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Confidential

# DETAILED BASEMENT CONSTRUCTION PLAN
# 102 CAMDEN MEWS
# LONDON
# NW1 9AG

For City and County Group

Project No: 12.568

March 2016

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## Document History and Status

| Date | Purpose/Status | Author | File Ref | Check | Review |
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| March 2016 | For Approval | JS | | TK | MR |
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## Document Details

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| **Author** | Jenna Sewell |
| **Project Number** | 12.568 |

## Contents



## Appendices

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## 1.0 INTRODUCTION

1.1. Martin Redston Associates were appointed by the building's owners to provide advice on structural implications of the proposed construction of a new one storey basement on the site 102 Camden Mews.

1.2. This report has been prepared in accordance with the requirements stated in Section 106 Agreement. It follows the Basement Impact Assessment and provides a summary of all details required for the construction phase of development. The following report has been prepared to ensure that the property and neighbouring properties are safeguarded during the works.

1.3. The structural proposed works noted above are properly undertaken by suitably qualified and experienced engineers as shown in the letter of professional certification attached in Appendix C.

## 2.0 DESCRIPTION OF EXISTING BUILDING AND SITE CONDITIONS

2.1. The site is situated on the outskirts of Camden, on a cobbled street among other Mews properties.

2.2. The property is a two storey residential unit of traditional construction with timber flat roof and floor on load bearing masonry construction. The property is an amalgam of various constructions, parts of which date back to circa 1890. There is later reconstruction in the form of fletton brickwork and cavity work with stock facing of unknown date. There is a single storey garage adjoining the left hand side of the property.

2.3. The rear wall to the property is of cavity construction with stock brick outer leaf and block inner leaf. The front wall appears to be faced in a single skin of modern brickwork.

2.4. 102 Camden Mews is a detached building. The adjacent owners' foundations are assumed to be trenchfill concrete foundations approximately 1100mm below existing ground level.

2.5. Although no access has yet been gained to the adjacent properties, there are no lightwells or pavement lights to indicate that there is a basement construction to either No. 100 or 104 Camden Mews. 102 Camden Mews has not been underpinned; this would be expected if one of the adjacent properties had constructed a basement, due to the later construction of both No. 100 and 104. In addition to this, referring to LBC's website, no planning applications have been made for a basement at no. 100 or 104 Camden Mews.

2.6. Further investigation into the adjacent properties foundations will be carried out prior to construction.

## 3.0 OBSERVATIONS

3.1. The left flank wall appears to be the only remaining original construction of the building.

3.2. Internal partitions have pulled away from the external walls, causing large vertical cracks between the walls and partitions. It is thought that this movement is due to subsidence.

3.3. There is significant cracking to the existing brickwork walls to the front façade and right flank wall of the property. It is thought these cracks are due to subsidence.

3.4. The right flank wall has been poorly toothed into the rear wall.

## 4.0 PROPOSED ALTERATIONS

4.1 The proposed works involve the demolition of the existing garage, construction of an extension in place of the garage and construction of a new one storey basement beneath the footprint of the existing house.

4.2 The basement walls will be formed as reinforced concrete retaining walls cast in segments following the underpinning sequences along the perimeter walls.

4.3 The superstructure works include internal alterations to the existing property, including replacing all floors.

4.4 New floors will be formed of a timber stress-skin panel, spanning side to side between masonry side and internal load bearing walls.

4.5 All work will be carried out in a logical sequences with due regards for health and safety issue.

4.6 Any unforeseen problems encountered will be notified to both the permanent and temporary works engineers to enable a solution to be agreed upon.

4.7 Existing drainage and sewage should not be affected by the proposed development. New drainage within the proposed scheme will have a pumped facility to connect to the Thames Water Sewer.

## 5.0 GEOLGICAL AND GEOTECHNICAL INFORMATION

5.1. The ground profile and geotechnical parameters used in design of basement structure were based on the site-specific ground investigation by Herts and Essex Site Investigations. The borehole recorded Made Ground to depth of 1.2m below ground level overlaying the London Clay. On this base, an allowable net bearing capacity of 100 kN/m2 has been assumed.

5.2. Herts and Essex Site Investigations recorded the average water level in the standpipe to be at 1.25m below ground level.

5.3. The Ground Movement Assessment (GMA) has been prepared by GabrielGeo Consulting and it is attached in the Appendix B.

## 6.0 THE REFURBISHMENT AND DEMOLITION

6.1. Refurbishment works are to be carried out in accordance with good construction practice.

6.2. Demolition works will be carried out in accordance with the Architect's drawings.

## 7.0 THE RETAINING WALLS AND UNDERPINNING

7.1. The proposed retaining walls to the side, front and rear of the property are to be constructed using an underpinning sequence. There are no party walls to this structure, all perimeter walls are independent of any neighbouring properties.

7.2. The proposed underpinning sequence should be carried out by excavating under existing wall in 1.2m sections in numerical order.

7.3. The ground bearing slab is to be dowelled into the new retaining walls.

7.4. The temporary works which retain wall bases are to remain until all retaining walls are fully cured for stability.

## 8.0 CONSTRUCTION SEQUENCES

8.1. The temporary works proposal is designed to prevent instability occurring to adjoining structures during the excavation and construction process.

8.2. The proposed construction sequences are listed as follows:

8.2.1 Refurbishment

I. Infill existing openings as required with solid masonry; all new masonry to be either toothed into existing or connected with furfix profiles.
II. Install temporary propping.
III. Demolish internals as required.
IV. Install steelwork and structural timber as per the engineering drawings.

8.2.2 Front and Rear Basement Wall

I. Excavate soil to required level; local pumping from a temporary sump will be required to remove ground water. If required baffle boxes will be installed to prevent loss of fines, however this is considered unlikely as the underlying geology is clay.
II. Cast concrete blinding on firm, well-compacted ground and construct underpinning/retaining wall base; repeat in numerical order for all sections as per the engineering drawings.
III. Construct underpinning/retaining wall stem; repeat in numerical order for all sections as per the engineering drawings.

IV. Central soil in basement area to be excavated and temporary supports installed from the base of retaining walls up, across the site with waling beams and struts; as per drawing T1 by Martin Redston Associates.
V. Cast new infill basement slabs

8.2.3 Adjacent Properties Underpinning and Basement Walls

I. Excavate soil to required level; local pumping from a temporary sump will be required to remove ground water. If required baffle boxes will be installed to prevent loss of fines, however this is considered unlikely as the underlying geology is clay.
II. Cast concrete blinding on firm, well-compacted ground and construct Underpinning; refer to engineering drawings for sequence of underpinning.
III. Temporary supports installed; as per drawing T2 and T3 by Martin Redston Associates.
IV. Construct Retaining Wall; refer to engineering drawings for sequence of underpinning.
V. Cast new infill basement slabs.

8.2.4 Build Additional Floor

I. Construct new walls upon retaining walls.
II. Install structure as per the engineering drawings.

## 9.0 MONITORING DURING EXCAVATION AND CONSTRUCTION

9.1. The Contractor shall provide monitoring to all structures and infrastructures adjacent to the basement excavation and construction.

9.2. The monitoring firm instructed by the Building Owner's contractor will commence monitoring prior to the excavation works to establish base readings.

9.3. During the excavation stage the monitoring shall be undertaken on a weekly basis with the reports issued to the Appointed Surveyors and Adjoining Owners' Checking Structural Engineer. During the formation and the construction of the basement the contractor should aim to limit vibrations to <3mm per stage; as per page 4 of GabrielGeo Consulting's Ground Movement Assessment (GMA), section 2.3.1.

9.4. The trigger level on the monitoring equipment will be set to 3mm for amber and 5mm for red per stage.

9.5. If the amber limit is reached, additional shoring should be installed to any excavations, and the Adjoining Owners' surveyor and engineer are to be informed of the movement within 24 hours of the survey taking place. The engineer should make an assessment of why the movement has occurred and provide details of how to prevent any further movement occurring.

9.6. Should the red limit be reached, additional shoring should be installed to any excavations, and the works must stop. The engineer should make an assessment of why the movement has occurred and provide details of how to prevent any further movement occurring. The work may only continue once all parties have agreed a way forward.

9.7. The contractor is to continue to monitor for a period of three months following completion of the notifiable works. Should readings during this time show any abnormal movement, the monitoring is to continue until agreed by the Adjoining Owners' surveyors that monitoring can cease. Following completion of the monitoring period, targets are to be removed from the Adjoining Owners' building and any disturbed surfaces made good. The monitoring should be measure "line, level & plumb". Refurbishment works are to be carried out in accordance with good construction practice.

## 10.0 CONCLUSION

10.1. The GMA report concludes that, given good workmanship, the basement to 102 Camden Mews can be constructed without imposing more than very slight damage on the adjoining properties and it will not cause the property or adjoining properties to become unstable.

10.2. The permanent and proposed temporary works have been designed to minimise any damage to the existing structures both within the site and to the adjoining properties on either side. As per the GMA, no more than a Burland Category 1 damage is expected, which is 'very slight'. Any damage that does occur is expected to be minor cracking that can be repaired by a Helifix masonry repair system, or equivalent, the cracks can then be refilled and redecorated over.

10.3. The permanent and proposed temporary works have been designed to minimise any damage to the adjacent minor cobbled road. There should not be any cracking or repairs to be made.

10.4. The permanent and proposed temporary works have been designed to minimise any damage to any drainage and sewage close to or within the site. In the unlikely event that any leaks occur, the pipework will be repaired accordingly. The proposed retaining walls to the side, front and rear of the property are to be constructed using an underpinning sequence. There are no party walls to this structure, all perimeter walls are independent of any neighbouring properties.

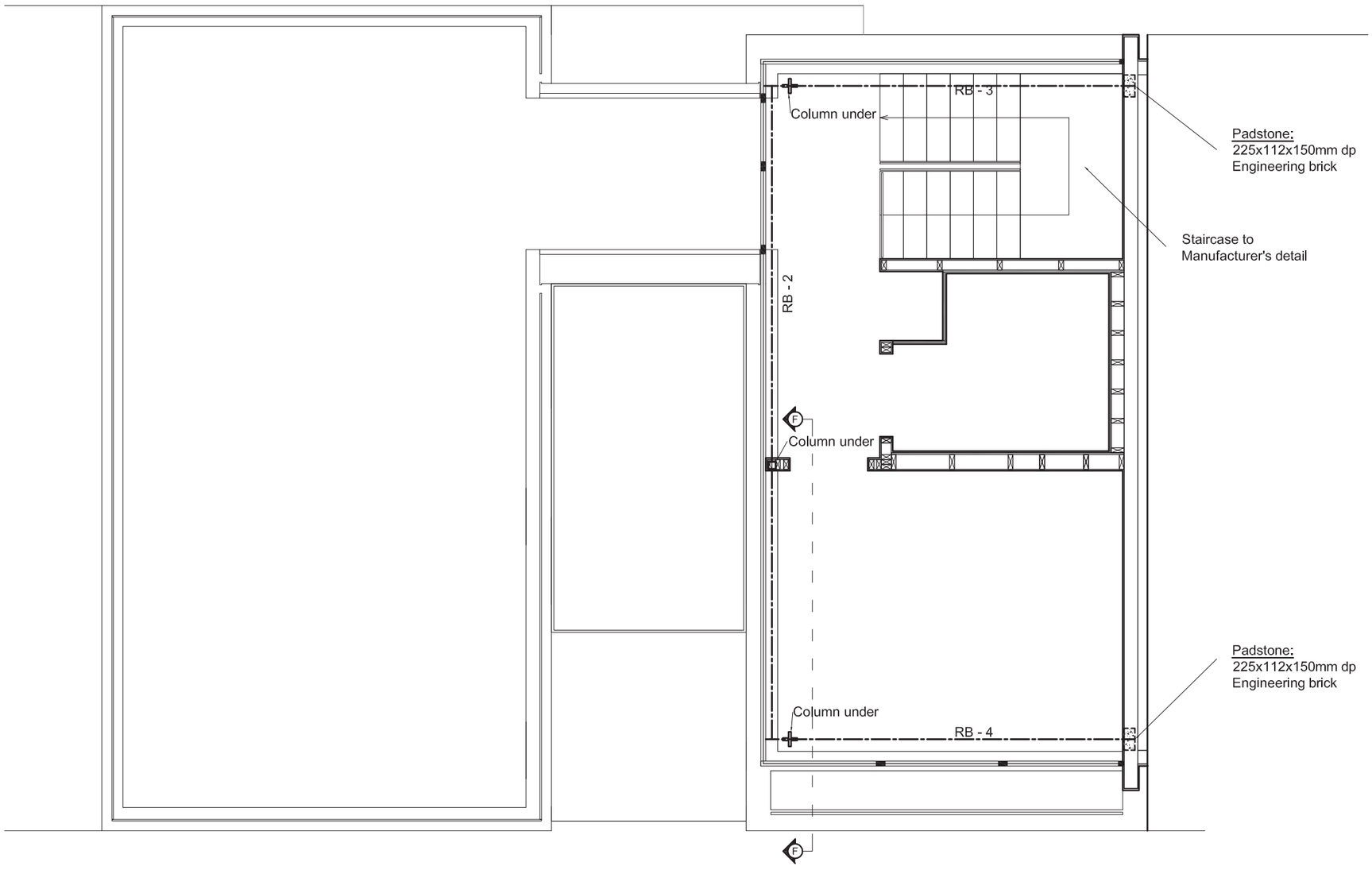
10.5. It is intended that the above measures and sequences of works are adopted for the eventual design and construction of the proposed works.

10.6. Detailed method statements and calculations for the enabling and temporary works will need to be prepared by the Contractor for comment by all relevant parties.

10.7. Martin Redston Associates will ensure that adequate supervision and monitoring is provided throughout the works particularly during the excavation and demolition stages.

# Appendix A

# Proposed Second Floor Plan - Structure Above




1:50 1m 3m

| Member | Section |
|---|---|
| RB - 1 | 152x152x23 UC |
| RB - 2 | 152x152x23 UC |
| RB - 3 | 152x152x23 UC |
| RB - 4 | 152x152x23 UC |

**NOTES**

1. All dimensions to be verified on site.
2. Read in conjunction with architect's drawings.
3. All steelwork designed to EN3 fabricated to EN3 and EN1090.
4. All steel members to be grade S275JR steel unless otherwise noted.
5. Apply 2 coats of red oxide primer/2 coats zinc rich primer to all steel prior to erection.
6. All fire protection to architect's specification. provide min. ½ hour fire resistance capability to all steel (e.g. 12.5 mm plasterboard and 7mm skim).
7. All external steel and steel within cavity to have 2 coats of bitumastic paint (RIW or similar) or galvanised.
8. All welding to be 4mm fillet welds carried out in workshop.
9. All black bolts to be grade 8.8.
10. All timberwork designed to BS 5268 OR EN5.
11. Double and triple joists to be bolted together with M12 bolts + 63mm dia. TP connectors and washer plate @ 450 c/c unless otherwise noted.
12. Connections:
    TIMBER/BRICK: BAT SPH hanger when there is a minimum of 675mm of brickwork above, if not use MAXI SPEEDY hangers or equivalent.
    TIMBER/TIMBER: BAT JIFFY or MAXI SPEEDY hanger or framing anchor.
    ALLOW FOR BAT M305 STRAPS @ 1200 c/c for restraint of joists and all wall plates.
13. Concrete padstones to be grade C25 (1:2:4).
14. Foundation concrete to be grade C40.
15. All temporary propping by the contractor.
16. New brickwork to be 35N/mm², new blockwork to be 3.5n/mm² set in 1:1:6 mortar. unless noted otherwise
17. All new masonry to be fixed to existing with furfix profiles.
18. All waterproofing and drainage to architect's specification.
19. All works to be approved by the building control officer.
20. No work to commence on site prior to building control approval of structural details.
21. Any excavations works within 3m of any adjoining property or party structure may be subject to party wall agreement.
22. Any deep foundations/piling within 6m may be subject to party wall agreement.
23. Floor joists strapped to main brick walls in accordance with A3 disproportionate collapse guidelines.
24. Vertical expansion joints:
    Every 5 metre length in blockwork
    Every 12 metre length in brickwork
25. If contractor has preferred alternative method of construction please call us.

