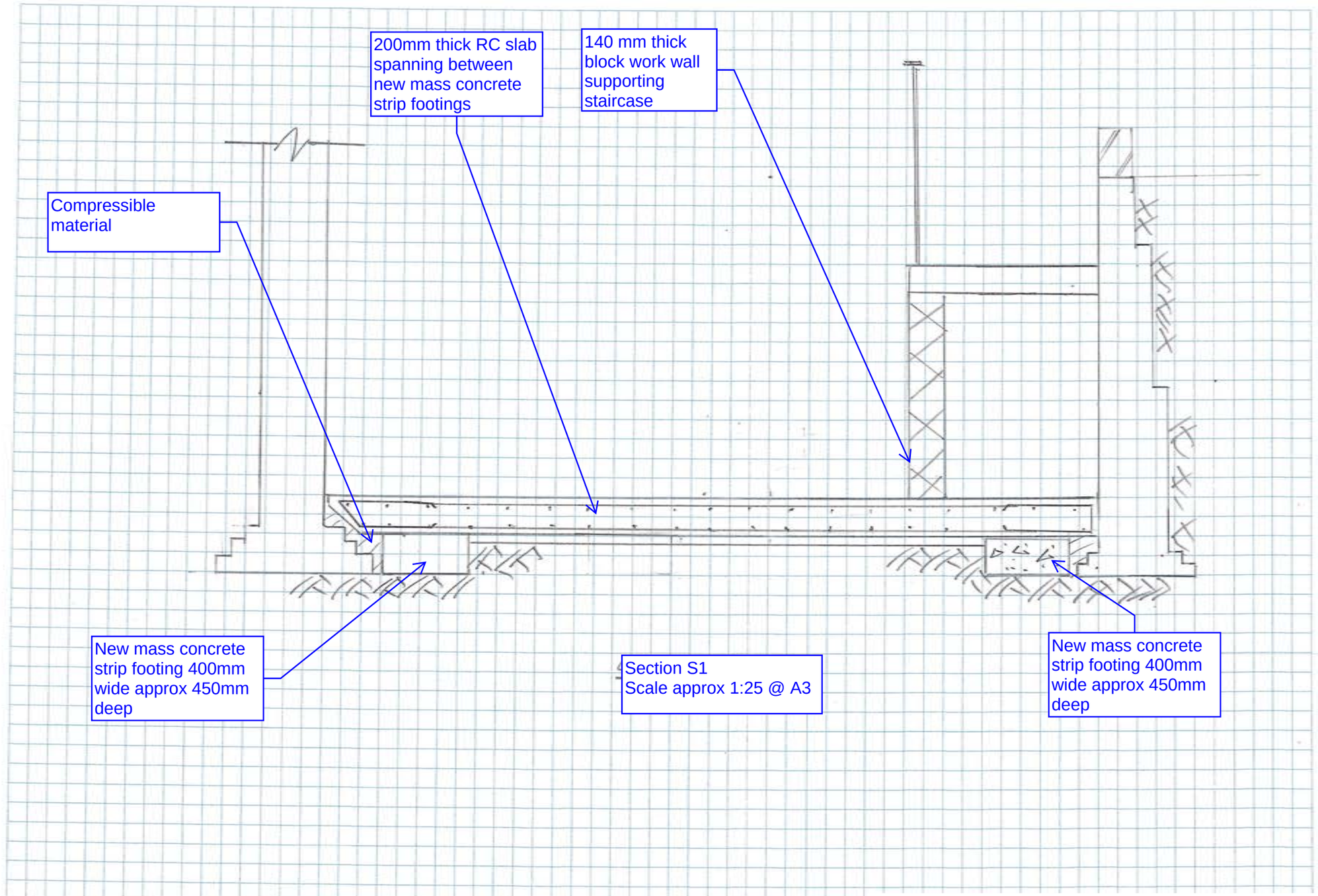
Title:	Proposed Structure to Lower Ground Floor	Sheet:	SK 1
Project:	40 Richmond Hill TW10 6BE	Job No:	9249
By:	Chkd:	Date:	Rev:
9249		17/03/23	P1



Section S1
Scale approx 1:25 @ A3

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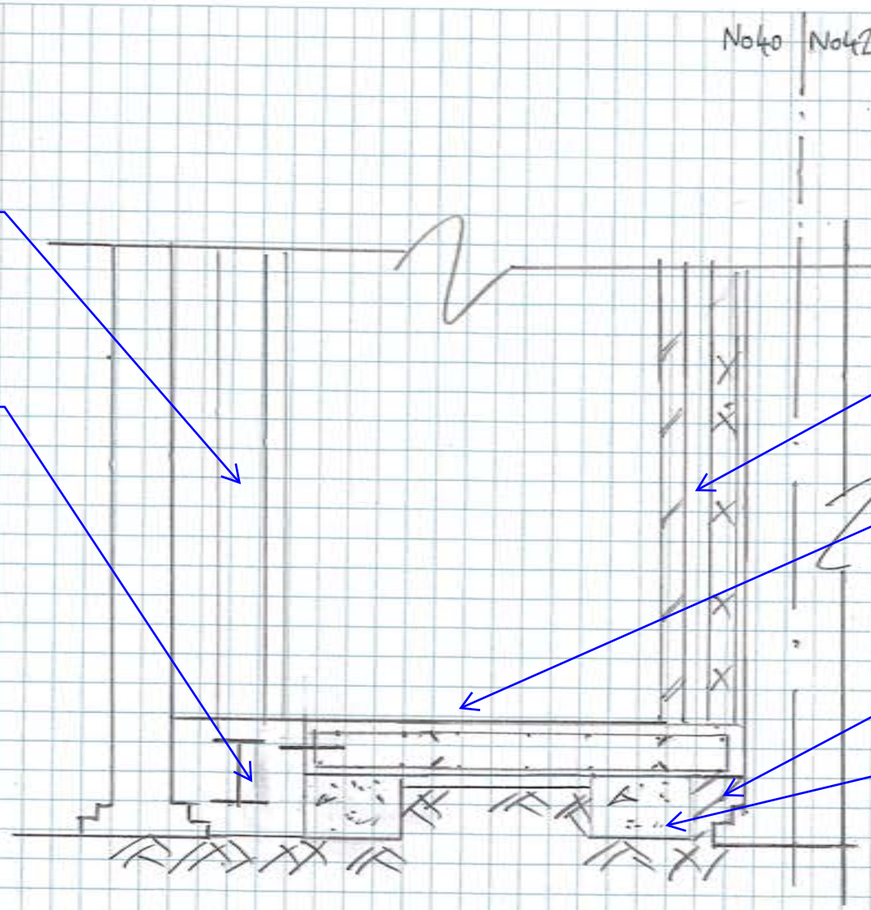
Title:		Sheet:
Section S1		SK 2
Project:		**Job No:**
40 Richmond Hill TW10 6BE		9249
By:	**Chkd:**	**Date:** / **Rev:**
DC		17/03/23 / P1



