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PILING AND EXCAVATION STATEMENTS and DRAWINGS

By Deep Foundation Specialists _ DFS

Rev 1

3rd November 2023

Barrie House, 29 St Edmund's Terrace, London, NW8 7QH

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Job No: DFS221011 Design Engineer: AR Date: 15 April 2023

Job Name: BROXWOOD VIEW, 29 ST. EDMUND'S TERRACE LONDON NW8 7QH

Calc Title: Detailed Designs – ∅450 Secant Pile Retaining Wall, ∅600 Contiguous Pile Retaining Wall & ∅300 Bearing Piles Rev. 06

BROXWOOD VIEW, 29. ST. EDMUND'S TERRACE

LONDON NW8 7QH

Detailed Designs for ∅450 Perimeter Secant Pile Retaining Wall, ∅600 Perimeter Contiguous Pile Retaining Wall & ∅300 Bearing Piles

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DESIGN STATUS & ISSUE RECORD

Revision	Status	Description	Design		Check	
			Engineer	Date	Engineer	Date
/	For Review	Detailed designs for secant pile retaining wall & bearing piles	Dr. Azeez Rotimi	14/10/22	Dr. Abid Adekunte	14/10/22
Rev. 01	For Review	Design for bearing piles updated on the basis of Project Structural Engineer's latest loading information for minipiles. Bearing pile size reduced from 350mm to 300mm.	Dr. Azeez Rotimi	26/10/22	Dr. Abid Adekunte	26/10/22
Rev. 02	For Review	Design for bearing piles updated on the basis of Project Structural Engineer's latest pile load schedule for minipiles. Pile wall redesigned as contiguous pile wall of ∅600 & ∅450 diameters.	Dr. Azeez Rotimi	30/11/22	Dr. Abid Adekunte	30/11/22
Rev. 03	For Review	Design report and drawings updated to account for comments & recommendations provided by checking engineers/party wall surveyors.	Dr. Azeez Rotimi	13/12/22	Dr. Abid Adekunte	13/12/22
Rev. 04	Construction	Pile wall design section B-B is changed from ∅450 contiguous pile retaining wall system to a ∅450 secant pile wall system. Design report, pile wall schedule and construction drawings updated accordingly.	Dr. Azeez Rotimi	14/02/23	Dr. Abid Adekunte	14/02/23
Rev. 05	Construction	Minor amendments to text and appendices	Dr. Azeez Rotimi	02/03/23	Dr. Abid Adekunte	02/03/23
Rev. 06	Construction	Updates to numerical models for pile wall section A-A	Dr. Azeez Rotimi	15/04/23	Dr. Abid Adekunte	15/04/23

BROXWOOD VIEW, 29. ST. EDMUND'S TERRACE LONDON NW8 7QH

DETAILED DESIGNS FOR ∅450 PERIMETER SECANT PILE RETAINING WALL, ∅600 PERIMETER CONTIGUOUS PILE RETAINING WALL & ∅300 BEARING PILES

1.0 INTRODUCTION

Deep Foundations Specialists (DFS) Limited have been appointed by Broxwood View Limited to carry out the detailed designs for the permanent perimeter pile retaining walls, associated temporary works and bearing piles for the proposed residential development on the above site in Northwest London.

The wider project is centred on the redevelopment of the site; this involves the complete demolition of the pre-existing 2 storey Porter's Lodge building on the site and the subsequent construction of a new 4 storey-extension adjacent to the northern wall of the existing Barrie House multi-storey block of residential apartments on the site, with an underlying single level-basement. The new 4 storey-structure would accommodate 9 No. residential apartments.

The approximate National Grid Reference for the approximately square-shaped 0.18 ha-site is 527495E, 183575N, while existing site topography generally slopes downwards from the northern boundary to the south, with an approximate gradient of 1:8. The site's reduced levels vary between (+48.600m OD) – (+42.000m OD). It is proposed to chiefly support the new structure on a 950mm thick reinforced concrete raft at basement floor level, while a number of bearing piles are also required outside the proposed basement area to support some sections of the proposed development.

A combination of secant bored pile retaining wall and contiguous bored pile retaining wall are required to support the deep excavation for the proposed subterranean components of the building, Maximum retained height is < 4.85m. The pile retaining walls would also function as permanent components of the new basement structure. In addition to lateral earth/groundwater retention, the bored pile retaining walls are also designed to support service vertical compressive loading of up to 500 kN/m run and nominal service vertical tension loading of -20 kN/m run of wall, as specified by the Project Structural Engineer.

The detailed design package for the temporary works that are required to provide lateral restraint to the bored pile walls at construction stage would be prepared and issued by DFS or others under separate cover.

This particular report chiefly focuses on the detailed designs for the ∅450 perimeter secant pile retaining wall, ∅600 perimeter contiguous pile retaining wall and the ∅300 bearing piles. The perimeter secant pile retaining wall shall comprise of 450mm dia. male and female piles, with male piles spaced @ 550mm c/c intervals. The perimeter contiguous pile retaining wall shall comprise of 600mm dia. piles @ 700mm c/c. The bearing piles are subject to service vertical compression, tension and horizontal loading of up to 250 KN/pile, -25 KN/pile and 10 KN/pile respectively.

The design report is presented under the following headings:

- INPUT DATA
- OUTLINE OF DESIGN
- TYPICAL SECTIONS CONSIDERED IN PILE WALL ANALYSIS & DESIGN
- GROUND CONDITIONS
- BORED PILE RETAINING WALL DESIGNS
  - Geotechnical Design
  - Structural Design
- BEARING PILE DESIGN
  - Geotechnical Design
  - Structural Design
- REFERENCES
- APPENDICES

2.0 INPUT DATA

Design is based on the following site-specific refence documents:

(i) Email Correspondence between Andrea Carbogno (Carbogno Ceneda Architects) and Dr. Abid Adekunte (Deep Foundations Specialists Limited) and others on 13/02/2023 @ 09:49 – RE: Broxwood View Secant Piled Wall.

(ii) PARMARBROOK's Document No. 1805 of May 2018 – Basement Impact Assessment: Barrie House, 29 St. Edmunds Terrace.

(iii) Card Geotechnics Limited's Geotechnical Report No. CG/28408 Rev. 2 of May 2018 – Barrie House Basement Impact Assessment Revision 2.

(iv) Soil Consultants Limited's Geotechnical Report No. 9241/OT/JRCB of 07 November 2012 – Ground Investigation Report for Proposed Construction at Barrie House, 29 St. Edmund's Terrace, London NW8 7QH.