Title: Proposed Second Floor Plan - Structure Above

Preliminary

| Rev | Date | Description | App |
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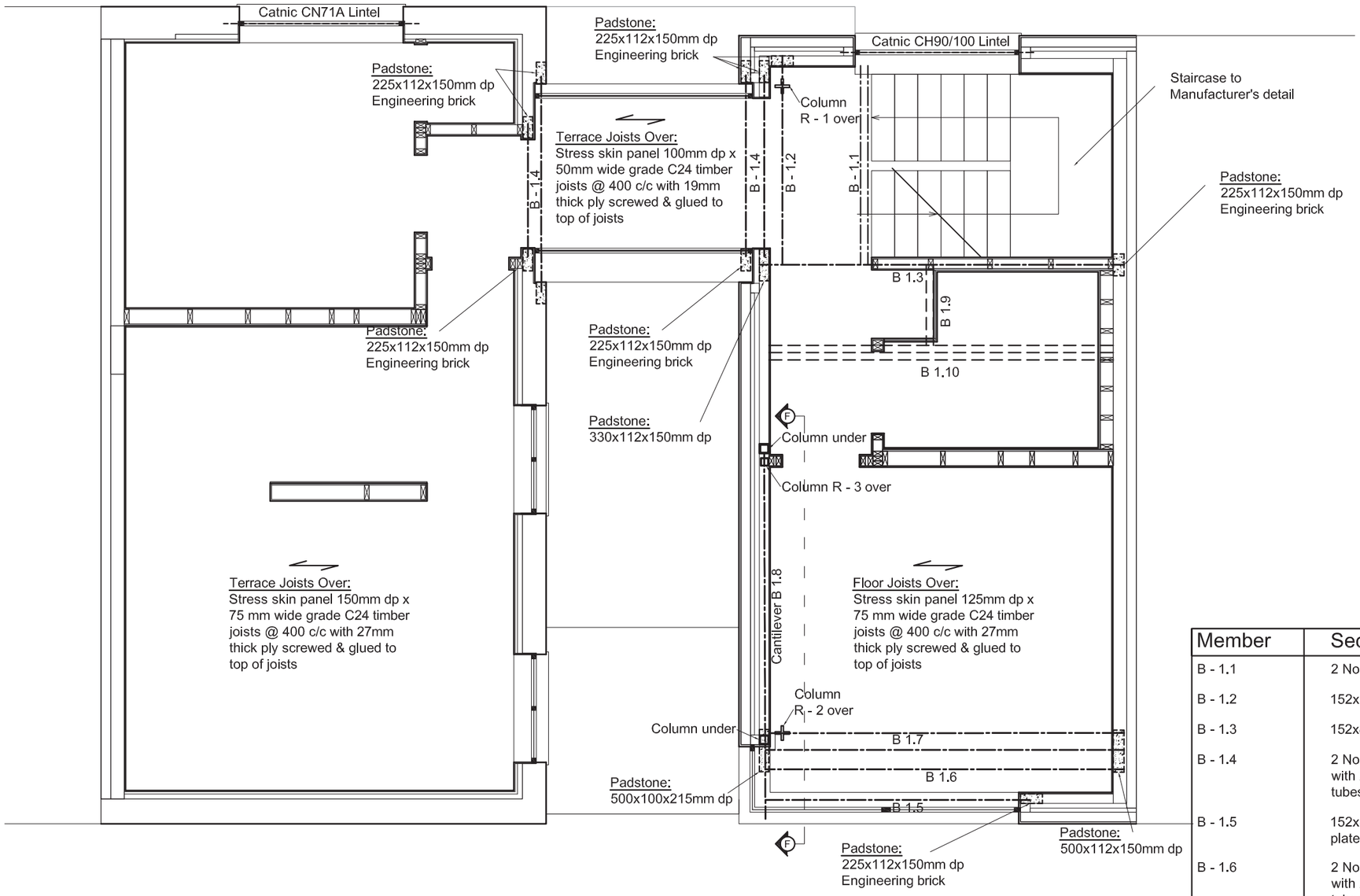
Date: 15/01/2016
Eng: EH
Scale: 1:50@A3
Job No: 12.568
Sheet No. 1
Rev B

Project: 102 Camden Mews, London, NW1

# Proposed First Floor Plan - Structure Above




| Member | Section |
|---|---|
| B - 1.1 | 2 No. 125mm dp x 75 mm wide C24's |
| B - 1.2 | 152x152x23 UC |
| B - 1.3 | 152x89x16 UB |
| B - 1.4 | 2 No. 152x89x16 UB bolted together with 2M12 grade 8.8 bolts & spacer tubes at 500 c/c |
| B - 1.5 | 152x89x16 UB, with 6mm steel plate welded to bottom flange |
| B - 1.6 | 2 No. 152x89x16 UB bolted together with 2M12 grade 8.8 bolts & spacer tubes at 500 c/c |
| B - 1.7 | 152x152x23 UC |
| Cantilever B - 1.8 | 152x89x16 UB with 6mm thick plate welded to bottom flange over window |
| B - 1.9 | 2 No. 125mm dp x 75 mm wide C24's |
| B - 1.10 | 3 No. 125mm dp x 75 mm wide C24's |
| R - 1 | 4No. 60x60x10.0 RSA |
| R - 2 | 4No. 60x60x10.0 RSA |
| R - 3 | 80x80x3.6 SHS |

**NOTES**

1. All dimensions to be verified on site.
2. Read in conjunction with architect's drawings.
3. All steelwork designed to EN3 fabricated to EN3 and EN1090.
4. All steel members to be grade S275JR steel unless otherwise noted.
5. Apply 2 coats of red oxide primer/2 coats zinc rich primer to all steel prior to erection.
6. All fire protection to architect's specification. provide min. ½ hour fire resistance capability to all steel (e.g. 12.5 mm plasterboard and 7mm skim).
7. All external steel and steel within cavity to have 2 coats of bitumastic paint (RIW or similar) or galvanised.
8. All welding to be 4mm fillet welds carried out in workshop.
9. All black bolts to be grade 8.8.
10. All timberwork designed to BS 5268 OR EN5.
11. Double and triple joists to be bolted together with M12 bolts + 63mm dia. TP connectors and washer plate @ 450 c/c unless otherwise noted.
12. Connections:
    TIMBER/BRICK: BAT SPH hanger when there is a minimum of 675mm of brickwork above, if not use MAXI SPEEDY hangers or equivalent.
    TIMBER/TIMBER: BAT JIFFY or MAXI SPEEDY hanger or framing anchor.
    ALLOW FOR BAT M305 STRAPS @ 1200 c/c for restraint of joists and all wall plates.
13. Concrete padstones to be grade C25 (1:2:4).
14. Foundation concrete to be grade C40.
15. All temporary propping by the contractor.
16. New brickwork to be 35N/mm², new blockwork to be 3.5n/mm² set in 1:1:6 mortar. unless noted otherwise
17. All new masonry to be fixed to existing with furfix profiles.
18. All waterproofing and drainage to architect's specification.
19. All works to be approved by the building control officer.
20. No work to commence on site prior to building control approval of structural details.
21. Any excavations works within 3m of any adjoining property or party structure may be subject to party wall agreement.
22. Any deep foundations/piling within 6m may be subject to party wall agreement.
23. Floor joists strapped to main brick walls in accordance with A3 disproportionate collapse guidelines.
24. Vertical expansion joints:
    Every 5 metre length in blockwork
    Every 12 metre length in brickwork
25. If contractor has preferred alternative method of construction please call us.

Title: Proposed First Floor Plan - Structure Above

Preliminary

| Rev | Date | Description | App |
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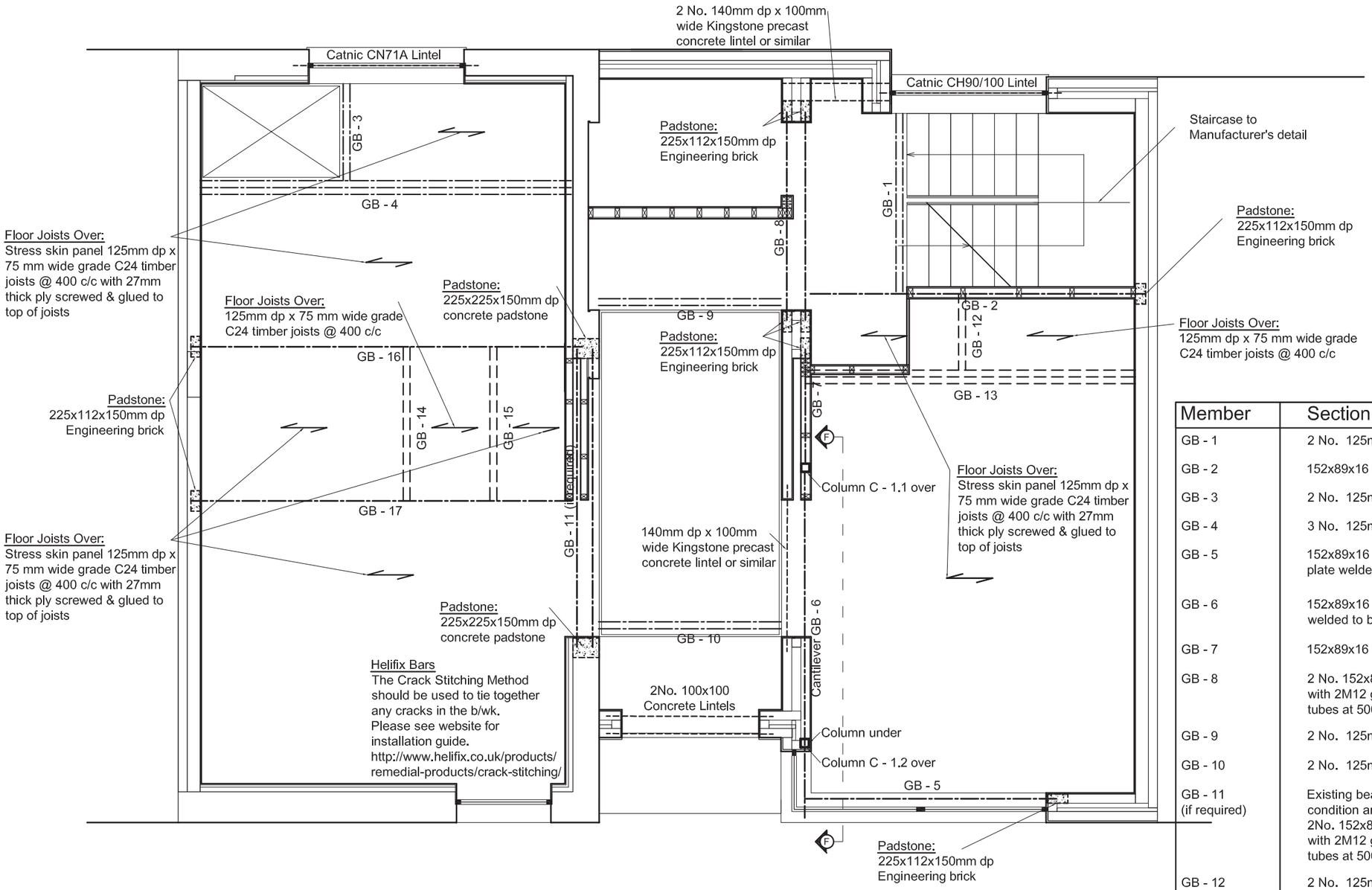
Date: 15/01/2016
Eng: EH
Scale: 1:50@A3
Job No: 12.568
Sheet No. 2
Rev B

Project: 102 Camden Mews, London, NW1

# Proposed Ground Floor Plan - Structure Above




| Member | Section |
|---|---|
| GB - 1 | 2 No. 125mm dp x 75 mm wide C24's |
| GB - 2 | 152x89x16 UB |
| GB - 3 | 2 No. 125mm dp x 75 mm wide C24's |
| GB - 4 | 3 No. 125mm dp x 75 mm wide C24's |
| GB - 5 | 152x89x16 UB, with 6mm steel plate welded to bottom flange |
| GB - 6 | 152x89x16 UB, with 6mm steel plate welded to bottom flange over window |
| GB - 7 | 152x89x16 UB |
| GB - 8 | 2 No. 152x89x16 UB bolted together with 2M12 grade 8.8 bolts & spacer tubes at 500 c/c |
| GB - 9 | 2 No. 125mm dp x 75 mm wide C24's |
| GB - 10 | 2 No. 125mm dp x 75 mm wide C24's |
| GB - 11 (if required) | Existing beam can remain if in good condition and must be a minimum of 2No. 152x89x16 UB bolted together with 2M12 grade 8.8 bolts & spacer tubes at 500 c/c |
| GB - 12 | 2 No. 125mm dp x 75 mm wide C24's |
| GB - 13 | 3 No. 125mm dp x 75 mm wide C24's |
| GB - 14 | 2 No. 125mm dp x 75 mm wide C24's |
| GB - 15 | 2 No. 125mm dp x 75 mm wide C24's |
| GB - 16 | 152x89x16 UB |
| GB - 17 | 152x89x16 UB |
| C - 1.1 | 100x100x10 SHS |
| C - 1.2 | 100x100x10 SHS |

**NOTES**

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3. All steelwork designed to EN3 fabricated to EN3 and EN1090.
4. All steel members to be grade S275JR steel unless otherwise noted.
5. Apply 2 coats of red oxide primer/2 coats zinc rich primer to all steel prior to erection.
6. All fire protection to architect's specification. provide min. ½ hour fire resistance capability to all steel (e.g. 12.5 mm plasterboard and 7mm skim).
7. All external steel and steel within cavity to have 2 coats of bitumastic paint (RIW or similar) or galvanised.
8. All welding to be 4mm fillet welds carried out in workshop.
9. All black bolts to be grade 8.8.
10. All timberwork designed to BS 5268 OR EN5.
11. Double and triple joists to be bolted together with M12 bolts + 63mm dia. TP connectors and washer plate @ 450 c/c unless otherwise noted.
12. Connections:
    TIMBER/BRICK: BAT SPH hanger when there is a minimum of 675mm of brickwork above, if not use MAXI SPEEDY hangers or equivalent.
    TIMBER/TIMBER: BAT JIFFY or MAXI SPEEDY hanger or framing anchor.
    ALLOW FOR BAT M305 STRAPS @ 1200 c/c for restraint of joists and all wall plates.
13. Concrete padstones to be grade C25 (1:2:4).
14. Foundation concrete to be grade C40.
15. All temporary propping by the contractor.
16. New brickwork to be 35N/mm², new blockwork to be 3.5n/mm² set in 1:1:6 mortar. unless noted otherwise
17. All new masonry to be fixed to existing with furfix profiles.
18. All waterproofing and drainage to architect's specification.
19. All works to be approved by the building control officer.
20. No work to commence on site prior to building control approval of structural details.
21. Any excavations works within 3m of any adjoining property or party structure may be subject to party wall agreement.
22. Any deep foundations/piling within 6m may be subject to party wall agreement.
23. Floor joists strapped to main brick walls in accordance with A3 disproportionate collapse guidelines.
24. Vertical expansion joints:
    Every 5 metre length in blockwork
    Every 12 metre length in brickwork
25. If contractor has preferred alternative method of construction please call us.

Title: Proposed Ground Floor Plan - Structure Above

Preliminary

| Rev | Date | Description | App |
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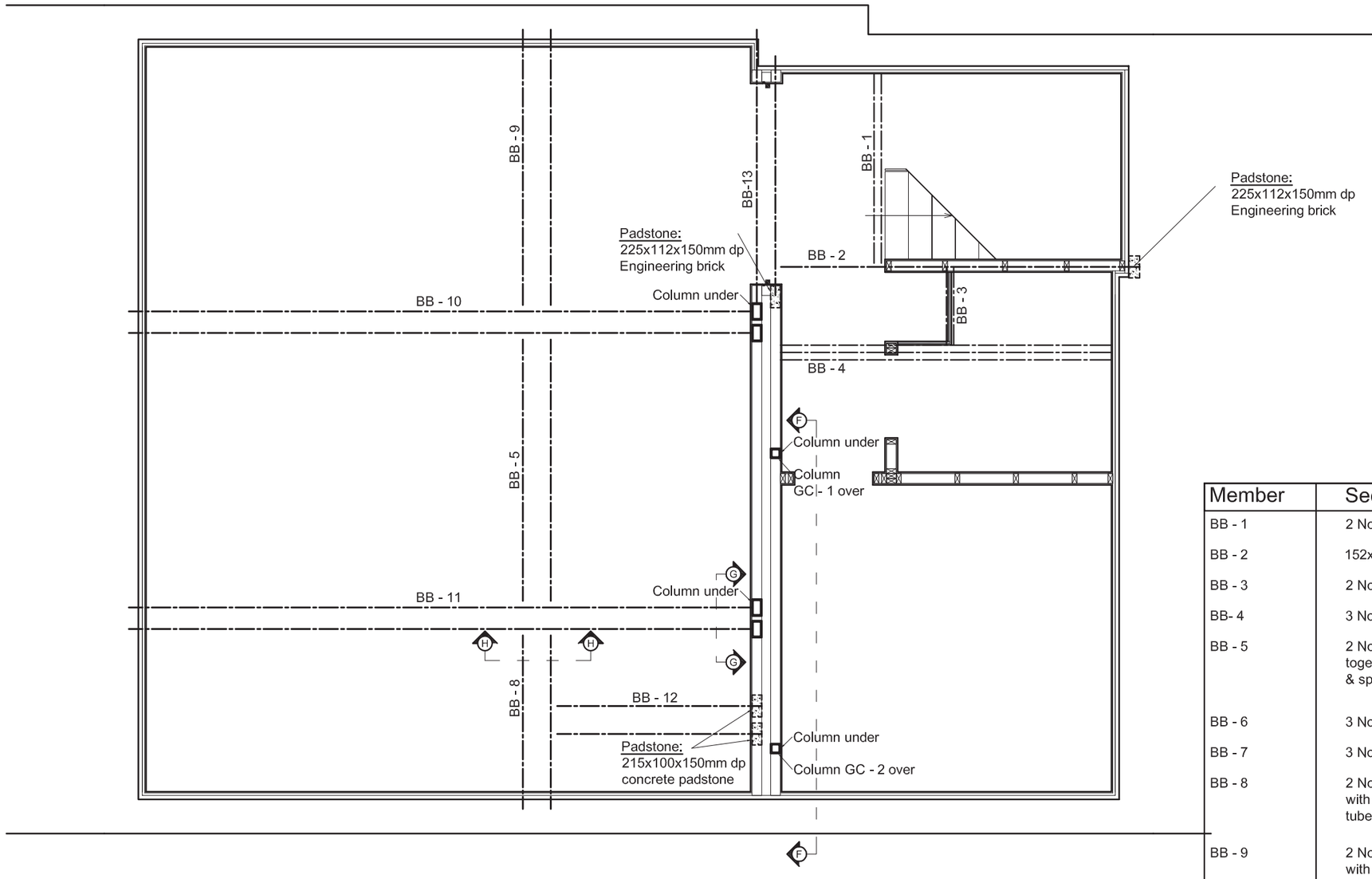
Date: 15/01/2016 | Sheet No. 3 | Rev B
Eng: EH | Scale: 1:50@A3
Job No: 12.568