Assumed existing steel column supporting ground floor steel beams

Assumed steel spreader beam spreading load from steel column

New Cavity Wall construction independent to garden retaining wall

200mm thick RC slab spanning between new mass concrete strip footings

Compressible material

New mass concrete strip footing 400mm wide approx 450mm deep

Section S2
Scale approx 1:25 @ A3

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Section S2		SK 3
Project:		**Job No:**
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By:	**Chkd:**	**Date:** / **Rev:**
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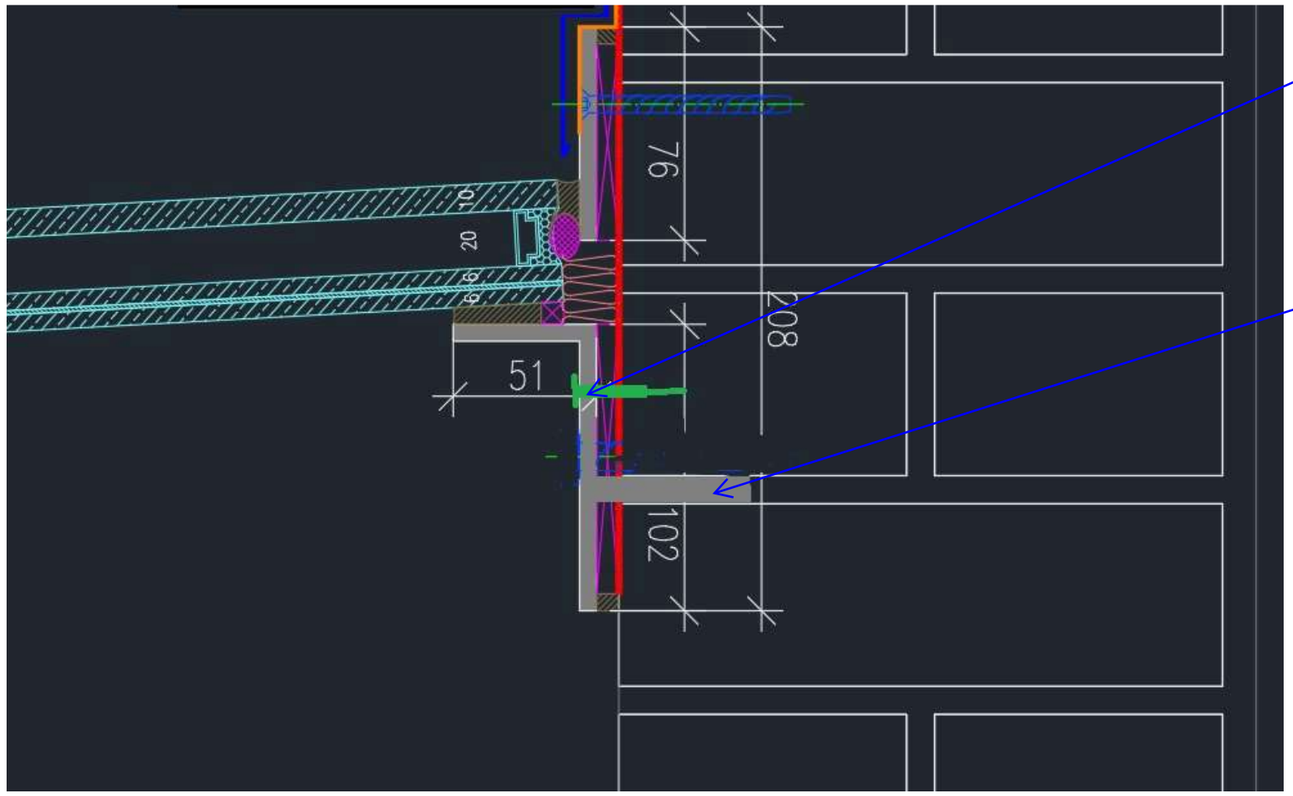

5mm diameter screw in wall plug fixing angle to wall at 450mm centres `

10mm thick steel bearing plate 100mm long, 50mm wide at 450mm centres placed within the horizontal mortar bed joints which are to be carefully racked out to a 50mm depth.

9249

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Title: Proposed Glazing Fixing Detail

Sheet: SK 4

Project: 40 Richmond Hill TW10 6BE

Job No: 9249

By: DC

Chkd:

Date: 17/03/23

Rev: P1