(v) Richard Tant Associates' Drawing No. 5295-S01K – Notes.

(vi) Richard Tant Associates' Drawing No. 5295-S02H – Proposed Basement Floor Sheet 1/2.

(vii) Richard Tant Associates' Drawing No. 5295-S03A – Proposed Basement Floor Sheet 2/2.

(viii) Richard Tant Associates' Drawing No. 5295-S04D – Proposed Ground Floor Sheet 1/2.

(ix) Richard Tant Associates' Drawing No. 5295-S05A – Proposed Ground Floor Sheet 2/2.

(x) Richard Tant Associates' Drawing No. 5295-S10E – Section 1-1.

(xi) Richard Tant Associates' Drawing No. 5295-S11E – Section 2-2.

(xii) Richard Tant Associates' Drawing No. 5295-S12D – Sections 3-3 & 4-4.

(xiii) Richard Tant Associates' Drawing No. 5295-S13G – Section 5-5.

(xiv) Richard Tant Associates' Drawing No. 5295-S14D – Sections 6-6 & 7-7.

(xv) Richard Tant Associates' Drawing No. 5295-S15F – Sections 8-8 & 9-9.

(xvi) Richard Tant Associates' Drawing No. 5295-S16C – Sections 10-10, 11-11 & 12-12.

(xvii) Richard Tant Associates' Drawing No. 5295-S17E – Section 13-13.

(xviii) Richard Tant Associates' Drawing No. 5295-S18D – Section 14-14.

(xix) Richard Tant Associates' Drawing No. 5295-S19F – Section 15-15.

(xx) Richard Tant Associates' Drawing No. 5295-S20D – Section 16-16.

(xxi) Richard Tant Associates' Drawing No. 5295-S21C – Section 17-17.

(xxii) Richard Tant Associates' Drawing No. 5295-S22C – Section 18-18.

(xxiii) Richard Tant Associates' Drawing No. 5295-S23D – Section 19-19.

(xxiv) Richard Tant Associates' Drawing No. 5295-S24B – Section 20-20.

(xxv) Richard Tant Associates' Drawing No. 5295-S25A – Sections 21-21 & 22-22.

(xxvi) Richard Tant Associates' Drawing No. 5295-S50A – Loading Plan – Basement.

(xxvii) Richard Tant Associates' Drawing No. 5295-MM01 – Movement Monitoring.

(xxviii) Richard Tant Associates' Drawing No. 5295-SM01 – Suggested Method of Works 1.

(xxix) Richard Tant Associates' Drawing No. 5295-SM02 – Suggested Method of Works 2.

(xxx) Richard Tant Associates' Drawing No. 5295-SM03 – Suggested Method of Works 3.

(xxxi) Richard Tant Associates' Drawing No. 5295-SM04 – Suggested Method of Works 4.

(xxxii) Richard Tant Associates' Drawing No. 5295-SM05 – Suggested Method of Works 5.

(xxxiii) Richard Tant Associates' Drawing No. 5295-SM06 – Suggested Method of Works 6.

(xxxiv) Richard Tant Associates' Drawing No. 5295-SM07 – Suggested Method of Works 7.

(xxxv) Richard Tant Associates' Drawing No. 5295-SM08 – Suggested Method of Works 8.

3.0 OUTLINE OF DESIGN

- Design calculations for the pile retaining walls and bearing piles have been carried out in accordance with the recommendations of the ICE SPERW (2016), BS 8002 (1994), BS 8004 (1986), BS8102 (2009), BS5975 (2008), CIRIA Report No. C760 (2017), London District Surveyors' Association's (LDSA) Guidance Note No. 1 for the Design of Straight Shafted Bored Piles in London Clay (2018) and the BS 8110 (1997).
- Proposed development comprises of a 4 storey-block of residential apartments, with an underlying basement, as an extension adjacent to the northern wall of the existing Barrie House multi-storey block of residential flats.
- The new structure is proposed to be chiefly supported on reinforced concrete raft at lower ground floor level. However, a number of bearing piles are also required outside the proposed basement area to support a number of sections of the proposed building.
- The proposed earth/groundwater retention system for the deep excavation for the new basement on the site shall comprise of a combination of ∅450 perimeter secant pile retaining wall; 450mm dia. Interlocking male and female piles, with male piles spaced @ 550mm c/c intervals and ∅600 contiguous pile retaining wall; 600mm dia. piles @ 700mm c/c intervals.
- **An existing Thames Water underground asset/trunk runs outside the northern boundary of the site at off-set distances of between 4.1m – 5.0m from the centreline of the nearest run of pile retaining wall. Therefore, the serviceability of the adjacent underground trunk has had to be carefully accounted for in the choices of the ground engineering methodologies and construction sequencing on which the detailed designs for the pile retaining walls and bearing piles presented in this report are based.**
- Approx. 69 lm total run of proposed perimeter bored pile retaining walls; this comprises of 12.5 lm of ∅600 contiguous pile retaining wall and 56.5 lm of ∅450 secant pile retaining wall.
- **For serviceability reasons, the pile retaining walls shall be temporarily restrained with temporary structural steel props prior to the commencement of bulk excavation for the new basement. The temporary props can be removed once the permanent floor slabs achieve sufficient structural strength. However, it is imperative that the Project Structural Engineer designs the reinforced**

concrete capping beam to safely span across openings at ground floor level in the permanent condition i.e. 8m minimum span length under 160 kN/m service horizontal loading.

- Maximum retained height of pile walls is < 4.85m.
- 5 No. ∅300 bearing piles are required outside the proposed basement area to support a number of sections of the proposed development.
- The bearing piles are subject to service vertical compressive, tension and horizontal loading of up to 250 KN/pile, -25 KN/pile and 10 KN/pile respectively. In addition, the design for the bearing piles accounts for load eccentricity-induced overturning moment of up to 19 kNm/pile. A copy of DFS' bearing pile construction schedule, which provides detailed information on individual pile loads, required pile lengths and required steel reinforcement is attached to the appendices of this report.
- Shaft resistance and passive resistance within the top 5m of every bearing pile have been ignored in pile axial capacity calculations and lateral analysis, in order to account for potential bulk excavation-induced stress relief in the ground within the site.
- Piling platform level(s) are unconfirmed at this stage. However, for design purpose, the piling mat level for both the perimeter pile walls and the bearing piles is generally taken to be the proposed ground floor level; +44.600m OD. **Nonetheless, the Principal Contractor must confirm actual piling platform level(s) prior to the commencement of piling works on the site, so that the pile wall construction schedule and bearing pile construction schedule may be amended accordingly.**
- The perimeter pile walls and bearing piles shall be installed by Continuous Flight Auger (CFA) drilling technique, with heavy duty augers.
- **It is imperative that a temporary guide wall be put in-place prior to the commencement of the installation of the pile retaining walls.**
- In addition to lateral earth/groundwater retention, the pile retaining wall has also been designed to support service vertical compressive and tension loading of up to +500 kN/m and -20 kN/m respectively.
- The pile wall designs account for 1:100 verticality tolerance (with heavy duty augers), 25mm horizontal positional tolerance (with a temporary guide wall in-place) and 30mm over-break in accordance with the recommendations of the ICE Specification for Piling & Embedded Retaining Walls (ICE SPERW, 2015). Based on these, there are potentials for piles in the secant wall to encroach into the basement