Project: 102 Camden Mews, London, NW1

# Proposed Basement Plan - Structure Above




1:50 1m 3m

| Member | Section |
|---|---|
| BB - 1 | 2 No. 125mm dp x 75 mm wide C24 |
| BB - 2 | 152x89x16 UB |
| BB - 3 | 2 No. 125mm dp x 75 mm wide C24 |
| BB- 4 | 3 No. 125mm dp x 75 mm wide C24 |
| BB - 5 | 2 No. 178x102x19 UB bolted together with 2M12 grade 8.8 bolts & spacer tubes at 500 c/c |
| BB - 6 | 3 No. 125mm dp x 75 mm wide C24 |
| BB - 7 | 3 No. 125mm dp x 75 mm wide C24 |
| BB - 8 | 2 No. 178x102x19 UB bolted together with 2M12 grade 8.8 bolts & spacer tubes at 500 c/c |
| BB - 9 | 2 No. 178x102x19 UB bolted together with 2M12 grade 8.8 bolts & spacer tubes at 500 c/c |
| BB - 10 | 2 No. 203x203x86 UC bolted together with 2M16 grade 8.8 bolts & spacer tubes at 500 c/c |
| BB - 11 | 2 No. 203x203x86 UC bolted together with 2M16 grade 8.8 bolts & spacer tubes at 500 c/c |
| BB - 12 | 2 No. 178x102x19 UB bolted together with 2M12 grade 8.8 bolts & spacer tubes at 500 c/c |
| BB - 13 | 2 No. 152x89x16 UB bolted together with 2M12 grade 8.8 bolts & spacer tubes at 500 c/c |
| GC - 1 | 100x100x10 SHS |
| GC - 2 | 100x100x10 SHS |

**NOTES**

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6. All fire protection to architect's specification. provide min. ½ hour fire resistance capability to all steel (e.g. 12.5 mm plasterboard and 7mm skim).
7. All external steel and steel within cavity to have 2 coats of bitumastic paint (RIW or similar) or galvanised.
8. All welding to be 4mm fillet welds carried out in workshop.
9. All black bolts to be grade 8.8.
10. All timberwork designed to BS 5268 OR EN5.
11. Double and triple joists to be bolted together with M12 bolts + 63mm dia. TP connectors and washer plate @ 450 c/c unless otherwise noted.
12. Connections:
    TIMBER/BRICK: BAT SPH hanger when there is a minimum of 675mm of brickwork above, if not use MAXI SPEEDY hangers or equivalent.
    TIMBER/TIMBER: BAT JIFFY or MAXI SPEEDY hanger or framing anchor.
    ALLOW FOR BAT M305 STRAPS @ 1200 c/c for restraint of joists and all wall plates.
13. Concrete padstones to be grade C25 (1:2:4).
14. Foundation concrete to be grade C40.
15. All temporary propping by the contractor.
16. New brickwork to be 35N/mm², new blockwork to be 3.5n/mm² set in 1:1:6 mortar. unless noted otherwise
17. All new masonry to be fixed to existing with furfix profiles.
18. All waterproofing and drainage to architect's specification.
19. All works to be approved by the building control officer.
20. No work to commence on site prior to building control approval of structural details.
21. Any excavations works within 3m of any adjoining property or party structure may be subject to party wall agreement.
22. Any deep foundations/piling within 6m may be subject to party wall agreement.
23. Floor joists strapped to main brick walls in accordance with A3 disproportionate collapse guidelines.
24. Vertical expansion joints:
    Every 5 metre length in blockwork
    Every 12 metre length in brickwork
25. If contractor has preferred alternative method of construction please call us.

Title: Proposed Basement Floor Plan - Structure Above

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| Rev | Date | Description | App |
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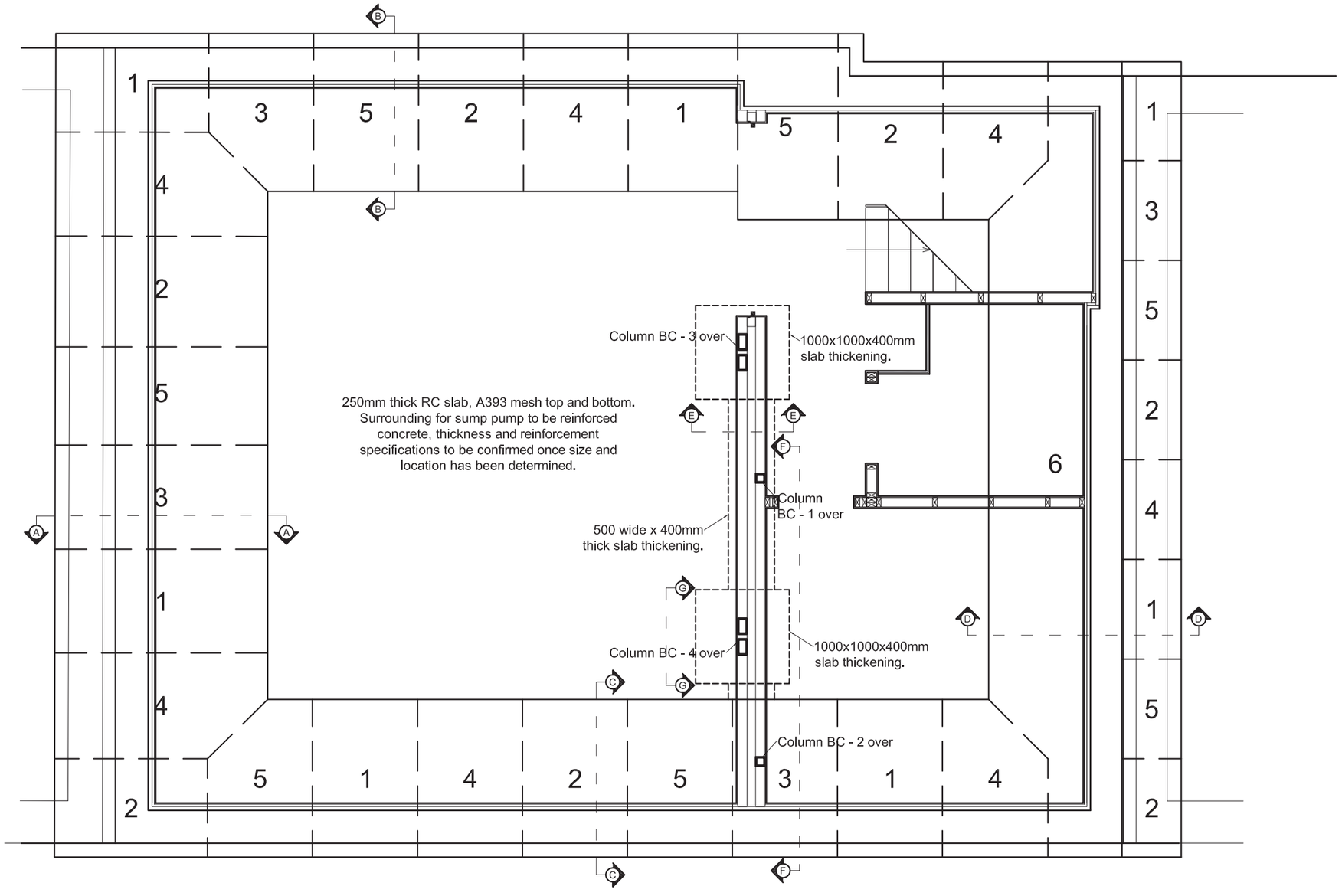
Date: 15/01/2016
Eng: EH
Scale: 1:50@A3
Job No: 12.568
Sheet No. 4
Rev B

Project: 102 Camden Mews, London, NW1

# Suggested Underpinning Sequence




1:50 1m 3m

| Member | Section |
|---|---|
| BC - 1 | 100x100x10 SHS |
| BC - 2 | 100x100x10 SHS |
| BC - 3 | 2No. 150x100x5.0 RHS |
| BC - 4 | 2No. 150x100x5.0 RHS |

**SEQUENCE OF UNDERPINNING**

1. WORKING IN STRIPS NOT EXCEEDING 1.2m LONG EXCAVATE TO REQUIRED DEPTH BENEATH EXISTING FOOTING.
2. CAREFULLY CUT AWAY TO PROVIDE LEVEL SOFFIT TO EXISTING BRICK FOOTING AND THOROUGHLY CLEAN BEFORE UNDERPINNING.
3. CAST NEW CONCRETE TO WITHIN 50mm OF SOFFIT OF EXISTING FOOTING AND ALLOW 24 HOURS TO CURE.
4. RAM IN DRY PACK MORTAR BETWEEN NEW AND EXISTING FOOTINGS.
5. NEVER EXCAVATE TWO ADJACENT STRIPS WITHOUT ALLOWING 3 DAYS FROM TIME OF DRY PACKING.
6. WHEN ADJACENT SECTIONS ARE OPENED UP THE EXPOSED CONCRETE SURFACES SHOULD BE THOROUGHLY CLEANED OF ALL LOOSE MATERIAL AND SCABBLED TO FORM A GOOD KEY.
7. UNDERPINNING WIDTH TO BE AS NOTED ON THE DRAWINGS.
8. ALL NEW CONCRETE BELOW GROUND TO BE SULPHATE RESISTING CEMENT CONC. GRADE C 40.
9. DRY PACK - 1:3 CEMENT/SAND.
10. ALL UNDERPINS ARE TO BE DOWELLED TOGETHER WITH H20 BARS 800mm LONG O/A AT 500mm CENTRES VERTICALLY. ALTERNATIVELY PROVIDE FULL WIDTH TOOTHED JOINTS ONE THIRD HIGH AND 250mm DEEP AT MID HEIGHT OF ALL UNDERPINS.

Title: Suggested Underpinning Sequence

Preliminary

| Rev | Date | Description | App |
|---|---|---|---|
| | | | |
| | | | |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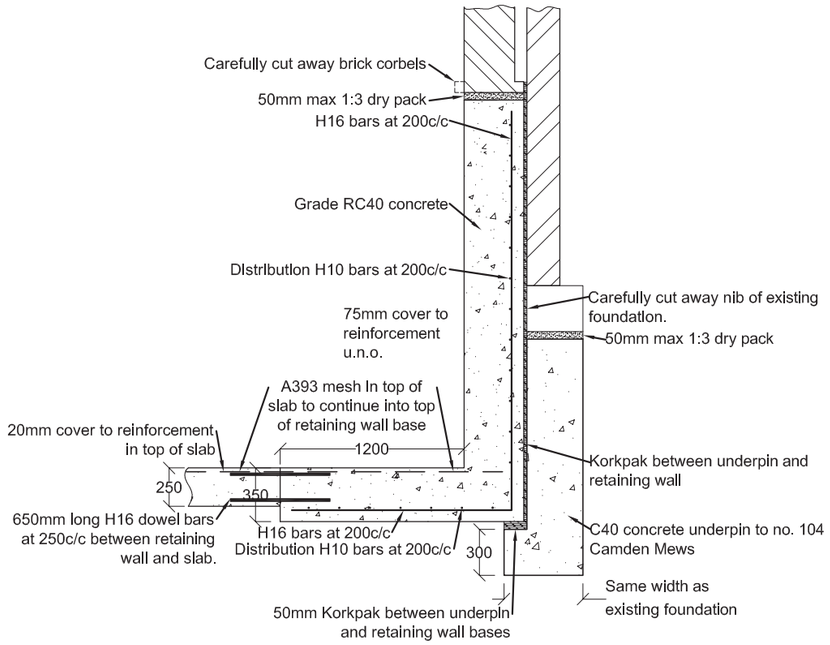
Date: 15/01/2016 | Sheet No. 5 | Rev B

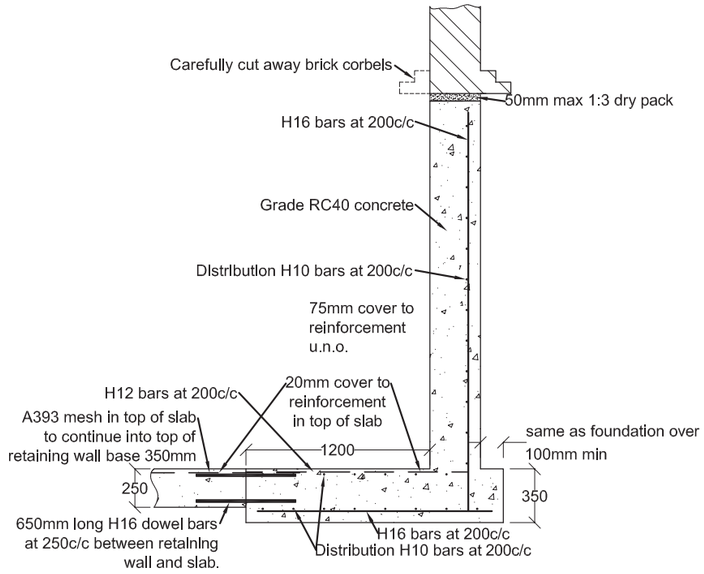
Eng: EH | Scale: 1:50@A3

Job No: 12.568

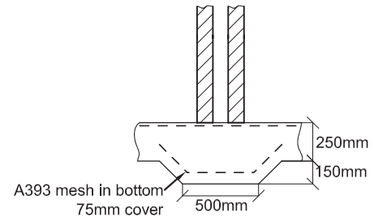
Project: 102 Camden Mews, London, NW1



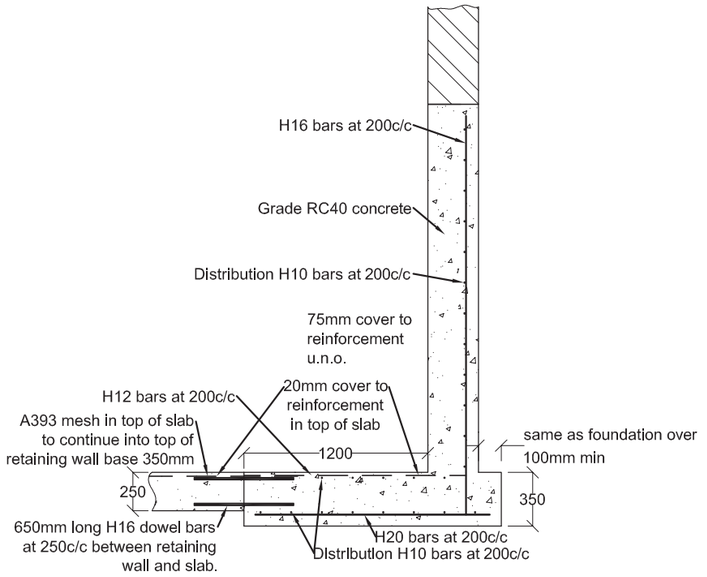

SECTION A-A



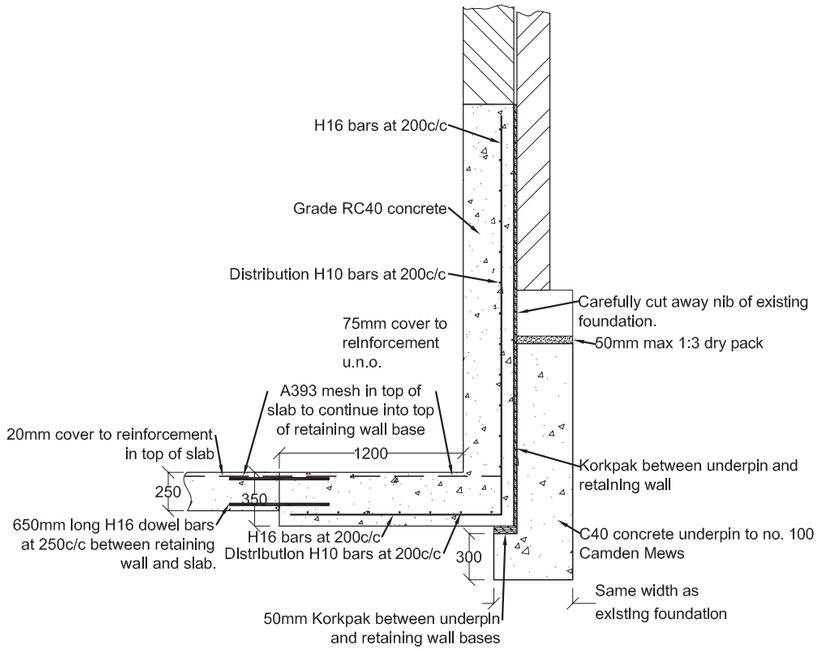

SECTION B-B




SECTION E-E




SECTION C-C




SECTION D-D

1:50 1m 3m

| Title: | Proposed Basement Section Details | |
|---|---|---|
| Preliminary | | |