area by magnitudes of up to 105mm. **It is imperative that the Architect, Project Structural Engineer and Principal Contractor make allowance for this.**

- The secant pile wall is designed to provide earth/groundwater retention in both temporary and permanent conditions. Pile wall design accounts for full hydrostatic pressure behind the wall in the long term, in accordance with the recommendations of the BS8102 (2009).
- Estimation of pile wall and bearing pile vertical capacities in compression are based on a global factor of safety of 2.6, with a minimum partial factor of safety of 1.2 on shaft friction resistance only. This is based on the assumption that no pile load tests would be carried out on the site (after LDSA, 2018).
- Estimation of pile wall and bearing pile vertical capacities in tension are based on a minimum factor of safety of 3.0 on shaft friction resistance only. This is also based on the assumption that no pile load tests would be carried out on the site (after LDSA, 2018).
- Estimation of pile wall axial capacities are based on 100% pile group efficiency for closely spaced perimeter pile groups, following the recommendations of Kezdi (1957), Broms (2007), Rose & Taylor (2010), Rose (2012) and Rose et al. (2013).
- Maximum pile settlement of 5mm under service vertical loading.
- Estimated pile wall lateral deflection in both temporary and permanent conditions is < 10mm.
- Concrete grade DS-4-FND4-C32/40 for male/hard piles, as specified by the Project Structural Engineer.
- 10 N/mm^2 56 day-strength concrete for female piles in secant pile wall for permanent groundwater cut-off.
- 50mm cover to pile reinforcement.

4.0 TYPICAL SECTIONS CONSIDERED IN PILE WALL ANALYSIS & DESIGN

Typical pile wall sections considered in numerical analysis and design are described below. Also, see DFS' construction drawings No's DFS221011-01, DFS221011-02 & DFS221011-03 attached to the appendices of this report for the numbered pile wall layout and illustration of typical design sections respectively.

PILE WALL SECTION A - A (∅600 PERIMETER CONTIGUOUS PILE WALL, DOUBLY PROPPED, ADJACENT TO EXISTING HEAVILY LOADED FOUNDATIONS UNDERNEATH BARRIE HOUSE BUILDING): Piling Platform Level = Proposed Ground Floor Level = +44.600m OD. Basement Formation Level ≈ -+39.770m OD. Maximum Pile Wall Retained Height < 4.85m (Measured from Piling Platform Level). Wall Section is Designed to be Temporarily Restrained with 2 No. Rows of Structural Steel Props at Just Underneath the RC Capping Beam Soffit Level and 2.5m Depth (i.e. +42.100) in the Temporary Condition. In the Permanent Condition, the Pile Wall shall be Restrained by the Basement Raft/Basement Floor Slab and the Ground Floor Slab. 270 kN/m Structural Surcharge Loading from Adjacent/Existing Foundations and 150 kPa Nominal Surcharge are Accounted for in Wall Analysis & Design. In Addition to Lateral Retention, Pile Wall Design Accounts for Service Vertical Compressive and Tension Loading of up to 500 kN/m & -20 kN/m Run of Wall Respectively.

Proposed Sequence of Construction:

1. Install ∅600 piles @ 700mm c/c intervals from piling platform level (+44.600) to depths specified by DFS to form contiguous pile wall; see DFS' pile wall construction schedule for more detailed information.
2. Break down piles to 75mm above proposed soffit level of RC capping beam.
3. Construct RC capping beam on pile wall.
4. Carry out Initial Excavation Down to a Maximum Depth of 1.5m.
5. Install 1st row of temporary props and Structural Steel Waling Beam Just Underneath Capping Beam Soffit Level.
6. Continue bulk excavation down to 3m depth.
7. Install 2nd row of temporary props and associated structural steel waling beam at 2.5m depth (+42.100).
8. Complete bulk excavation down to basement formation level; +39.770.
9. Place blinding of 50mm minimum thickness at formation level.

10. Construct 950mm thick reinforced concrete raft/basement floor slab with water-proof concrete and dowel into pile retaining wall.
11. Commence the construction of RC liner wall with water-proof concrete, in front of pile retaining wall, from basement level, up to 3m depth.
12. Remove 2nd row of temporary props and associated structural steel waling beam at 2.5m depth (+42.100).
13. Continue the construction of RC liner wall up to level of 1st row of props.
14. Construct ground floor slab and connect same to RC capping beam.
15. Remove 1st row of props and waling beam.
16. Complete RC liner wall construction and connect to capping beam.
17. Construct superstructure.

PILE WALL SECTION B - B (∅450 PERIMETER SECANT PILE WALL, SINGLY PROPPED, OTHER AREAS OF PROPOSED BASEMENT): Piling Platform Level = Proposed Ground Floor Level = +44.600m OD. Basement Formation Level ≈ -+39.770m OD. Maximum Pile Wall Retained Height < 4.85m (Measured from Piling Platform Level). Wall Section is Designed to be Temporarily Restrained with 1 No. Row of Structural Steel Props at Just Underneath the RC Capping Beam Soffit Level. In the Permanent Condition, the Pile Wall shall be Restrained by the Basement Raft/Basement Floor Slab and the Ground Floor Slab. 25 kN/m Estimated Additional Horizontal Loading from Proposed RC Garden Retaining Wall Supporting Higher Ground behind Pile Wall, 50 kPa Estimated Potential Surcharge from Emergency Fire Engines/Appliances and 10 kPa Nominal Traffic & Services Surcharge are Accounted for in Wall Analysis & Design. In Addition to Lateral Retention, Pile Wall Design Accounts for Service Vertical Compressive and Tension Loading of up to 70 kN/m & -20 kN/m Run of Wall Respectively.

Proposed Sequence of Construction:

1. Install temporary guide wall prior to the commencement of secant pile wall construction.
2. Install ∅450 interlocking male and female piles, with male piles spaced @ 550mm c/c intervals from piling platform level (+44.600) to depths specified by DFS to form secant pile wall; see DFS' pile wall construction schedule for more detailed information.
3. Break down piles to 75mm above proposed soffit level of RC capping beam.
4. Construct RC capping beam on pile wall.

5. Carry out initial excavation down to a maximum depth of 1.5m.
6. Install temporary props and structural steel waling beam underneath capping beam soffit level.
7. Complete bulk excavation down to basement formation level; +39.770.
8. Place blinding of 50mm minimum thickness at formation level.
9. Construct 950mm thick reinforced concrete raft/basement floor slab with water-proof concrete and dowel into pile retaining wall.
10. Commence the construction of RC liner wall with water-proof concrete, in front of pile retaining wall, from basement level, up to waling beam soffit level.
11. Construct ground floor slab and connect same to capping beam.
12. Remove temporary props and waling beam.
13. Complete RC liner wall construction and connect to capping beam.
14. Construct superstructure.

5.0 GROUND CONDITIONS

Site stratigraphy at Broxwood View, 29 St. Edmund's Terrace London NW8 7QH may be generalised as shown in table 1 below:

DEPTH (m bgl)	DESCRIPTION	Representative N_{spt} Value
0.0 – 2.5	Made Ground	-
Below 2.5m bgl	Soft to Firm to Stiff to Very Stiff London Clay	6 - 16

Table 1 – Generalised Site Stratigraphy

Soil parameters used in design are presented in table 2 overleaf. In table 2;

ϕ' values for the cohesionless layers/made ground have been deduced from N_{spt} values (after Peck, Hanson & Thorburn (1974)).

ϕ' values for the cohesive layers are deduced from plasticity indices (after CIRIA Report No. 104, 1984 & CIRIA Report No. C580, 2003).

E' values for cohesionless materials/made ground are estimated with the correlation: $E' = 2000 – 3000 * N_{spt}$ in kPa (after CIRIA Report No. 143, 1995 & CIRIA Report No. C580, 2003).

E' values for cohesive layers are deduced from the expression $E' = 0.8 * E_u$, where $E_u = 800 * C_u$. (after Borin, 2012).

SOIL LAYER	N_{spt}	γ (kN/m^3)	ϕ' (°)	C' (kPa)	C_u (kPa)	E_u	E' (kPa)
Made Ground	-	18.0	28.0	0.0	-	-	15000
Soft to Firm to Stiff to Very Stiff London Clay	6 - 16	19.0	23.0	5.0	30 + 12z	24000 + 9600z	19200 + 7680z

Table 2 – Input soil parameters

6.0 PILE RETAINING WALL DESIGNS

(i) Geotechnical Design

The geotechnical design involves four stages, which are outlined below;

(i) *Ultimate Limit State (ULS) Analysis* – This involves the use of factored soil parameters to estimate the required embedment of the wall below proposed excavation level, for overall stability to be maintained in both the temporary condition and the permanent condition. This analysis has been carried out with the 'CADS PWS 6.09' geostructural modelling programme for embedded retaining walls. Analysis also provides information on estimated ultimate bending moments and shear forces in the wall.

Factors of safety adopted in the ULS analysis are based on the recommendations of the CIRIA Report No. C580 (2003) and CIRIA Report No. C760 (2017) for moderately conservative parameters. These are outlined below:

Factor of safety on undrained shear strength C_u = 1.5

Factor of safety on drained shear strength C' = 1.2

Factor of safety on drained angle of shearing resistance ϕ' = 1.2

See copies of the CADS PWS 6.09 ULS analysis output files attached to the appendices of this report.

(ii) *Serviceability Limit State (SLS) Analysis* – This involves the use of unfactored soil parameters to estimate the lateral displacement of the wall, as well as service bending moments, shear forces and service loads on the struts/permanent slabs. The analysis has been carried out with the 'CADS PWS 6.09' geostructural modelling programme. See copies of the CADS PWS 6.09 SLS analysis output files attached to the appendices of this report.

(iii) *Pile Wall Capacities under Vertical Axial Loading* – This is based on the traditional bearing capacity approach for axially loaded piles. 100% pile group efficiency has been adopted, based on the

recommendations of Rose & Taylor (2010), Rose et al. (2011 & 2012), Kezdi (1957) & Broms (2007) for perimeter pile groups embedded in clay or sand.

However, the wall is assumed to act as a continuous deep strip footing below basement formation level, surrounded by a block of soil, with the assumption of a block type failure mechanism in the ultimate limit state. In addition, the bearing capacity factor N_c in the London clay is reduced with a reduction factor f, in order to account for the existence of gaps in-between the piles within the wall.

The reduction factor f is expressed as;

$$f = \frac{\pi D}{4S} \qquad \text{---------- [1]}$$

Where D = pile diameter and S = pile centre to centre spacing. This approach produces an estimate of the axial capacities of the wall per metre run. See Adekunte (2014) for more detailed information on this methodology.

Separate MS Excel spreadsheet showing pile wall axial capacities in compression and tension are attached to the appendices of this report.

(iv) *Assessment of At-Rest Lateral Earth Pressures Around Pile Wall in the Permanent Condition* –

The numerical modelling/analysis of all pile wall sections for the permanent conditions are based on drained/effective stress parameters ϕ′, c′ & E′ presented in table 2 of section 5.0 of this report. However, as the pile retaining wall would be restrained by permanent floor slabs in the permanent condition, such that potential wall lateral displacement could be limited, there could be potentials for lateral earth pressures around the retaining wall to be higher than the active pressures or lower than the passive resistances computed by the CADS PWS 6.09 programme that had been based on active and passive pressure coefficients K_a & K_p respectively.

Therefore, this report considers it prudent to investigate the potential influence of at-rest-lateral earth pressures on the overall stability of the pile wall in the permanent condition. Lateral effective earth pressure at rest σ'_r is given by the equation;

$$\sigma'_r = \sigma'_z * K_o \quad \text{---------- [2]}$$

In equation 2, K_o is coefficient of earth pressure at rest and σ'_z is effective vertical pressure (including overburden pressure).

Taking the shallow made ground layer on the site to be normally consolidated material, whilst taking the underlying London clay stratum to be overconsolidated in line with established geotechnical practice;

$K_{o(NC)}$ for the made ground layer may be estimated with Jaky's (1944 & 1948) equation;

$$K_{o(NC)} = 1 - \text{Sin } \phi' \quad \text{---------- [3]}$$

In equation 3, ϕ' is effective angle of shearing resistance.