| Rev | Date | Description | App |
|---|---|---|---|
| | | | |
| | | | |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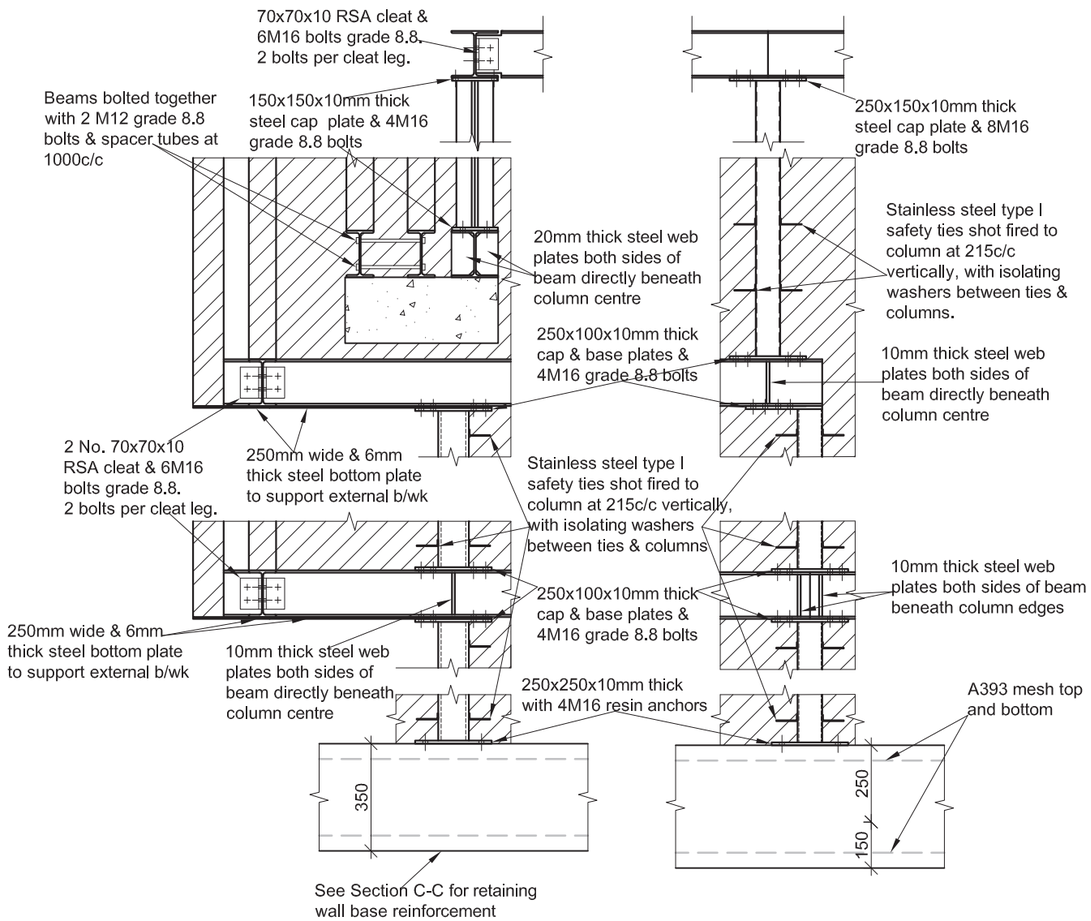
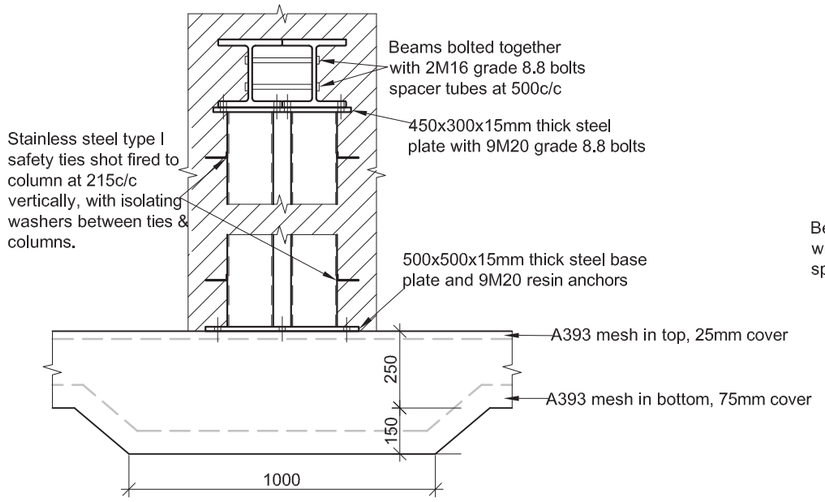
| Date: 15/01/2016 | | Sheet No. | Rev |
|---|---|---|---|
| Eng: JS | Scale: 1:40@A3 | 6 | A |
| Job No: 12.568 | | | |

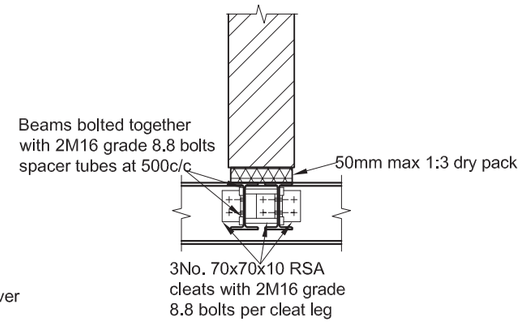
Project: 102 Camden Mews, London, NW1




SECTION F-F




SECTION G-G




SECTION H-H

1:50 1m 3m

Title: Proposed section details

Preliminary

| Rev | Date | Description | App |
|---|---|---|---|
| | | | |
| | | | |

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Date: 15/01/2016
Eng: JS
Scale: 1:20@A3
Job No: 12.568
Sheet No. 7
Rev -

Project: 102 Camden Mews, London, NW1

# Appendix B

# HERTS & ESSEX SITE INVESTIGATIONS

The Old Post Office, Wellpond Green, Standon,
Ware, Herts, SG11 1NJ

Telephone : Ware (01920) 822233
Fax: Ware (01920) 822200


9th February 2015 Our Ref : MRS/12419

Martin Redston Associates
3 Edward Square
London
N1 0SP

**For the attention of J.Hutchins Esq,:.**

Dear Sir,

**Re: 102 Camden Mews, Camden, NW1 9AG : Site Investigation**

## 1.0 Introduction

1.01 In accordance with your instructions, we visited the above site during October 2014 .

1.02 The purpose of our visit was to carry out an investigation into the subsoil conditions with a view to foundation design.

1.03 The comments and opinions expressed are based purely on the conditions encountered and the subsequent laboratory testing.

1.04 Therefore, it is possible that some special conditions prevailing on site have not been encountered or taken into account.

1.05 All ground water recordings or their absence relate to short term observations and do not allow for fluctuations due to seasonal or other effects.

## 2.0 Description of Site

2.01 The site is situated at 102 Camden Mews, Camden, NW1 9AG

2.02 At the time of our visit the site was generally flat.

## 3.0 Fieldwork

3.01 One borehole was sunk to a maximum depth of 7.00m by means of a window sampler drilling rig togeter with exposing the existing foundations.

3.02 The location of the works is indicated on the site plan forming appendix one.

3.03 The various strata and details encountered were noted and are recorded on the borehole logs forming appendix two.

3.04 Insitu strength tests were carried out in the boreholes, the results of which can be seen on the aforementioned logs.

3.05 A full range of samples were recovered as noted and retained for subsequent laboratory testing.

3.06 The location, type and height of any trees should be taken from a survey for later use with NHBC Chapter 4.20, if required.

## 4.0 Laboratory Testing

4.01 All samples were tested in accordance with BS:1377:1990 Methods of Test for Soils for Civil Engineering purposes.

4.02 Selected samples were tested to determine their atterberg limits, triaxial strength, soluble sulphate content and pH value.

4.03 The results of all laboratory testing are summarised in appendix three.

## 5.0 Conclusions and Recommendations

5.01 By inspection of the borehole logs it can be seen that the subsoil consists of Cobble over Gravely SAND to 0.25m where a Loose Dark grey To Black Claybound Gravely Brick Concrete FILL overlies at 1.20m a Firm To Stiff Brown Mottled grey CLAY to 3.00m where a Stiff grey Brown CLAY is encountered and present to the base of the excavation.

5.02 No water was encountered upon excavation of the borehole as described on the borehole logs, a standpipe was installed at 5.00m . The water level was 1.25m below ground level on the 21st January 2015

5.03 Standard Penetration Tests in the Fill gave N values of 8 indicating a low bearing capacity.

5.04 No significant roots were encountered in the borehole.

5.05 The existing footings were exposed in January 2015 and the details are enclosed.

5.06 Laboratory testing proved the clays to be of very high plasticity (PI=46 - 47 %) which indicates a high susceptibility to movement associated with moisture content change.

5.07 Triaxial testing proved the CLAYS to have cohesion values between 106 - 136 Kn/m² these values are generally seen to increase with depth.

5.08 Therefore when considering the information available we are of the opinion that a the basement can take the form of a reinforced raft with walls designed to take the pressure of the retained soil.

5.09 Further investigation may be required in order to locate existing foundations within the area of the site which may restrict any future works.

5.10 As the site contains less than 0.50g/L of soluble sulphate it can be categorised as a class 1 site in accordance with BRE Digest, and as such any concrete in contact with the subsoil needs no special precautions.

5.11 Chemical testing is enclosed to allow material to be taken to the tip, the upper FILL material is contaminated with hydrocarbons and will need to be removed from the site, whereas the lower natural soil has no elevated levels of contamination.

We hope that this is satisfactory, however if you should require any further information, please do not hesitate to contact us.

Yours faithfully,

M. R. Smith M.Sc
Principal Engineer

# HERTS & ESSEX SITE INVESTIGATIONS

The Old Post Office, Wellpond Green, Standon, Ware, Herts SG11 1NJ
Telephone: Ware (01920) 822233
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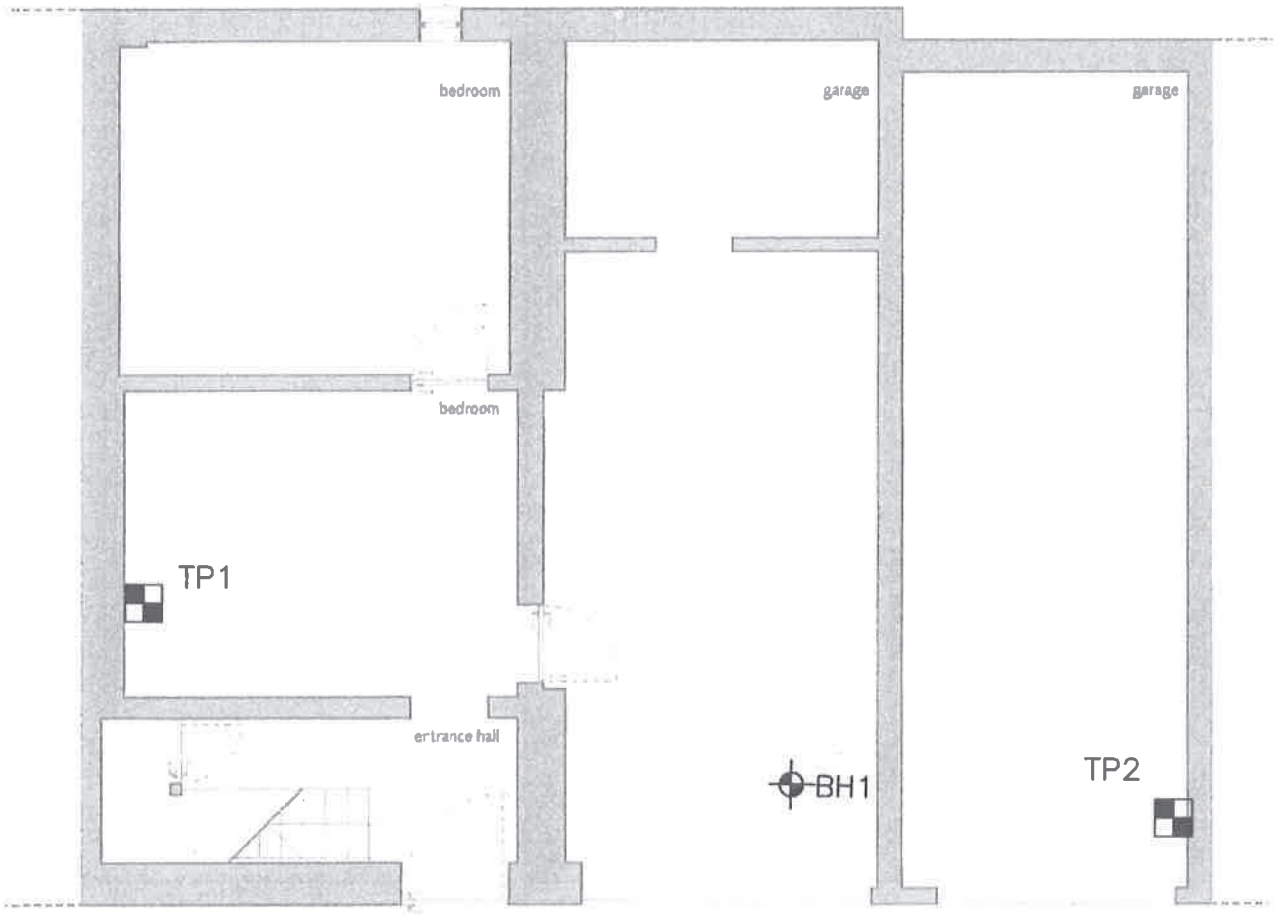
| | |
|---|---|
| Appendix No. | 1 |
| Sheet No. | 1 |
| Job No. | 12419 |
| Date | Feb 2015 |

102 Camden Mews, Camden, NW1 9AG

Site Plan




Not to Scale

H & E SI

102 Camden Mews, London, NW1 9AG

Existing Footing Detail

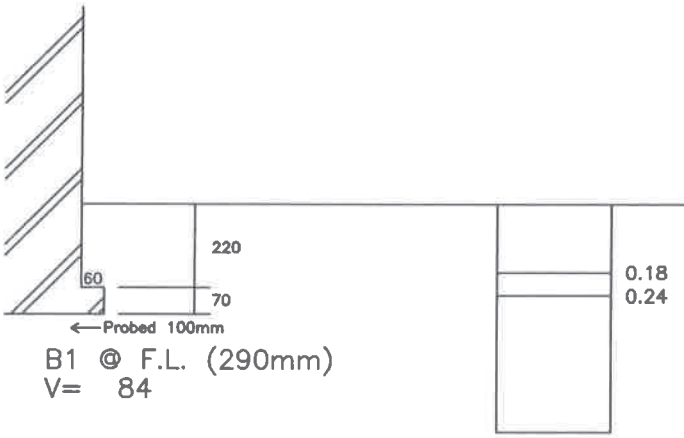
Appendix No 2

Sheet No 1

Job No. 12419

Date Feb 2015

Trial Pit One




Roots to Close

Concrete

Weak concrete over compact brick fragments

Stiff dark orange brown mottled grey slightly Silty CLAY

Scale 1 : 20

NOTES

▽ = Standing Water
▼ = Water Strike
B = Bulk Sample
V = Shear Vane Test ($kN/M^2$)
N = SPT 'N'-Value

H&ESI

102 Camden Mews, London, NW1 9AG

Existing Footing Detail

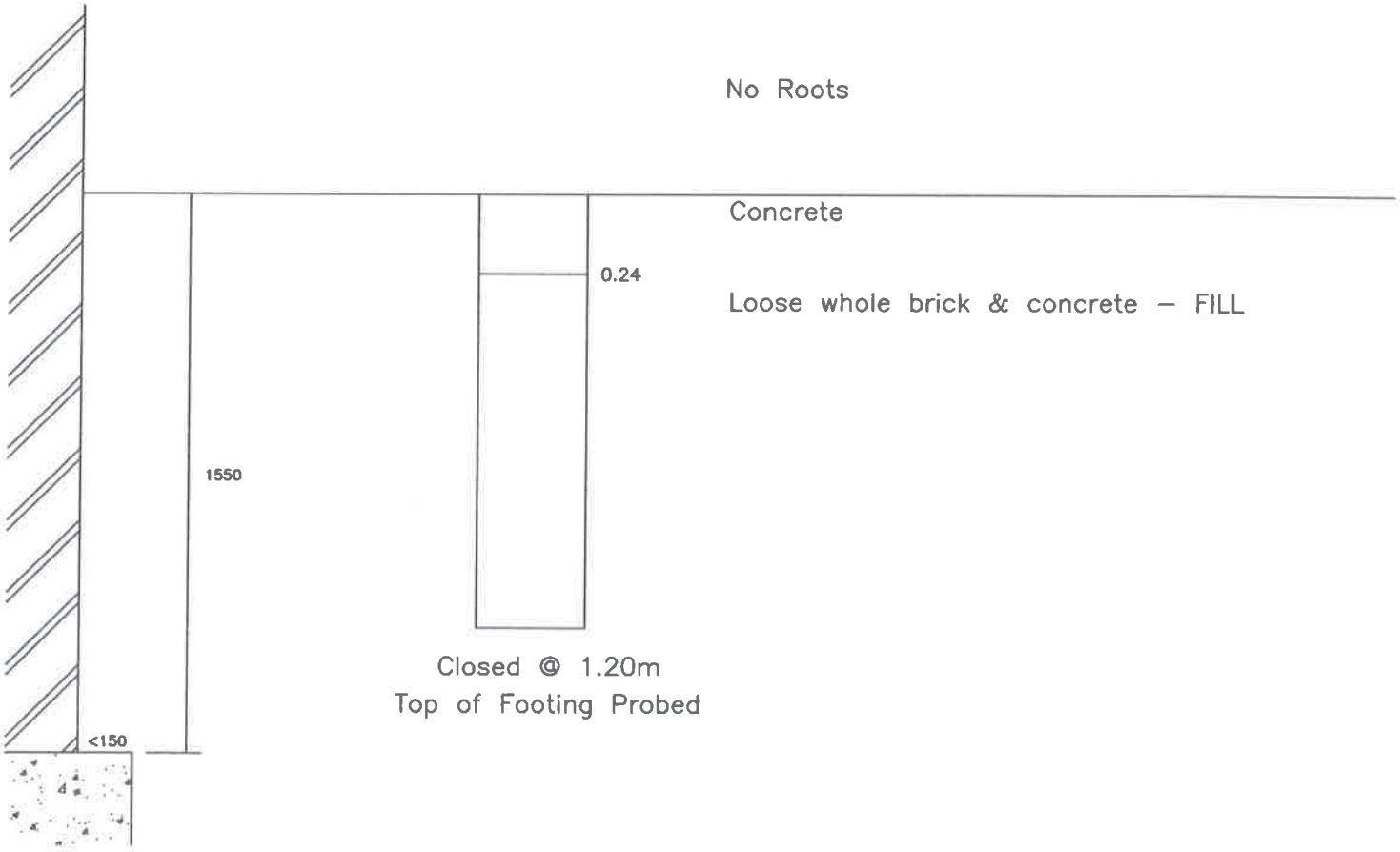
Appendix No 2

Sheet No 2

Job No. 12419

Date Feb 2015

Trial Pit Two




Scale 1 : 20

NOTES

▽ = Standing Water
▼ = Water Strike
B = Bulk Sample
V = Shear Vane Test ($kN/M^2$)
N = SPT 'N'-Value