$K_{o(OC)}$ for the London clay stratum may be estimated with Schmertmann's (1985) equation;

$$K_{o(OC)} = 0.5 * (OCR)^{0.5} \quad \text{---------- [4]}$$

where OCR is overconsolidation ratio, which can be estimated with Mayne & Mitchell's (1987) equation;

$$OCR = 4.31 * (C_u/\sigma'_z)^{0.5} \quad \text{---------- [5]}$$

where C_u = undrained shear strength and σ'_z is effective vertical stress (including overburden pressure).

However, with references to the CIRIA Report No. 104 (1984), CIRIA Report No. C580 (2003) and the CIRIA Report No. C760 (2017), at-rest-earth pressures/conditions are inapplicable to embedded

retaining walls due to the effects of wall installation by boring technique and the subsequent bulk excavation in front of the retaining wall, which essentially result in significant stress relief around the embedded retaining wall, such that horizontal effective stresses close to the wall are considerably reduced to values below their in-situ value e.g. see section 4.1.2 of the CIRIA Report No. C580 (2003).

Furthermore, section 4.5 of the CIRIA Report No. 104 (1984) recommends that coefficients of at-rest-pressures "should not in general be thought of as a fundamental property of the soil" in embedded retaining wall analysis and design, as at-rest-conditions no longer apply if the ground has strained horizontally" e.g. due to drilling-induced/bulk excavation-induced reduction in horizontal stress. In addition, movements of most propped/unpropped embedded retaining walls inevitably lower K_o values behind the wall from its value just after installation to a value close to the coefficient of active pressure Ka (after CIRIA Report No. 104, 1984).

In addition, while the CIRIA Report No. 104 (1984) acknowledges that in some circumstances, rigid structures may experience higher than active pressures, any structure partially or wholly relying on passive pressure of the soil in front of the wall to maintain overall stability should not be designed for pressures higher than active values behind the wall (see page 76, section 8.1.2 of the CIRIA Report No. 104, 1984).

On the basis of the above, CIRIA Reports No's 104 (1984), C580 (2003) & C760 (2017) generally do consider coefficients of at-rest-earth pressures not to be particularly applicable to the design of embedded retaining walls in both temporary and permanent conditions, while the use of active and passive pressure coefficients K_a and K_p are encouraged by all the documents. These recommendations essentially form the basis of the retaining wall design calculations presented in this report.

The results of the wall analysis and design are presented in table 3 overleaf. A copy of the pile wall construction schedule is also attached to the appendices of this report.

PILE WALL SECTION	Maximum Retained Height (m)	Required Male Pile Length/Female Pile Length (m)	Theoretically Estimated & Expected Maximum Pile Wall Lateral Deflection (mm)	Temporary Prop Load/Permanent Horizontal Loading on RC Floor Slabs (kN/m)	Required Steel Reinforcement in Piles
Section A - A (∅600 Contiguous Pile Wall, Doubly Propped @ Just Underneath Capping Beam Soffit Level & 2.5m Depth)	4.85	14.0/6.0	10.0 (< 10.0 expected, based on DFS' experience with the CADS PWS 6.09 programme & parallel field instrumentation & monitoring).	300.0 (1st Row of Temporary Props @ Capping Beam Level) 550.0 (2nd Row of Temporary Props @ 2.5m Depth; +42.100) 550.0 (Basement Raft/Basement Floor Slab) 160.0 (Ground Floor Slab)	12–B25s x 11m & B16 links @ 225mm c/c
Section B - B (∅450 Secant Pile Wall, Singly Propped @ Capping Beam Level)	4.85	8.0/6.0	8.0 (< 10.0 expected, based on DFS' experience with the CADS PWS 6.09 programme & parallel field instrumentation & monitoring).	40.0 (Temporary Props @ Capping Beam Level) 220.0 (Basement Raft/Basement Floor Slab) 90.0 (Ground Floor Slab)	5–B20s x 7m & B8 links @ 175mm c/c

- The hard pile lengths recommended in the above table are adequate to support service vertical compressive and tension loading of up to +500 kN/m and -20 kN/m run of wall respectively, as required by the Project Structural Engineer.
- Copies of CADS PWS 6.09 computer output files for pile lateral stability analysis are attached to the appendices of this report.
- Separate MS-Excel spreadsheet for pile wall axial capacities in compression and tension are also attached to the appendices of this report.

Table 3 – Summary of Pile Retaining Wall Design

(ii) Structural Design

The 'CADS PWS 6.09' geostructural modelling programme has also been used to design the reinforcement bars in the piles within the contiguous pile wall. Copies of relevant computer output files are attached to the appendices of this report.

7.0 BEARING PILE DESIGN

(i) Geotechnical Design

The geotechnical design for the bearing piles to support service vertical compressive loading, tension loading, horizontal loading and overturning moments involves three stages, which are outlined below;

- *Estimation of Pile Capacities under Vertical Axial Compressive/Tension Loading.*
- *Pile Settlement Analysis*
- *Assessment of Pile Behaviour under Combined Lateral Loading/Tension/Overturning Moments*

Pile Capacities under Vertical Axial Loading

Design is generally based on the traditional bearing capacity approach.

In cohesionless layers, ultimate shaft friction capacity Q_s is given by the equation:

$$Q_s = k_s \cdot \overline{\sigma'_{vo}} \cdot tan(\delta) \cdot A_s \qquad \text{---------- (6)}$$

And ultimate end bearing capacity is given by the equation:

$$Q_b = N_q \cdot \sigma'_{v1} \cdot A_b \qquad \text{---------- (7)}$$

where

$k_s =$ Coefficient of lateral earth pressure.

$\overline{\sigma'_{vo}} =$ Average effective overburden pressure along shaft. (kPa)

$\delta =$ Angle of friction between pile and soil.

$\sigma'_{v1} =$ Effective overburden pressure at toe level. (kPa)

$N_q =$ Bearing capacity factor (after Berezanstev et al., 1961).

In cohesive layers, ultimate shaft friction capacity is given by the equation:

$Q_s = \alpha * C_u * A_s$ ---------- (8)

Ultimate end bearing capacity is given by the equation:

$Q_b = N_c * C_u$ ---------- (9)

Where

α = adhesion factor. This has been taken to be 0.5-0.6 in the clay strata on the current site (after Martin et al., 2016).