# HERTS & ESSEX SITE INVESTIGATIONS

The Old Post Office, Wellpond Green, Standon, Ware, Herts SG11 1NJ
Telephone: Ware (01920) 822233
Fax: Ware (01920) 822200


Appendix No. 2
Sheet No. 3
Job No. 12419
Date OCT 2014

102 Camden Mews, Camden, NW1 9AG

Borehole One

| Description of Strata | Depth | Reduced Level | Legend | Thickness (m) | Water Level | Samples No. | Samples Type | Samples Depth (m) | S.P.T N-Value or Vane Strength | Casing Depth (m) |
|---|---|---|---|---|---|---|---|---|---|---|
| Cobble Over Light Brown Gravely SAND | 0.25 | | | 0.25 | DRY | 1 | U | 0.00 | | |
| Loose Dark Grey To Black Claybound Gravely Brick Concrete FILL | 1.20 | | | 0.95 | | 2 | U | 1.00 | N=8 | 1.00 |
| Firm To Stiff Brown Mottled Grey CLAY | 3.00 | | | 1.80 | | 3 | U | 2.00 | | |
| | | | | | | 4 | U | 3.00 | | |
| Stiff Grey Brown CLAY | 7.00 | | | 4.00 | | 5 | U | 4.00 | | |
| | | | | | | 6 | U | 5.00 | | |
| | | | | | | 7 | U | 6.00 | | |
| | | | | | | | | 7.00 | | |
| Borehole Complete At 7.00m<br>Standpipe Installed at 5.00m | | | | | | | | | | |

Remarks: Standpipe Installed at 5.00m

Scale 1:50

Key : U–Undisturbed Sample (100mm diameter) B –Bulk Sample ▽–Water Struck D –Disturbed Sample ▽–Water Standing W–Water Sample P–Piston Sample N–S.P.T. N–Value V–Vane Strength (kN/m²)

# HERTS & ESSEX SITE INVESTIGATIONS

Warren House, Bells Hill, Bishop's Stortford, Herts. CM23 2NN
Telephone: Bishops Stortford (01279) 506725
Fax: Bishops Stortford (01279) 506724


Appendix No. 3
Sheet No. 1
Job No. 12419
Date Nov 2014

LOCATION 102 Camden Mews, London NW1

LIQUID AND PLASTIC LIMIT TEST RESULTS

| Borehole | Depth (m) | Sample | Natural Moisture Content (%) | Liquid Limit (%) | Plastic Limit (%) | Plasticity Index (%) | Group Symbol | Desiccation Profile | Percentage Retained 425 Micron Sieve (%) |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 2.00 | U | 31 | 71 | 25 | 46 | CV | | 0 |
| 1 | 4.00 | U | 31 | 72 | 25 | 47 | CV | | 0 |
| 1 | 6.00 | U | 29 | 73 | 26 | 47 | CV | | 0 |

# HERTS & ESSEX SITE INVESTIGATIONS

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Appendix No. 3
Sheet No. 2
Job No. 12419
Date Nov 2014

LOCATION 102 Camden Mews, London NW1

UNDRAINED COMPRESSION TEST RESULTS

| Borehole | Depth (m) | Sample | Natural Moisture Content (%) | Bulk Density ($Mg/m^3$) | Lateral Pressure ($kN/m^2$) | Deviator Stress ($kN/m^2$) | Apparent Cohesion ($kN/m^2$) | Angle of Shearing Resistance | Remarks |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 2.00 | U | 31 | 1.99 | 40 | 220 | 110 | | |
| 1 | 3.00 | U | 35 | 2.00 | 60 | 212 | 106 | | |
| 1 | 4.00 | U | 31 | 2.01 | 80 | 228 | 114 | | |
| 1 | 5.00 | U | 28 | 2.00 | 100 | 252 | 126 | | |
| 1 | 6.00 | U | 29 | 2.00 | 120 | 262 | 131 | | |
| 1 | 7.00 | U | 29 | 2.03 | 140 | 272 | 136 | | |

# HERTS & ESSEX SITE INVESTIGATIONS

Warren House, Bells Hill, Bishop's Stortford, Herts. CM23 2NN
Telephone: Bishops Stortford (01279) 506725
Fax: Bishops Stortford (01279) 506724


Appendix No. 3
Sheet No. 3
Job No. 12419
Date Nov 2014

LOCATION 102 Camden Mews, London NW1

SULPHATE ANALYSIS TEST RESULTS

| Window Sampler | Depth (m) | Sample | Concentrations of Soluble Sulphate | | | Classification | pH |
|---|---|---|---|---|---|---|---|
| | | | Soil | | Groundwater | | |
| | | | Total $SO_4$ (%) | $SO_4$ in 2:1 water:soil (g/l) | | | |
| 1 | 2.00 | U | | 0.31 | | | 7.51 |
| 1 | 4.00 | U | | 0.24 | | | 7.77 |
| 1 | 6.00 | U | | 0.05 | | | 7.72 |

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The right chemistry to deliver results
Chemtest Ltd.
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.co.uk

UKAS TESTING
2183

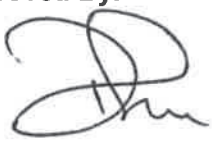
MCERTS

# Final Report

| | |
|---|---|
| **Report Number:** | 14-13210 Issue-1 |
| **Initial Date of Issue:** | 04-Nov-14 |
| **Client:** | Herts & Essex Site Investigations |
| **Client Address:** | The Old Post Office<br>Wellpond Green<br>Standon<br>Ware<br>Hertfordshire<br>SG11 1NJ |
| **Contact(s):** | Martyn Smith |
| **Project:** | 12419 - 102 Camden Mews, London NW1 |

| | | | |
|---|---|---|---|
| **Quotation No.:** | | **Date Received:** | 31-Oct-14 |
| **Order No.:** | | **Date Instructed:** | 31-Oct-14 |
| **No. of Samples:** | 2 | **Results Due:** | 04-Nov-14 |
| **Turnaround: (Weekdays)** | 3 | | |
| **Date Approved:** | 04-Nov-14 | | |

**Approved By:**



**Details:** Darrell Hall, Laboratory Director

Chemtest
The right chemistry to deliver results

# Results Summary - Soil

## Project: 12419 - 102 Camden Mews, London NW1

| Client: Herts & Essex Site Investigations | | | | | Chemtest Job No.: | 14-13210 | 14-13210 |
|---|---|---|---|---|---|---|---|
| Quotation No.: | | | | | Chemtest Sample ID.: | 64309 | 64310 |
| Order No.: | | | | | Client Sample Ref.: | | |
| | | | | | Client Sample ID.: | WS1 | WS1 |
| | | | | | Sample Type: | SOIL | SOIL |
| | | | | | Top Depth (m): | 0.80 | 1.50 |
| | | | | | Bottom Depth(m): | | |
| | | | | | Date Sampled: | 27-Oct-14 | 27-Oct-14 |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | |
| ACM Type | U | 2192 | | | | - | - |
| Asbestos Identification | U | 2192 | % | 0.001 | | No Asbestos Detected | No Asbestos Detected |
| Moisture | N | 2030 | % | 0.02 | | 18 | 21 |
| Stones | N | 2030 | % | 0.02 | | < 0.020 | < 0.020 |
| Soil Colour | N | | | | | brown | brown |
| Other Material | U | | | | | stones | none |
| Soil Texture | N | | | | | loam | loam |
| pH | M | 2010 | | | | 8.2 | 8.0 |
| Electrical Conductivity (2:1) | N | 2020 | µS/cm | 1 | | 830 | 810 |
| Boron (Hot Water Soluble) | M | 2120 | mg/kg | 0.4 | | 32 | 1.6 |
| Sulphate (2:1 Water Soluble) as SO4 | M | 2120 | g/l | 0.01 | | 0.22 | 0.27 |
| Cyanide (Total) | M | 2300 | mg/kg | 0.5 | | 0.80 | < 0.50 |
| Cyanide (Free) | M | 2300 | mg/kg | 0.5 | | < 0.50 | < 0.50 |
| Sulphate (Total) | M | 2430 | % | 0.01 | | 1.1 | 0.16 |
| Arsenic | M | 2450 | mg/kg | 1 | | 82 | 15 |
| Cadmium | M | 2450 | mg/kg | 0.1 | | < 0.10 | 0.13 |
| Copper | M | 2450 | mg/kg | 1 | | 1200 | 67 |
| Mercury | M | 2450 | mg/kg | 0.1 | | < 0.10 | < 0.10 |
| Nickel | M | 2450 | mg/kg | 1 | | 57 | 58 |
| Lead | M | 2450 | mg/kg | 1 | | 510 | 49 |
| Zinc | M | 2450 | mg/kg | 1 | | 91 | 130 |
| Chromium (Trivalent) | N | 2490 | mg/kg | 5 | | 17 | 70 |
| Chromium (Hexavalent) | N | 2490 | mg/kg | 0.5 | | < 0.50 | < 0.50 |
| Organic Matter | M | 2625 | % | 0.4 | | 33 | 1.2 |
| Naphthalene | M | 2700 | mg/kg | 0.1 | | < 0.10 | < 0.10 |
| Acenaphthylene | M | 2700 | mg/kg | 0.1 | | < 0.10 | < 0.10 |
| Acenaphthene | M | 2700 | mg/kg | 0.1 | | < 0.10 | < 0.10 |
| Fluorene | M | 2700 | mg/kg | 0.1 | | < 0.10 | < 0.10 |
| Phenanthrene | M | 2700 | mg/kg | 0.1 | | 1.4 | < 0.10 |
| Anthracene | M | 2700 | mg/kg | 0.1 | | 0.24 | < 0.10 |
| Fluoranthene | M | 2700 | mg/kg | 0.1 | | 5.4 | < 0.10 |
| Pyrene | M | 2700 | mg/kg | 0.1 | | 6.3 | < 0.10 |

Chemtest
The right chemistry to deliver results

# Results Summary - Soil

## Project: 12419 - 102 Camden Mews, London NW1

| Client: Herts & Essex Site Investigations | | | | | Chemtest Job No.: | 14-13210 | 14-13210 |
|---|---|---|---|---|---|---|---|
| Quotation No.: | | | | | Chemtest Sample ID.: | 64309 | 64310 |
| Order No.: | | | | | Client Sample Ref.: | | |
| | | | | | Client Sample ID.: | WS1 | WS1 |
| | | | | | Sample Type: | SOIL | SOIL |
| | | | | | Top Depth (m): | 0.80 | 1.50 |
| | | | | | Bottom Depth(m): | | |
| | | | | | Date Sampled: | 27-Oct-14 | 27-Oct-14 |
| **Determinand** | **Accred.** | **SOP** | **Units** | **LOD** | | | |
| Benzo[a]anthracene | M | 2700 | mg/kg | 0.1 | | 2.5 | < 0.10 |
| Chrysene | M | 2700 | mg/kg | 0.1 | | 2.2 | < 0.10 |
| Benzo[b]fluoranthene | M | 2700 | mg/kg | 0.1 | | 4.0 | < 0.10 |
| Benzo[k]fluoranthene | M | 2700 | mg/kg | 0.1 | | 1.1 | < 0.10 |
| Benzo[a]pyrene | M | 2700 | mg/kg | 0.1 | | 2.3 | < 0.10 |
| Indeno(1,2,3-c,d)Pyrene | M | 2700 | mg/kg | 0.1 | | 1.3 | < 0.10 |
| Dibenz(a,h)Anthracene | M | 2700 | mg/kg | 0.1 | | 0.35 | < 0.10 |
| Benzo[g,h,i]perylene | M | 2700 | mg/kg | 0.1 | | 1.5 | < 0.10 |
| Total Of 16 PAH's | M | 2700 | mg/kg | 2 | | 29 | < 2.0 |
| Total Phenols | M | 2920 | mg/kg | 0.3 | | < 0.30 | < 0.30 |

Chemtest
The right chemistry to deliver results

## Report Information

### Key

| | |
|---|---|
| U | UKAS accredited |
| M | MCERTS and UKAS accredited |
| N | Unaccredited |
| S | This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis |
| SN | This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis |
| T | This analysis has been subcontracted to an unaccredited laboratory |
| I/S | Insufficient Sample |
| U/S | Unsuitable sample |
| N/E | not evaluated |
| < | "less than" |
| > | "greater than" |

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis
The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVCOs, PCBs, Phenols
For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at our Coventry laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

### Sample Deviation Codes

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container

### Sample Retention and Disposal

All soil samples will be retained for a period of 1 month following the date of the test report
All water samples will be retained for 7 days following the date of the test report
Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.co.uk

Report

# Ground Movement Assessment for Basement

at

**102 Camden Mews,**
**London, NW1 9AG**

for

**City & County Group Ltd**

Ref: 15448/R1.1

April 2015

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Project: **Ground Movement Assessment for Basement**

Site: **102 Camden Mews, London, NW1 9AG**

Client: **City & County Group Ltd**

## Foreword

This report has been prepared in accordance with the scope and terms agreed with the Client, and the resources available, using all reasonable professional skill and care. The report is for the exclusive use of the Client and relevant regulatory authorities, shall not be relied upon by any third party without explicit written agreement from Gabriel GeoConsulting Ltd.

This report is specific to the proposed site use or development, as appropriate, and as described in the report; Gabriel GeoConsulting Ltd accept no liability for any use of the report or its contents for any purpose other than the development or proposed site use described herein.

This assessment has involved consideration, using normal professional skill and care, of the findings of ground investigation data obtained from the Client and other sources. Ground investigations involve sampling a very small proportion of the ground of interest as a result of which it is inevitable that variations in ground conditions, including groundwater, will remain unrecorded around and between the exploratory hole locations; groundwater levels/pressures will also vary seasonally and with other man-induced influences; no liability can be accepted for any adverse consequences of such variations.

This report must be read in its entirety in order to obtain a full understanding of our recommendations and conclusions.

**Contents** Page



**Figures**

## 1. INTRODUCTION

1.1 A planning application has been submitted to the London Borough of Camden (LBC) for the proposed redevelopment of the site of 102 Camden Mews (application 2014/5589/P). The proposed redevelopment includes the demolition of part of the existing structure, and the construction of a new two storey house with a single storey basement. This report is for planning and scheme development purposes and is not a design document.

1.2 A ground movement assessment, including damage category assessment, has been requested in accordance with the requirements set out in LBC's guidance document CPG4 'Basements and Lightwells' (2013) and the associated 'Camden, geological, hydrogeological and hydrological study – Guidance for subterranean development'' (Camden GHHS, Arup, November 2010). This report presents the analyses undertaken and the required damage category assessment.

1.3 The following architectural drawings which were prepared by Dols Wong Architects have been referred to in preparing this report. Drawings which were irrelevant to the basement, or which showed alternative schemes, have been ignored.

**Existing Drawings**

- Drg No.1108-101a Ground Floor Plan
- Drg No.1108-110a Section AA

**Proposed Drawings**

- Drg No.1108-120c Basement Plan
- Drg No.1108-121c Ground Floor Plan
- Drg No.1108-125c Front Elevation
- Drg No.1108-130a Section AA
- Drg No.1108-141 Demolition plan (existing ground floor)
- Drg No.1108-142 Demolition plan (existing first floor)

These drawings have been referred to primarily for factual information purposes.

1.4 The structural design for the proposed scheme was prepared by Martin Redston Associates (MRA). The following structural drawings have been referred to:

- Drg No. 12.568/2B Suggested Underpinning Sequence
- Drg No. 12.568/3B Proposed Basement Sections
- Drg No. 12.568/W1A Existing and Proposed Wall Load Takedowns
- Drg No. 12.568/T1A Proposed Underpinning Temporary Works Section Front to Back

1.5 This assessment has been prepared by Keith Gabriel, a UK Registered Ground Engineering Adviser and Chartered Geologist with an MSc degree in Engineering Geology. The author has previously undertaken assessments of basements in several London Boroughs including Barnet, Enfield, Lambeth, Hammersmith & Fulham, Haringey, Kensington & Chelsea, Kingston, Richmond, Wandsworth and Westminster, as well as Camden. He also undertakes independent reviews of BIA reports on behalf of the London Borough of Camden.

## 2. GROUND MOVEMENT ASSESSMENT

### 2.1 Basement Geometry and Stresses:

2.1.1 Analyses of vertical ground movements (heave or settlement) have been undertaken using PDISP software, in order to assess the potential magnitudes of movements which may result from the changes of vertical stresses caused by excavation of the basement. These preliminary analyses for planning purposes have not modelled the horizontal forces on the retaining walls, so have significantly simplified the stress regime.

2.1.2 The attached Figure 1 illustrates the layout of the proposed basement taken from the 'Suggested Underpinning Sequence' drawing by Martin Redston Associates (MRA, Drg No. 12.568/2B). Figure 2 consists of an extract from the 'Existing and Proposed Wall Load Takedowns' drawing (MRA Drg No.12.568/W1A).

2.1.3 The plan dimensions of the proposed basement are approximately 10.74m wide by 8.47m long. A proposed basement finished floor level of 2.7m below ground level was measured from Dols Wong Architects 'Proposed section AA' (Drg No.1108-130b). With an allowance of 0.15m for insulation, cavity drainage and floor structure, together with slab and base thicknesses as given on the 'Proposed Basement Sections' by Martin Redston Associates, the following excavation depths were calculated:

- Perimeter retaining walls (0.35m thick base): 3.2m.
- Underpins to end/flank walls of the adjacent properties No's 100 & 104: 3.5m
- Basement slab (0.25m thick): 3.1m
- Slab thickenings for internal walls (0.40m thick): 3.25m.

2.1.4 Excavation of 3.1-3.5m of ground will cause a gross reduction in vertical total stress in the order of 59-67 kPa. This reduction in vertical stress will extend to a depth equal to twice the width of the unloaded area (below which the stress reduction is generally considered to be insignificant). The strata beneath the proposed basement floor slab are unlikely to have been subject to any significant stresses from the existing foundations. The loads from the superstructure and basement walls may therefore be deducted from the gross unloading to obtain net unloading values.

2.1.5 Table 1 presents the co-ordinates of the zones used to input the main elements of the basement's geometry into PDISP, as shown on the illustration in Figure 3, together with the net changes in vertical pressure for the four stages of the stress changes which will result from excavation and construction of the basement (see 2.3.1 below for details).

| Table 1: Coordinates and net bearing pressures for PDISP zones | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ZONE | Centroid | | Dimensions | | Net change in vertical pressure (kPa) | | | |
| # | Xc(m) | Yc(m) | X(m) | Y(m) | Stage 1 | Stage 1b | Stage 2 | Stages 3 and 4 |
| 1 | 4.295 | 7.628 | 4.640 | 1.680 | -5.86 | -5.86 | -5.86 | -5.86 |
| 2 | 7.217 | 7.478 | 1.204 | 1.980 | -14.18 | -14.18 | -14.18 | -14.18 |
| 3 | 8.320 | 7.328 | 1.001 | 1.680 | -5.86 | -5.86 | -5.86 | -5.86 |
| 4 | 9.595 | 4.084 | 1.550 | 8.168 | -60.80 | 13.59 | 13.59 | 13.59 |
| 5 | 5.398 | 0.840 | 6.845 | 1.680 | -5.86 | -5.86 | -5.86 | -5.86 |
| 6 | 1.170 | 4.234 | 1.610 | 8.468 | -60.80 | 13.80 | 13.80 | 13.80 |
| 7 | 4.415 | 6.513 | 0.500 | 0.550 | 0.00 | 0.00 | -61.75 | 114.45 |
| 8 | 4.415 | 4.830 | 0.500 | 1.520 | 0.00 | 0.00 | -61.75 | 114.45 |
| 9 | 4.415 | 5.914 | 0.500 | 0.648 | 0.00 | 0.00 | -58.90 | -50.90 |
| 10 | 3.070 | 5.430 | 2.190 | 2.718 | 0.00 | 0.00 | -58.90 | -50.90 |
| 11 | 4.174 | 2.875 | 4.398 | 2.390 | 0.00 | 0.00 | -58.90 | -50.90 |
| 12 | 5.519 | 5.429 | 1.708 | 2.718 | 0.00 | 0.00 | -58.90 | -50.90 |
| 13 | 7.947 | 4.084 | 1.747 | 4.808 | 0.00 | 0.00 | -58.90 | -50.90 |
| 14 | 0.183 | 4.234 | 0.365 | 8.468 | 218.98 | 218.98 | 218.98 | 218.98 |
| 15 | 10.553 | 4.084 | 0.365 | 8.168 | 218.98 | 218.98 | 218.98 | 218.98 |
| 16 | 6.723 | 4.084 | 0.700 | 4.808 | 0.00 | 0.00 | -58.90 | 58.39 |
| 17 | 6.495 | 6.638 | 0.243 | 0.300 | 0.00 | 0.00 | -58.90 | -50.90 |

## 2.2 Ground Conditions:

2.2.1 The ground profile and geotechnical parameters used for the analyses were based on the site-specific ground investigation by Herts & Essex Site Investigations. The borehole recorded Made Ground to a depth of 1.2m below ground level (bgl), underlying which were clays of the London Clay Formation, described to the base of the borehole at 7.0m bgl.

2.2.2 The short-term and long-term geotechnical properties of the soil strata used for the PDISP analyses are summarised in Table 2. They were based on the findings of the site-specific investigation and data from previous projects.

| Table 2: Soil parameters for PDISP analyses | | | | |
|---|---|---|---|---|
| **Strata** | **Level** (m bgl) | **Undrained Shear Strength,** Cu (kPa) | **Short term, undrained Young's Modulus,** Eu (MPa) | **Long term, drained Young's Modulus,** E′ (MPa) |
| London Clay | 1.20 | 66 | 33.0 | 19.8 |
| | 3.50 | 84 | 42.0 | 25.2 |
| | 30.00 | 282 | 141.0 | 84.6 |
| Where:<br>Undrained shear strength, Cu assumed conservatively as Cu = 66 + 7.5z kPa<br>where z = depth below the top of the stratum (1.2m bgl).<br>Undrained Young's Modulus, Eu = 500 * Cu<br>Drained Young's Modulus, E′ = 0.6 Eu | | | | |

## 2.3 PDISP Analyses:

2.3.1 Three dimensional analyses of vertical displacements have been undertaken using PDISP software and the basement geometry, loads/stresses and ground conditions outlined above in order to assess the potential magnitudes of ground movements (heave or settlement) which may result from the vertical stress changes caused by excavation of the basement. PDISP analyses have been carried out as follows:

- Stage 1a – Construction of underpins beneath the end/flank walls of the adjacent properties (No's 100 & 104), with associated excavation adjacent to the underpins, and construction of retaining walls/underpins beneath front and rear walls – Short-term condition
- Stage 1b – Construction of the retaining walls alongside the underpins installed during Stage 1a – Short term condition
- Stage 2 – Bulk excavation of central areas to basement formation level – Short-term condition
- Stage 3 – Construction of basement slab – Short-term (undrained) condition
- Stage 4 – As Stage 3, except – Long-term (drained) condition.

2.3.2 The results of the analyses for Stages 1b to 4 are presented as contour plots on the appended Figures 4 to 7 respectively.

## 2.4 Heave Assessment

2.4.1 Excavation of the basement will cause immediate elastic heave in response to the stress reduction, followed by long-term plastic swelling as the underlying clays take up groundwater. The rate of plastic swelling in the in-situ clays will be determined largely by the availability of water and as a result, given the low permeability of the clays in the London Clay Formation, can take decades to reach full equilibrium. The basement slab will need to be designed so as to enable it to accommodate the swelling displacements/pressures developed underneath it.

2.4.2 The ranges of predicted short-term and long-term movements for each of the main areas of the basement are summarised in Table 3 below. All values are approximate owing to the simplification of the stress regime.

2.4.3 The analyses indicated that small settlements are likely to develop beneath the underpins to the end/flank walls of the adjacent properties (No's 100 & 104) and the associated retaining walls within No.102. Displacements of the front and rear retaining walls/underpins were predicted to range from negligible settlement to slight heave, whilst negligible to slight heave was predicted within the central basement slab.

**Table 3: Summary of predicted displacements**

| Location | Stage 1b (Figure 4) | Stage 2 (Figure 5) | Stage 3 (Figure 6) | Stage 4 (Figure 7) |
|---|---|---|---|---|
| 104 CM underpins | 2.5 – 5mm Settlement | 2 – 4mm Settlement | 2 – 4mm Settlement | 3 – 7mm Settlement |
| 102 underpins next to 104CM | 1 – 3.5mm Settlement | 1mm Heave – 2mm Settlement | 0 – 3mm Settlement | 0 – 5mm Settlement |
| 100 CM underpins | 2 – 5mm Settlement | 2 – 4mm Settlement | 2 – 4mm Settlement | 3 – 7mm Settlement |
| 102 retaining wall next to 100CM | 1 – 3.5mm Settlement | 1mm Heave – 2mm Settlement | 0 – 3mm Settlement | 1mm Heave – 5mm Settlement |
| Front retaining wall/ underpin | 0 – 2.5mm Settlement | 3mm Heave – 2mm Settlement | 2mm Heave – 2mm Settlement | 3mm Heave – 3mm Settlement |
| Rear retaining wall/ underpin | 0 – 2.5mm Settlement | 3mm Heave – 2mm Settlement | 1mm Heave – 2mm Settlement | 2mm Heave – 3mm Settlement |
| Central basement slab | 0.5 – 1.5mm Settlement | 1 – 5mm Heave | 0 – 3mm Heave | 0 – 5mm Heave |

2.4.4 All the short term elastic heave would have occurred before the basement slabs were cast, so only the post-construction incremental heave is likely to be experienced by to the slab design. The analyses indicated that no significant predicted post-construction displacements beneath the basement slab are expected.

## 3. Underpinning Methods and associated Ground Movements

Basement Retaining Wall Construction:

3.1 The structural drawings by drawings Martin Redston Associates (MRA) show that the basement will be constructed using a combination of underpinning techniques and reinforced concrete (RC) retaining walls as follows:

a. underpinning beneath the adjacent walls to No's 100 & 104 Camden Mews;
b. underpinning beneath No.102's flank wall alongside No.104, and beneath the adjoining sections of No.102's front and flank walls which are to be retained;
c. RC retaining walls to support the remainder of the front and rear walls, cast in-situ, in panels of limited width, on the same 'hit and miss' basis as used for the underpins;
d. An RC retaining wall alongside No.100's flank wall (once underpinned), to support the new flank wall for the proposed structure at 102 Camden Mews. It is proposed to construct the RC retaining wall in one stage (Figure 1).

Construction methods for both the underpins and the RC retaining wall panels involve excavation of the ground in short lengths in order to enable the stresses in the ground to 'arch' onto the ground or completed underpinning on both sides of the excavation.

3.2 Some ground movement is inevitable when basements are constructed. When underpinning methods are used the magnitude of the movements in the ground being supported by the new basement walls is dependent primarily on:

- the geology,
- the adequacy of temporary support to both the underpinning excavations and the partially complete underpins prior to installation of full permanent support;
- the quality of workmanship when constructing the permanent structure.

A high quality of workmanship and use of best practice methods of temporary support are therefore crucial to the satisfactory control of ground movements alongside basement excavations (see 3.4 to 3.6 below). Any cracks in the load-bearing walls which are to be retained and underpinned will have weakened their structural integrity; such cracks should be fully repaired in accordance with recommendations from the appointed structural engineers before any underpinning is carried out.

3.3 Under UK standard practice, the contractor is responsible for designing and implementing the temporary works, so it is considered essential that the contractor employed for these works should have completed similar schemes successfully. For this reason, careful pre-selection of the contractors who will be invited to tender for these works is recommended. Full details of the temporary works should be provided in the contractor's method statements.

3.4 In accordance with normal health and safety good practice, the requirements for temporary support of any excavation must be assessed by a competent person at the start of every shift and at each significant change in the geometry of the

excavations as the work progresses. London Clay is usually fissured; such fissures can cause seemingly strong, stable excavations to collapse with little or no warning. Thus, in addition to normal monitoring of the stability of the excavations, a suitably competent person should check whether such fissuring is present and, if encountered, should assess what support is appropriate.

3.5 For the proposed basement at No.102 Camden Mews:

- It should be assumed that full support will be required to the Made Ground and any natural granular soils exposed in the excavations.
- Closely spaced support should be used where any firm clay is present at the top of the London Clay.
- More widely spaced temporary support may be adequate in the stiff or very stiff clays of the London Clay Formation, depending on the degree of fissuring, except at corner excavations where closely spaced support should be provided.
- Temporary support must also be installed to support all the new underpins and RC retaining wall panels and must be maintained until the full permanent support has been completed, including allowing time for the concrete to gain adequate strength.

All temporary support should use high stiffness systems installed in accordance with best practice in order to minimise the ground movements.

3.6 The unloaded clays at/beneath formation level will readily absorb any available water which would lead to softening and loss of strength. It will therefore be important to ensure that the clays at formation level are protected from all sources of water, with suitable channelling to sumps for any groundwater seeping into the excavations. The formation clays should be inspected and then blinded with concrete immediately after completion of final excavation to grade. Any unacceptably soft/weak areas must be excavated and replaced with concrete.

## 4. Damage Category Assessment

4.1 When underpinning it is inevitable that the ground will be un-supported or only partially supported for a short period during excavation of each pin, even when support is installed sequentially as the excavation progresses. This means that the behaviour of the ground will depend on the quality of workmanship and suitability of the methods used, so calculations of predicted ground movements can never be rigorous. However, provided that the temporary support follows best practice as outlined in Section 3 above, then extensive past experience has shown that the bulk movements of the ground alongside the basement caused by underpinning for a single storey basement (typical depth 3.5m) should not exceed 5mm in either horizontal or vertical directions.

4.2 In order to relate these typical ground movements to possible damage which adjoining properties might suffer, it is necessary to consider the strains and the

angular distortion (as a deflection ratio) which they might generate using the method proposed by Burland (2001, in CIRIA Special Publication 200, which developed earlier work by himself and others).

4.3 Searches on LBC's website found that no planning applications had been made for a basement beneath No.104. The ground level rises slightly from 102 to 104, but the age of property suggests that it is likely to have a suspended floor so the ground level has been assumed equal to that in 102.

4.4 Planning consent for building four live-work units at No's 96-100 was granted in 2005 (application 2005/2017/P); no basements were included in the scheme and the architect's cross-section shows basic trench fill type footings. Ground levels fall slightly and the front elevation by Dols Wong (Drg No.1108-125c) indicates that the ground levels in 100 will be approximately 0.2m lower than in 102.

4.5 The sections provided by Dols Wong indicate that ground levels are the same to front and rear of No.102. Separate damage category assessments are required for No.104 and No's 96-100 however, as the PDISP heave analyses have predicted similar magnitudes of ground movements at the front and rear ends of both end/flank walls to the adjacent properties (No's 100 & 104), only one analysis is required for the front and rear walls of each adjoining property.

4.6 Ground movements associated with the construction of retaining walls in clay soils have been shown to extend to a distance up to 4 times the depth of the excavation.

No.104:

4.7 The relevant geometries are as follows:

Footing depth to No.104 = 0.29m (as per H&ESI, TP1)
Depth of excavation below footings = 3.5 – 0.29 = 3.21m
Width (L) = 3.21 x 4 = 12.8m, so the ground movements are only likely to extend across part of the front wall to No.45.
Height (H) = 6.1m to top of parapet
Hence L/H = 2.09 = approx. 2.0

Thus, for an anticipated 5mm maximum horizontal displacement, the strain beneath No.104 would, theoretically, be in the order of $\varepsilon_h = 3.9 \times 10^{-4}$ (0.039%).

The 3mm settlement predicted by the PDISP analysis must be added to the typical settlement caused by relaxation of the ground alongside the basement in response to excavation of the underpins, giving a 8mm total predicted settlement of the ground at the level of No.104's footings. The settlement profile is expected to be convex with a worst case (low stiffness) deflection, $\Delta$ = 17% of the predicted combined settlement profile. Hence, $\Delta$ = 1.4mm, which represents a deflection ratio, $\Delta/L = 1.09 \times 10^{-4}$ (0.011%).

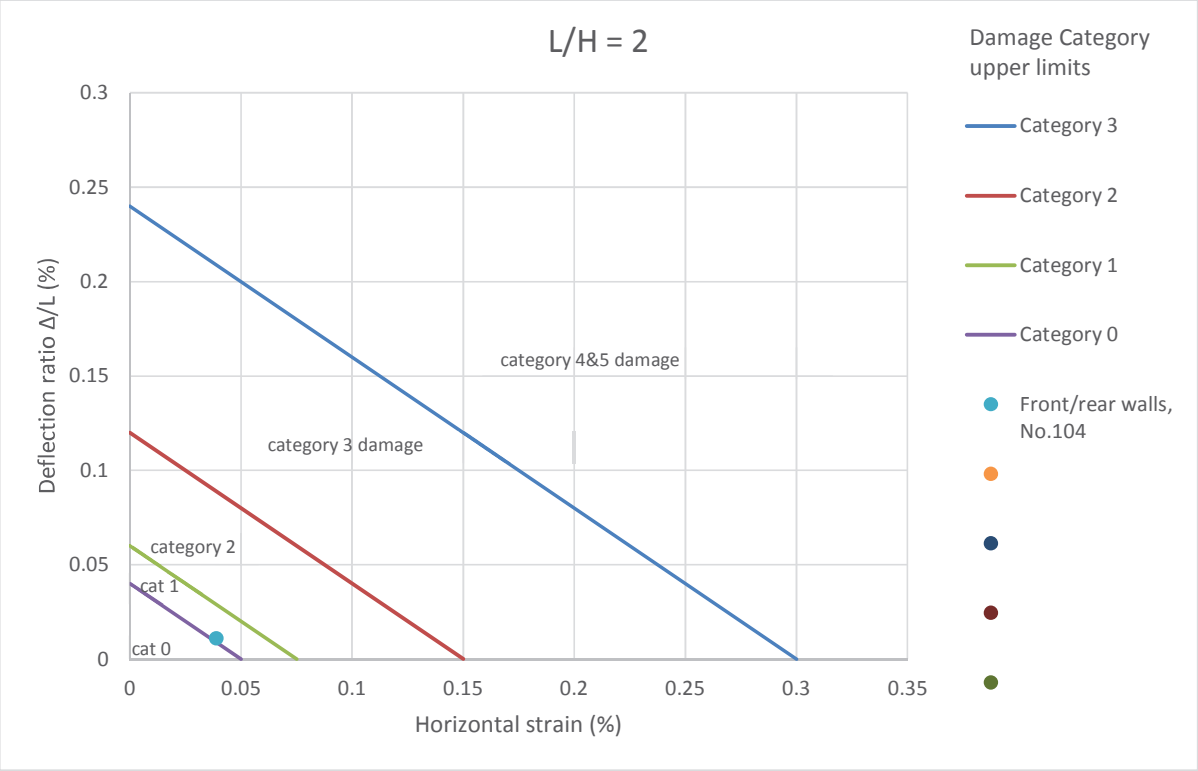



**Figure 8:** Damage category assessment for front and rear walls of No.104

4.8 Using the graphs for L/H = 2.0 these deformations represent a damage category of 'very slight' (Burland Category 1, $\varepsilon_{lim}$ =0.05-0.075%) as given in CIRIA SP200, Table 3.1, and illustrated in Figure 8 above.