C_u = undrained shear strength

A_s = pile shaft surface area

N_c = bearing capacity factor accounting for cohesion. This is taken to be 9 in clay.

Separate MS Excel spreadsheet for pile axial capacities in tension and compression are attached to the appendices of this report. Bearing pile construction schedule showing pile lengths and reinforcement details is also attached to the appendices.

Analysis of Pile Settlement under 250 KN Maximum SWL (∅300 Pile)

Maximum pile settlement under a given applied load is given by the sum of the initial shaft movement required to mobilise the skin friction around the pile shaft, elastic settlement of the pile shaft and the elasto-plastic deformation of soil beneath the pile toe. This can be expressed as:

$$\varepsilon = \frac{(W_s + 2W_b)\,L}{2\,A_s\,E_p} + \frac{\pi * W_b}{4A_b} * \frac{B\,(1 - \nu^2)\,I_p}{E_b} + \Delta_y \qquad \text{---------- (10)}$$

(after Tomlinson, 2001 and Mokwa & Duncan, 2003).

In equation 10, Δ_y is the initial movement required to mobilise skin friction resistance around the pile shaft. It is generally considered to be smaller than the movement required to mobilise the end-bearing resistance at pile toe level, while it is generally independent of pile diameter and soil type (after Kulhawy, 1984).

Δ_y typically ranges between 2.5mm – 8mm (after Davisson (1975), Gardner (1975) & Kulhawy (1984)). However, for the purpose of the current settlement calculations, Δ_y = 3mm is considered to be reasonable (after Mokwa & Duncan, 2003).

Ultimate skin friction capacity = 558 KN (please see copy of DFS' pile axial capacity calculation spreadsheet attached to the appendices of this report)

Adopting a factor of safety of 1.5 on shaft friction resistance only;

$Q_{allowable}$ in skin friction = 558/1.5 = 372 KN; this shall be limited to the maximum service load on the pile (250 KN).

∴ Load on Pile Shaft W_s = 250 KN

∴Total Load Transferred to pile base W_b = (250 – 250) KN = 0.0 (this essentially points to the likelihood of the service loading on the pile being wholly supported in shaft friction only, with negligible or no-load transfer to the pile base).

L = Shaft Length = 15.0m

B = Pile diameter = 0.3m

A_s = Shaft Area = $\pi * B * L = \pi * 0.3 * 15.0 = 14.14m^2$

A_b = Pile Base Area = $\pi * B^2 / 4 = \pi * 0.3^2 / 4 = 0.07\ m^2$

E_p = Elastic Modulus of Pile Material (concrete) = 30 GPa. However, conservatively adopt 15 GPa.

ν = Poisson's ratio of soil beneath pile base. Pile is end-bearing in stiff to very stiff clay. Use $\nu = 0.15$.

I_p = Influence factor. For $\nu = 0.0 – 0.25$ and $L/B > 5$, $I_p = 0.5$ (after Tomlinson, 2001).

E_b = Deformation modulus of soil beneath the pile. This can be expressed as:

$E_b = 2 - 3 * N_{spt}$ in MPa (after CIRIA Report No. 143, 1995, CIRIA Report No. C580, 2003 and CIRIA Report No. C760, 2017)

N_{spt} at pile toe level > 35

$\therefore E_b = 2 * 35 = 70$ MPa or 70,000 kPa

$\therefore \varepsilon = [8.84 \times 10^{-3}] + [0.0] + [3.0]$ mm

$\therefore \varepsilon \approx 3.1$mm.

Hence, based on site-specific design parameters, estimated worst-case pile head settlement under service vertical compressive loading of up to 250 KN is < 5mm (O.K.).

Also, a copy of the pile settlement analysis spreadsheet is attached to the appendices of this report.

(ii) Structural Design

1. Compression Reinforcement in Bearing Piles:

∅300 Section

Capacity of concrete section under axial compressive loading is given by:

$$Compressive\ SWL \leq \frac{0.4 \times f_{cu} \times A_c}{\gamma_f} \quad \text{---------- (11)}$$

$\gamma_f =$ 1.5

$f_{cu} =$ 40N/mm^2

$A_c =$ 70718 mm^2

$$SWL \leq \frac{0.4 \times 40 \times 70718}{1.5}$$

$SWL \leq$ 754 KN (O.K.).

Maximum service vertical compressive loading of 250 KN/pile is less than 754 KN, therefore Grade C32/40 concrete O.K. Compression reinforcement is not required.

∴ Provide nominal compression reinforcement.

2. Bending/Tension/Shear Reinforcement in Bearing Piles:

Please see copies of bearing pile lateral analysis spreadsheet attached to the appendices of this report.

Essentially, the 4-B25 x 8m steel reinforcement cage and R6 links @ 120mm c/c in each bearing pile is designed to support a combination of tension loading, bending moments and shear forces. Therefore, no additional central tendons are required in these piles.