No's 96-100:

4.9 The relevant geometries are as follows:

Assume minimum footing depth to No.100 = 1.75m (see H&ESI, TP2)
Depth of excavation = 3.5 – 1.75 = 1.75m
Width (L) = 1.75 x 4 = 7.0m
Height (H) = 5.9m to parapet (ignoring local 3storey section)
Hence L/H = 1.19 = approx. 1.5 (conservative)

Thus, for the anticipated 3mm maximum horizontal displacement (reduced pro-rat to excavation depth), the strain beneath No's 96-100 would, theoretically, be in the order of $\varepsilon_h = 4.29 \times 10^{-4}$ (0.043%).

The 3mm settlement predicted by the PDISP analysis must be added to the typical settlement caused by relaxation of the ground alongside the basement in response to excavation of the underpins, reduced pro-rata for the depth of excavation below No.100's deep footings. This gives a 6mm total predicted settlement of the ground at the assumed level of No.100's footings. The settlement profile is expected to be

convex with a worst case (low stiffness) deflection, Δ = 17% of the predicted combined settlement profile. Hence, Δ = 1.0mm, which represents a deflection ratio, Δ/L = 1.43 x $10^{-4}$ (0.014%).

Using the graphs for L/H = 1.5, which is conservative, these deformations once again represent a damage category of 'very slight' (Burland Category 1, $\varepsilon_{lim}$ =0.05-0.075%) as given in CIRIA SP200, Table 3.1, and illustrated in Figure 9 below.

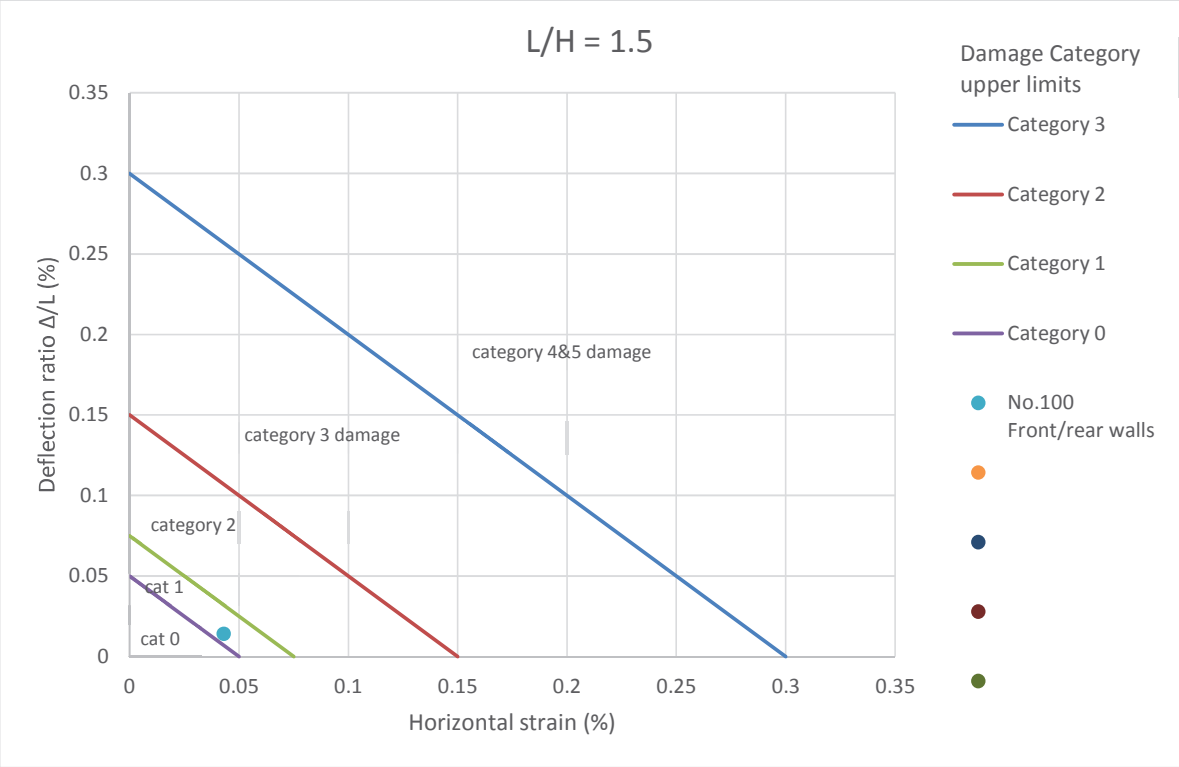



**Figure 9:** Damage category assessment for front and rear walls of No's 96-100.

4.10 Use of best practice construction methods, as outlined in Section 3 above, will be essential to ensure that the ground movements are kept in line with the above predictions.

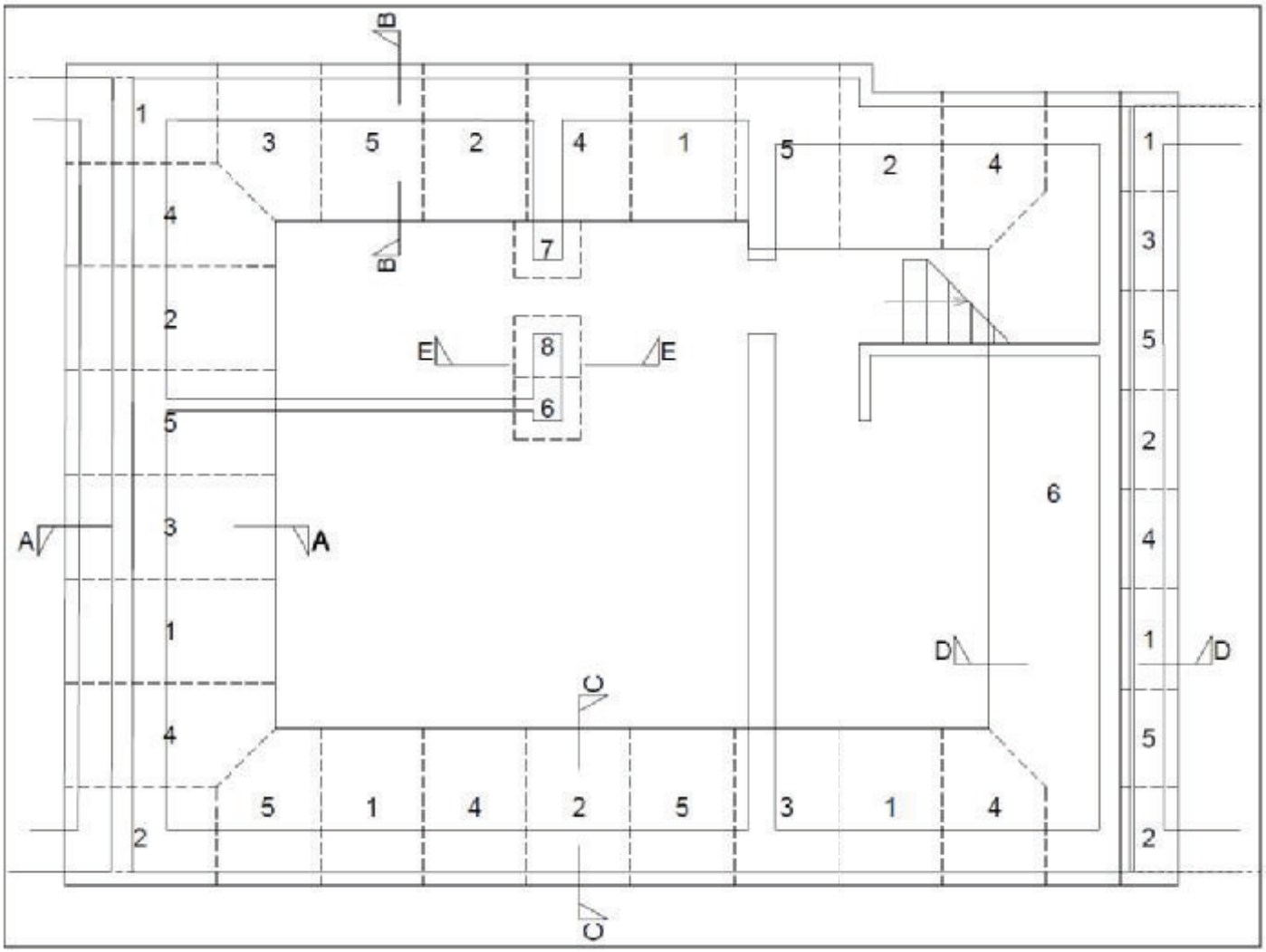
**Keith Gabriel**
MSc DIC CGeol FGS
UK Registered Ground Engineering Adviser

## References

Arup (November 2010) Camden geological, hydrogeological and hydrological study – Guidance for subterranean development. Issue 01. London.

BS EN 1997-1 (2004) Eurocode 7: Geotechnical Design – Part 1: General rules. British Standards Institution.

London Borough of Camden (2013) Camden Planning Guidance CPG4– Basements and lightwells.




SUGGESTED UNDERPINNING SEQUENCE

Extract from Martin Redston Associates' Suggested Underpinning Sequence (Drg No.12.568/2B).

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Project: | 102 Camden Mews, London, NW1 9AG | Title: | Layout of the proposed basement foundation plan | | | Figure: | 1 |
| 15448 | | Date: | April 2015 | Checked: | AG | Approved: KRG | Scale : Not to scale |

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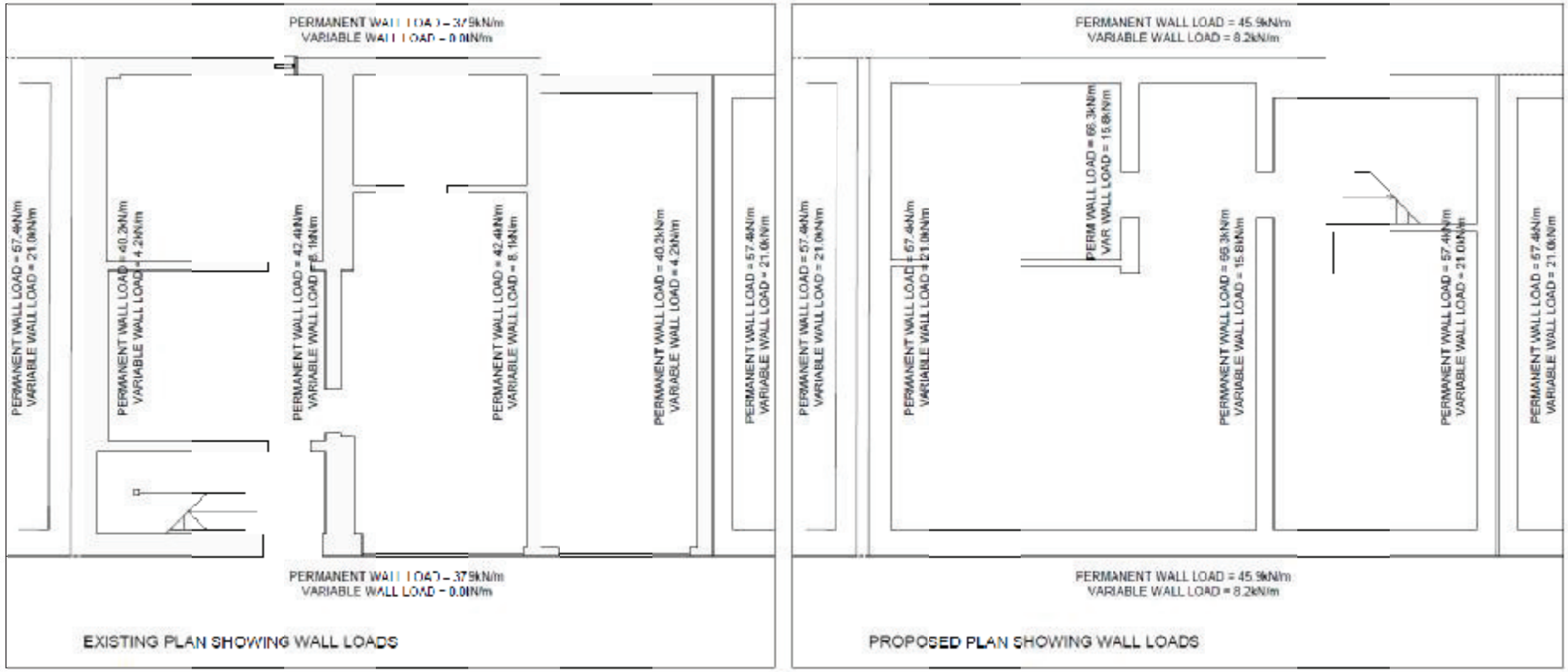


Note: Loads of retaining walls, foundations and ground bearing slabs have not been taken into account when calculating the wall takedown loads.

Extract from Martin Redston Associates' Existing and Proposed Wall Load Takedowns (Drg No.12.568/W1A)

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Project: | **102 Camden Mews, London, NW1 9AG** | Title: | **Existing and proposed wall load takedowns** | | | Figure: | **2** |
| 15448 | | Date: | April 2015 | Checked: | AG | Approved: KRG | Scale : Not to scale |

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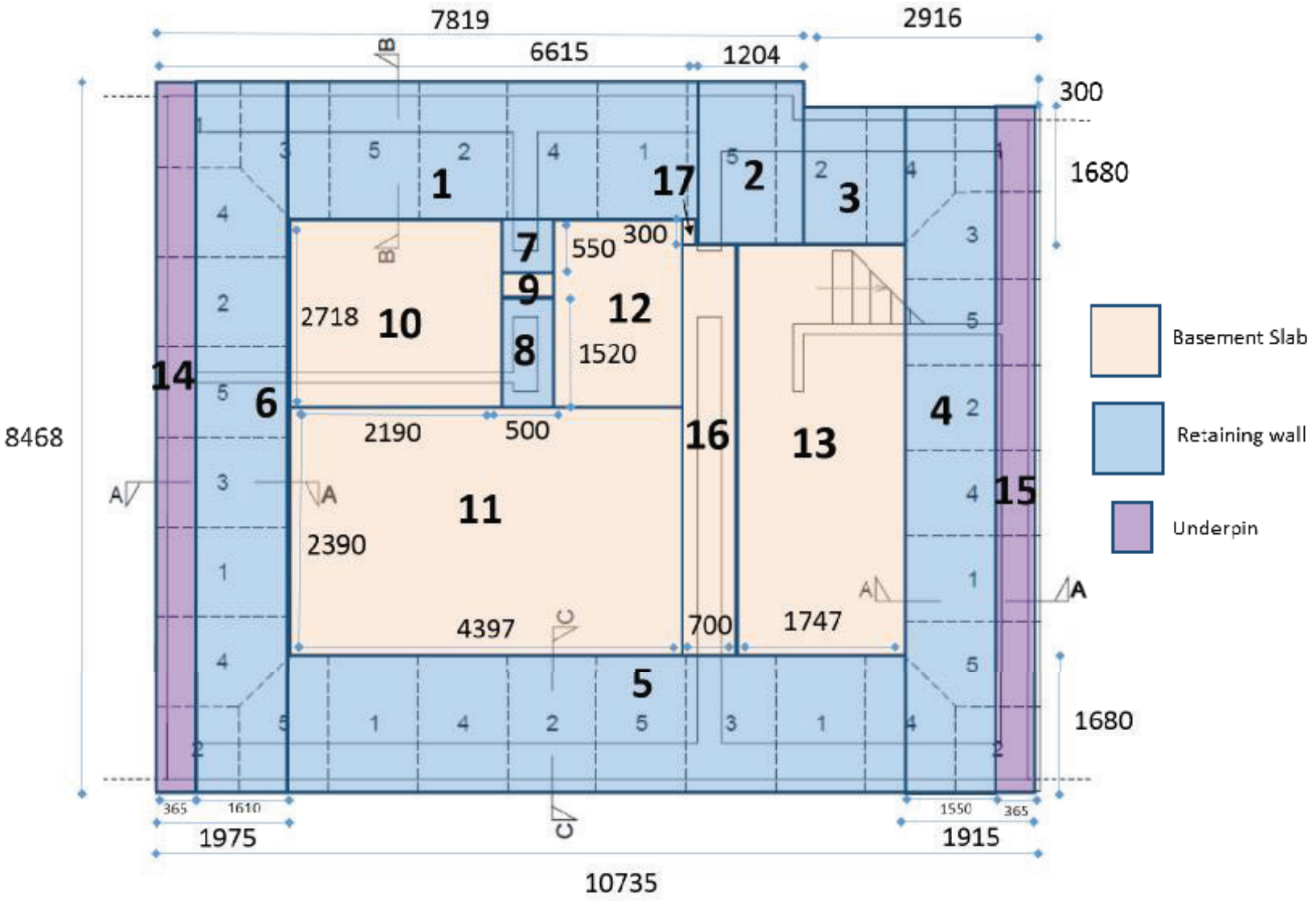


| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Project: | 102 Camden Mews, London, NW1 9AG | Title: | Geometry of Zones used for PDISP analyses | | | Figure: | 3 |
| 15448 | | Date: | April 2015 | Checked: | AG | Approved: KRG | Scale : Not to scale |