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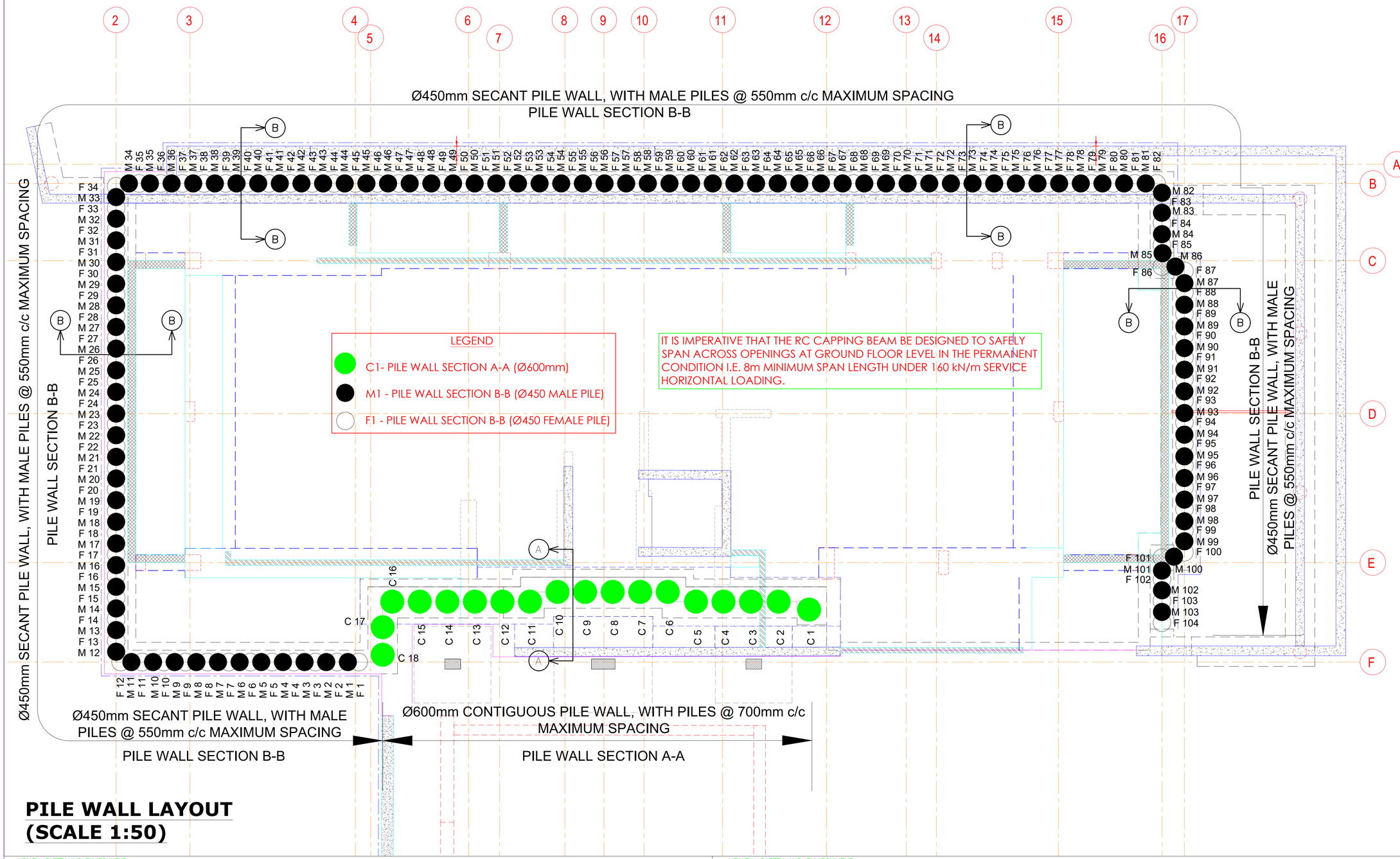
APPENDICES

DFS' Pile Wall Construction Drawings



PILE WALL LAYOUT (SCALE 1:50)

IMPORTANT CONSTRUCTION NOTES

1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE.
2. ALL LEVELS ARE IN METRES UNLESS NOTED OTHERWISE.
3. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS, ENGINEERS, AND SPECIALISTS LATEST DRAWINGS AND SPECIFICATIONS. ANY DISCREPANCIES MUST BE REPORTED TO DFS, ENGINEER AND ARCHITECT IMMEDIATELY.
4. ONLY FIGURED DIMENSIONS ARE TO BE USED. ANY QUERIES MUST BE REFERRED TO DFS.
5. 50mm COVER TO PILE REINFORCEMENT.
6. STRICT SUPERVISION OF BULK EARTH WORKS IS REQUIRED TO ENSURE THAT EXCAVATIONS DO NOT EXCEED THE DESIGN DEPTH SHOWN IN THESE DRAWINGS (4.83m).
7. SECANT & CONTIGUOUS PILE WALLS SHALL BE INSTALLED IN ACCORDANCE WITH THE RECOMMENDATIONS OF THE ICE SPECIFICATIONS FOR PILING AND EMBEDDED RETAINING WALLS (ICESPERW, 2017).
8. THE SECANT & CONTIGUOUS PILE WALLS ARE DESIGNED FOR BOTH TEMPORARY AND PERMANENT USE.
9. THE SECANT & CONTIGUOUS PILE WALLS ARE DESIGNED TO SUPPORT FULL HYDROSTATIC PRESSURE IN THE LONG-TERM, ONCE FACED WITH A PERMANENT RC LINER WALL, IN ACCORDANCE WITH THE RECOMMENDATION OF THE BS8102 (2009).

HEALTH, SAFETY AND ENVIRONMENT

1. THIS GEO-STRUCTURAL DESIGN HAS BEEN CARRIED OUT AND REVIEWED IN ACCORDANCE WITH THE CONSTRUCTION, DESIGN & MANAGEMENT (CDM) REGULATIONS 2015 AND DOES NOT INCLUDE ANY ABNORMAL RISK ITEM THAT A COMPETENT CONTRACTOR WOULD NOT BE AWARE OF WHEN UNDERTAKING CONSTRUCTION WORKS SHOWN.
2. THE PILE WALL DESIGNS ACCOUNT FOR 1:100 VERTICALITY TOLERANCE (WITH HEAVY DUTY AUGERS), 25mm HORIZONTAL POSITIONAL TOLERANCE (WITH A TEMPORARY GUIDE WALL IN-PLACE) AND 30mm OVER-BREAK IN ACCORDANCE WITH THE RECOMMENDATIONS OF THE ICE SPECIFICATION FOR PILING & EMBEDDED RETAINING WALLS (ICE SPERW, 2015). BASED ON THESE, THERE ARE POTENTIALS FOR PILES IN THE SECANT WALL TO ENCROACH INTO THE BASEMENT AREA BY MAGNITUDES OF UP TO 105MM. IT IS IMPERATIVE THAT THE ARCHITECT, PROJECT STRUCTURAL ENGINEER AND PRINCIPAL CONTRACTOR MAKE ALLOWANCE FOR THIS.
3. THE PRINCIPAL CONTRACTOR AND ASSOCIATED SUB-CONTRACTORS MUST CARRY OUT INDEPENDENT RISK ASSESSMENTS THAT ARE APPLICABLE TO THEIR WORKS AND FULLY COMPLY WITH THE ABOVE STATED REGULATION.
4. THE PRINCIPAL CONTRACTOR AND ASSOCIATED SUB-CONTRACTORS MUST REVIEW THE SITE-SPECIFIC AND HISTORICAL BOREHOLE LOGS OF THE SITE TO HAVE ADEQUATE KNOWLEDGE OF GROUND CONDITIONS ON THE SITE, PRIOR TO COMMENCEMENT OF WORKS.
5. DURING SITE OPERATIONS, IF OBSERVED GROUND CONDITIONS DIFFER FROM THE GENERALISED STRATIGRAPHY SHOWN IN THIS SET OF DRAWINGS, DFS MUST BE INFORMED IMMEDIATELY.
6. IT IS THE RESPONSIBILITY OF THE PRINCIPAL CONTRACTOR AND ASSOCIATED SUB-CONTRACTORS TO ENSURE THAT SITE OPERATIVES ARE COMPETENT AND EXPERIENCED IN THE AREA OF WORKS TO BE UNDERTAKEN.