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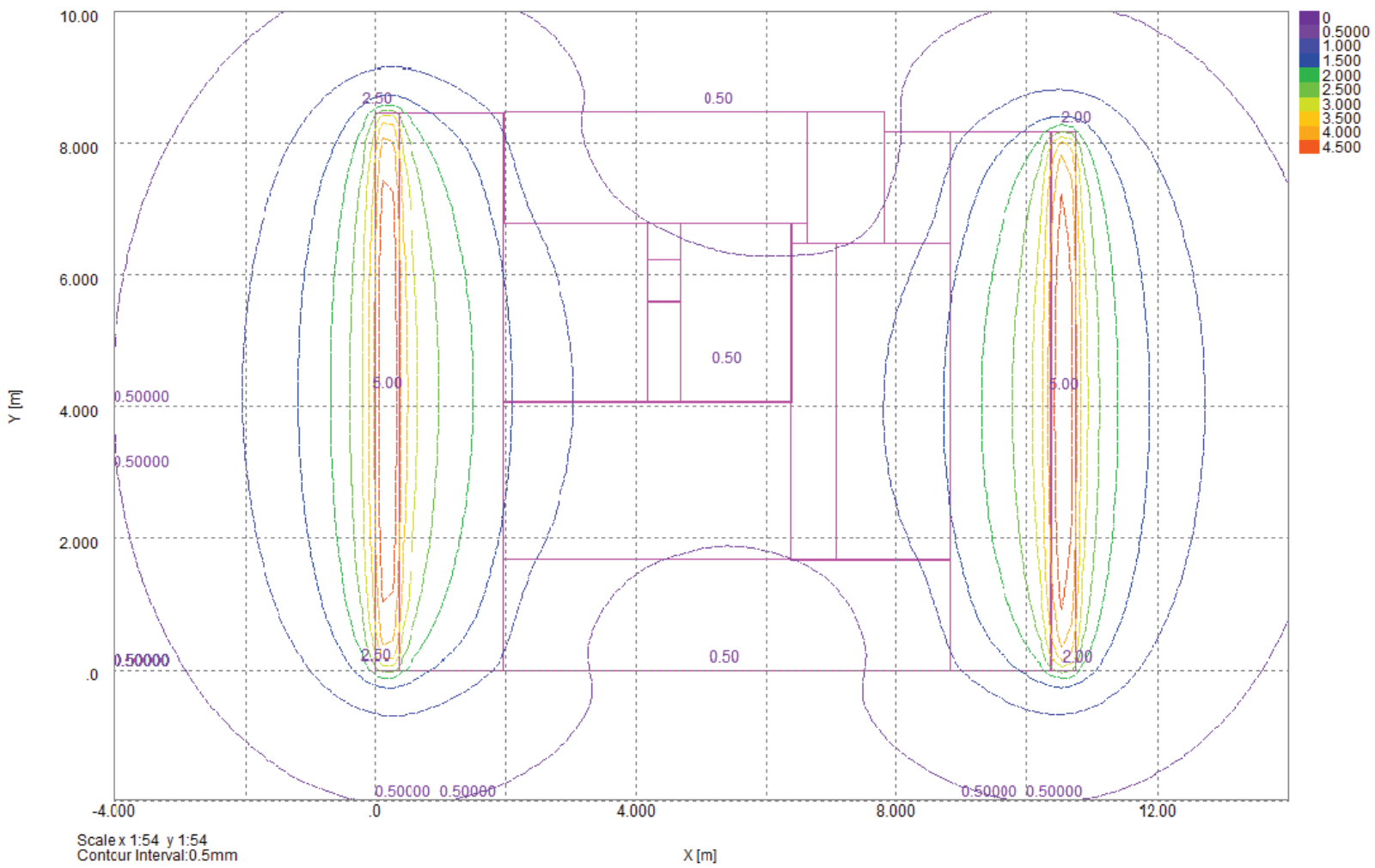


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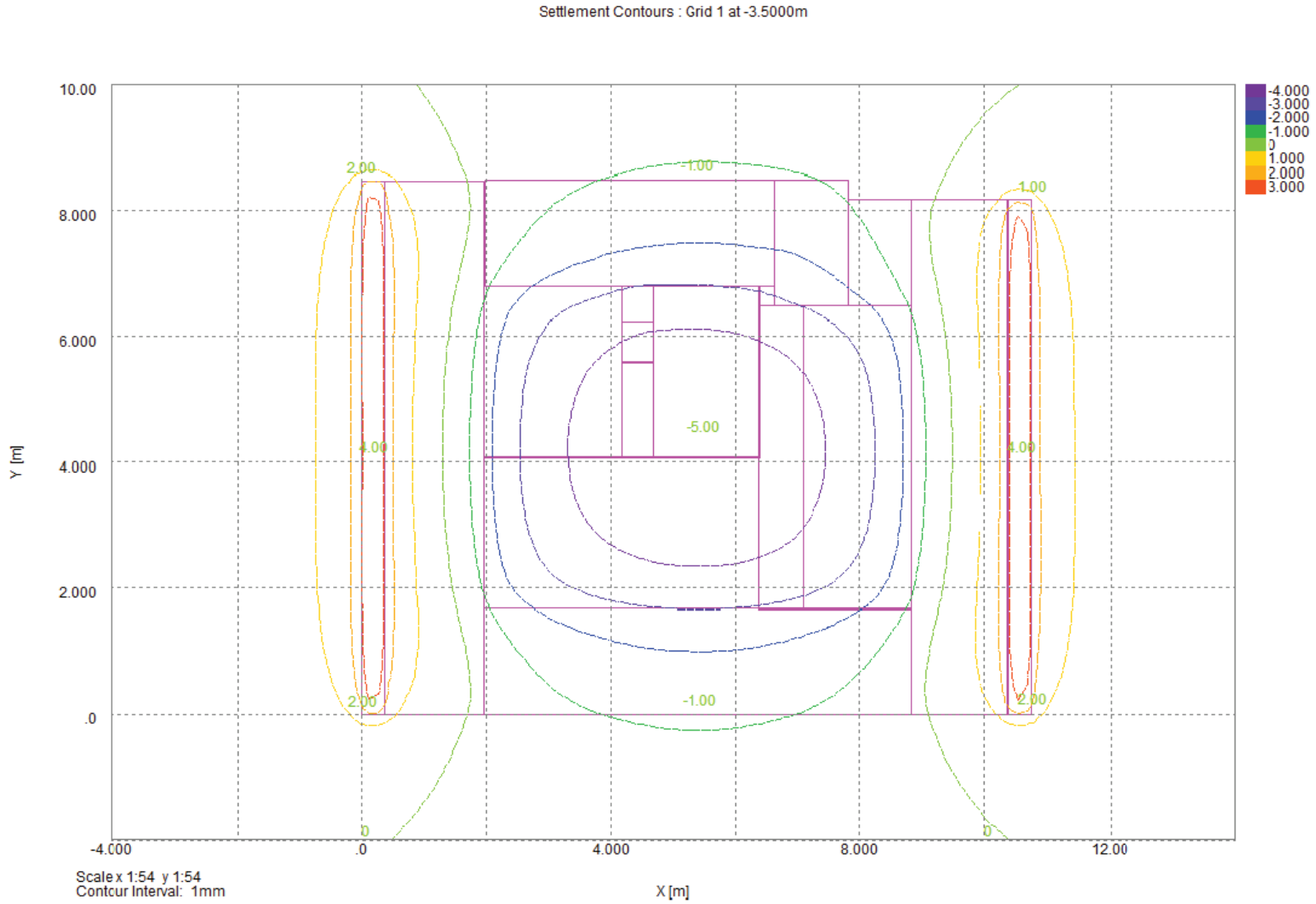
|---|---|---|---|---|---|---|---|---|---|
| Project: | 102 Camden Mews, London, NW1 9AG | | Title: | PDISP output - Short term (Stage 1b) displacements | | Figure: | 4 | GabrielGeo Consulting |
| 15448 | | | Date: | April 2015 | Checked: AG | Approved: KRG | Scale : | Not to scale | |




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Project: | 102 Camden Mews, London, NW1 9AG | Title: | PDISP output - Short term (Stage 2) displacements | | | Figure: | 5 |
| 15448 | | Date: | April 2015 | Checked: | AG | Approved: KRG | Scale : Not to scale |

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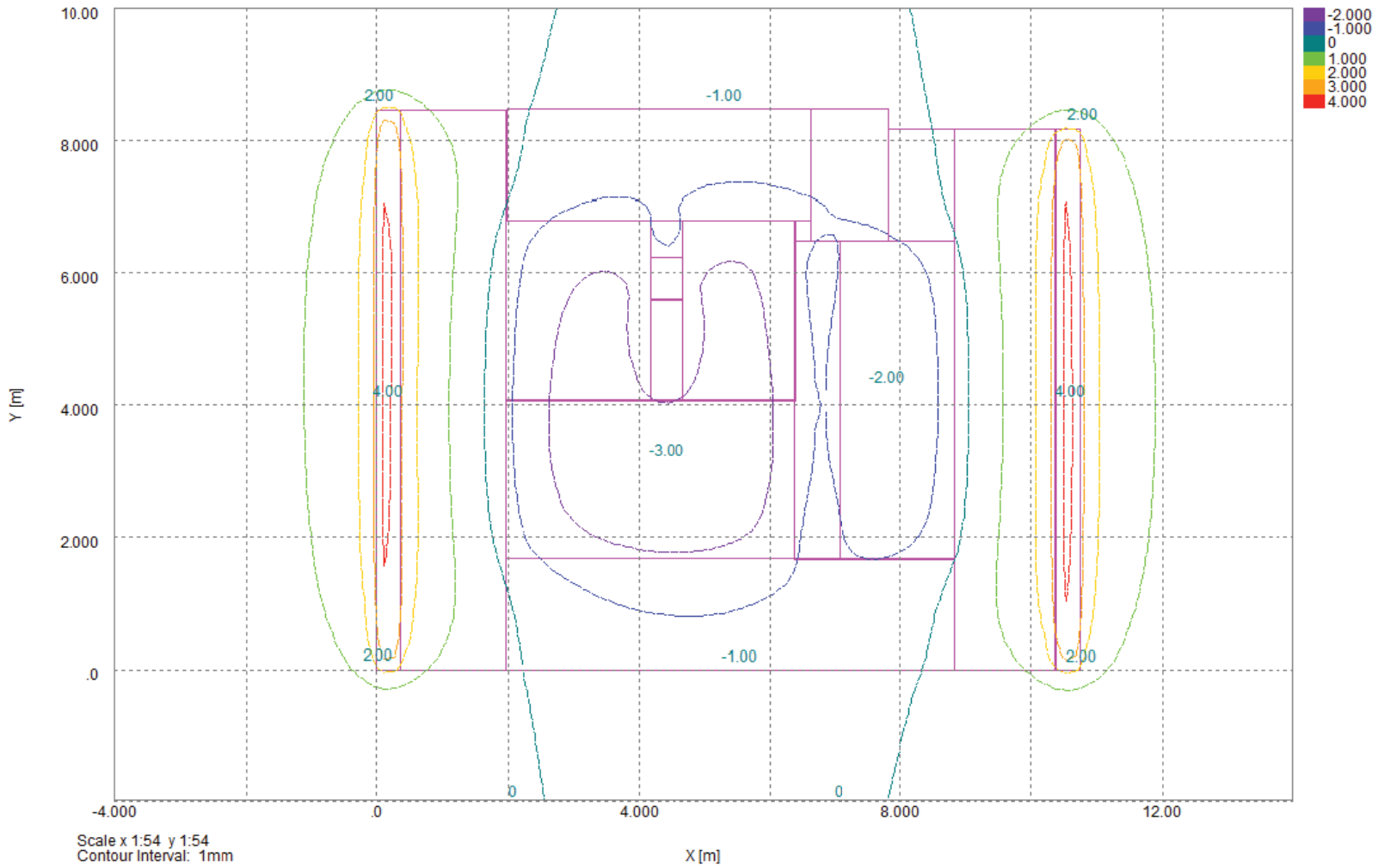


| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Project: | 102 Camden Mews, London, NW1 9AG | Title: | PDISP output - Short term (Stage 3) displacements | | | Figure: | 6 |
| 15448 | | Date: | April 2015 | Checked: | AG | Approved: KRG | Scale : Not to scale |

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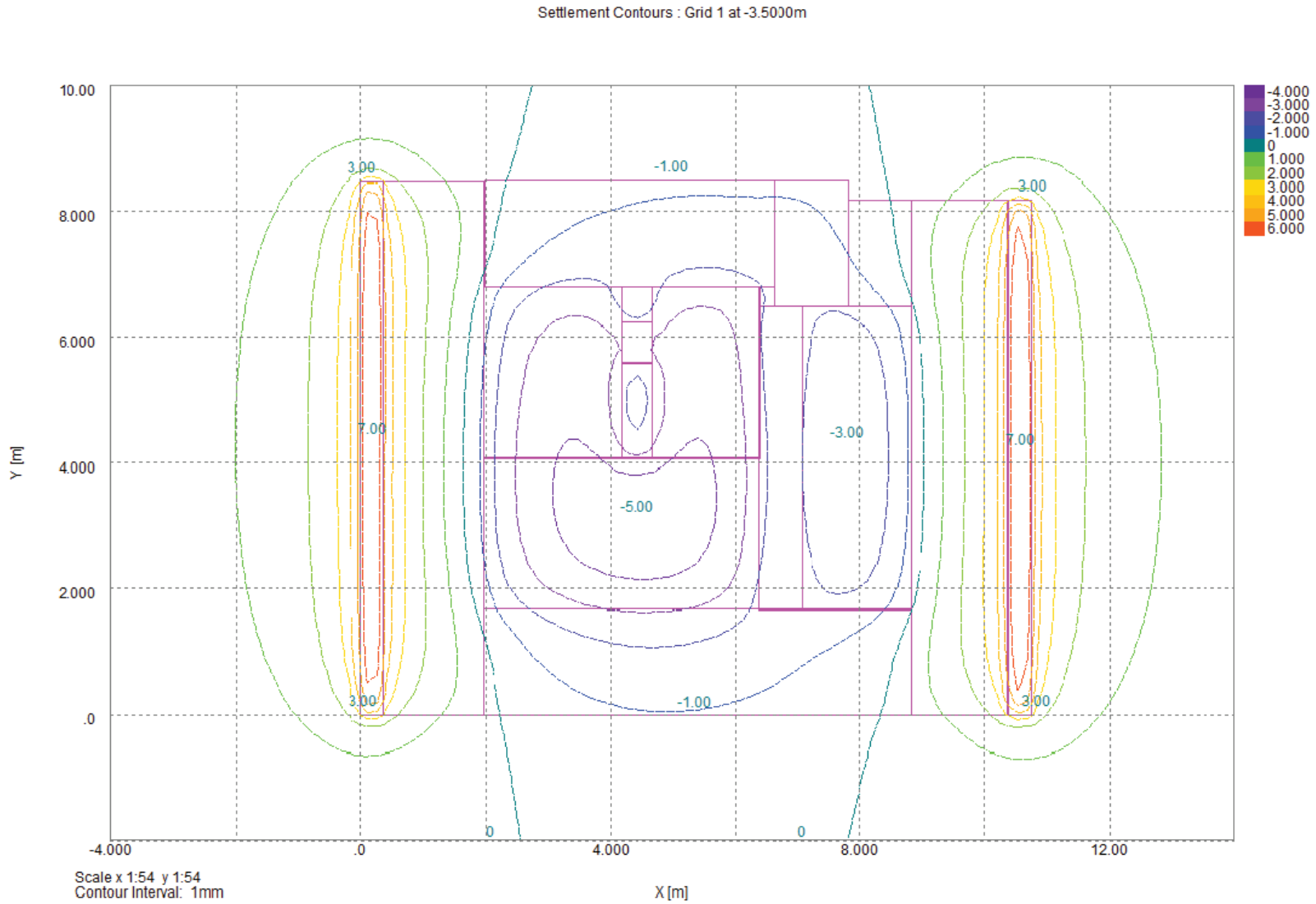


| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Project: | 102 Camden Mews, London, NW1 9AG | Title: | PDISP output - Long term (Stage 4) displacements | | | Figure: | 7 |
| 15448 | | Date: | April 2015 | Checked: | AG | Approved: KRG | Scale : Not to scale |

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# Appendix C

**Martin Redston Associates**
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Our ref: Professional Certification
2nd March 2016

City & County Group Ltd
19 Wimpole Street
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To whom it may concern,

I can confirm that all work carried out by Martin Redston Associates is completed to the latest codes of practice and that we have two Chartered Engineers who oversee our projects.

Martin Redston B.Sc., C.Eng. M.I.C.E
Tatjana Kosanovic MEng C.Eng. MIStructE

Should you have any questions please do not hesitate to contact us.

Yours sincerely

Martin Redston
Practice Principal