HEALTH, SAFETY AND ENVIRONMENT

7 IN ADDITION TO THE RISK/HAZARD TYPICALLY ASSOCIATED WITH THE GROUND ENGINEERING WORKS DETAILED IN THIS DRAWING, ADDITIONAL SITE/WORK-SPECIFIC HAZARDS HAVE BEEN IDENTIFIED THROUGH DESIGN RISK ASSESSMENT. THESE ARE OUTLINED IN 7.1 – 7.3 BELOW. ALL SITE OPERATIONS MUST ACCOUNT FOR ALL USUAL AND SITE/WORK-SPECIFIC HAZARDS.

7.1 PILING PLATFORM LEVEL IS UNCONFIRMED AT THIS STAGE. HOWEVER, FOR DESIGN PURPOSE, THE PILING MAT LEVEL FOR THE PERIMETER PILE WALLS AND BEARING PILES IS GENERALLY TAKEN TO BE THE PROPOSED GROUND FLOOR LEVEL; APPROX. +44.600M OD. NONETHELESS, THE PRINCIPAL CONTRACTOR MUST CONFIRM ACTUAL PILING PLATFORM LEVEL(S) PRIOR TO THE COMMENCEMENT OF PILING WORKS ON THE SITE, SO THAT THE PILE WALL SCHEDULE & BEARING PILE SCHEDULE MAY BE AMENDED ACCORDINGLY.

7.2 A REINFORCED CONCRETE CAPPING BEAM MUST BE CONSTRUCTED ON THE PILE WALL, WHILE TEMPORARY PROPS MUST BE INSTALLED AT LEVELS SPECIFIED BY DFS PRIOR TO THE COMMENCEMENT OF BULK EXCAVATION FOR THE NEW BASEMENT.

7.3 IN ADDITION, IT IS IMPERATIVE THAT THE CONCRETE MIX DESIGN FOR THE PILES IN THE CONTIGUOUS WALL ACCOUNTS FOR 10MM MAXIMUM AGGREGATE SIZE AND SET-RETARDING ADMIXTURES IN ORDER TO EASE THE INSTALLATION OF REINFORCEMENT CAGES INTO CONCRETED DRILLHOLES. REINFORCEMENT CAGE VIBRATORS MAY ALSO BE REQUIRED TO FORCE THE STEEL CAGES DOWN TO THE DESIGN DEPTHS.

DEEP FOUNDATIONS SPECIALISTS LIMITED
2nd FLOOR, THE PORTER BUILDING 1 BRUNEL WAY
SLOUGH SL1 1FQ.
TELEPHONE: 01753 396498

CLIENT: ARMA PILING LIMITED

JOB TITLE: BROXWOOD VIEW, 29 ST. EDMUND'S TERRACE LONDON NW8 7QH

DRAWING TITLE: PILE WALL LAYOUT

DATE	DRAWN	CHECKED
15 APR 2023	AR	AA

DRAWING No.	REV.	SCALE
DFS221011-01	05	1:50 @ A1

HEALTH, SAFETY AND ENVIRONMENT

1. THIS GEO–STRUCTURAL DESIGN HAS BEEN CARRIED OUT AND REVIEWED IN ACCORDANCE WITH THE CONSTRUCTION, DESIGN & MANAGEMENT (CDM) REGULATIONS 2015 AND DOES NOT INCLUDE ANY ABNORMAL RISK ITEM THAT A COMPETENT CONTRACTOR WOULD NOT BE AWARE OF WHEN UNDERTAKING CONSTRUCTION WORKS SHOWN.

2. THE PILE WALL DESIGNS ACCOUNT FOR 1:100 VERTICALITY TOLERANCE (WITH HEAVY DUTY AUGERS), 25mm HORIZONTAL POSITIONAL TOLERANCE (WITH A TEMPORARY GUIDE WALL IN–PLACE) AND 30mm OVER–BREAK IN ACCORDANCE WITH THE RECOMMENDATIONS OF THE ICE SPECIFICATION FOR PILING & EMBEDDED RETAINING WALLS (ICE SPERW, 2015). BASED ON THESE, THERE ARE POTENTIALS FOR PILES IN THE SECANT WALL TO ENCROACH INTO THE BASEMENT AREA BY MAGNITUDES OF UP TO 105MM. IT IS IMPERATIVE THAT THE ARCHITECT, PROJECT STRUCTURAL ENGINEER AND PRINCIPAL CONTRACTOR MAKE ALLOWANCE FOR THIS.

3. THE PRINCIPAL CONTRACTOR AND ASSOCIATED SUB–CONTRACTORS MUST CARRY OUT INDEPENDENT RISK ASSESSMENTS THAT ARE APPLICABLE TO THEIR WORKS AND FULLY COMPLY WITH THE ABOVE STATED REGULATION.

4. THE PRINCIPAL CONTRACTOR AND ASSOCIATED SUB–CONTRACTORS MUST REVIEW THE SITE–SPECIFIC AND HISTORICAL BOREHOLE LOGS OF THE SITE TO HAVE ADEQUATE KNOWLEDGE OF GROUND CONDITIONS ON THE SITE, PRIOR TO COMMENCEMENT OF WORKS.

5. DURING SITE OPERATIONS, IF OBSERVED GROUND CONDITIONS DIFFER FROM THE GENERALISED STRATIGRAPHY SHOWN IN THIS SET OF DRAWINGS, DFS MUST BE INFORMED IMMEDIATELY.

6. IT IS THE RESPONSIBILITY OF THE PRINCIPAL CONTRACTOR AND ASSOCIATED SUB–CONTRACTORS TO ENSURE THAT SITE OPERATIVES ARE COMPETENT AND EXPERIENCED IN THE AREA OF WORKS TO BE UNDERTAKEN.

7. IN ADDITION TO THE RISK/HAZARD TYPICALLY ASSOCIATED WITH THE GROUND ENGINEERING WORKS DETAILED IN THIS DRAWING, ADDITIONAL SITE/WORK–SPECIFIC HAZARDS HAVE BEEN IDENTIFIED THROUGH DESIGN RISK ASSESSMENT. THESE ARE OUTLINED IN 7.1 – 7.3 BELOW. ALL SITE OPERATIONS MUST ACCOUNT FOR ALL USUAL AND SITE/WORK–SPECIFIC HAZARDS.

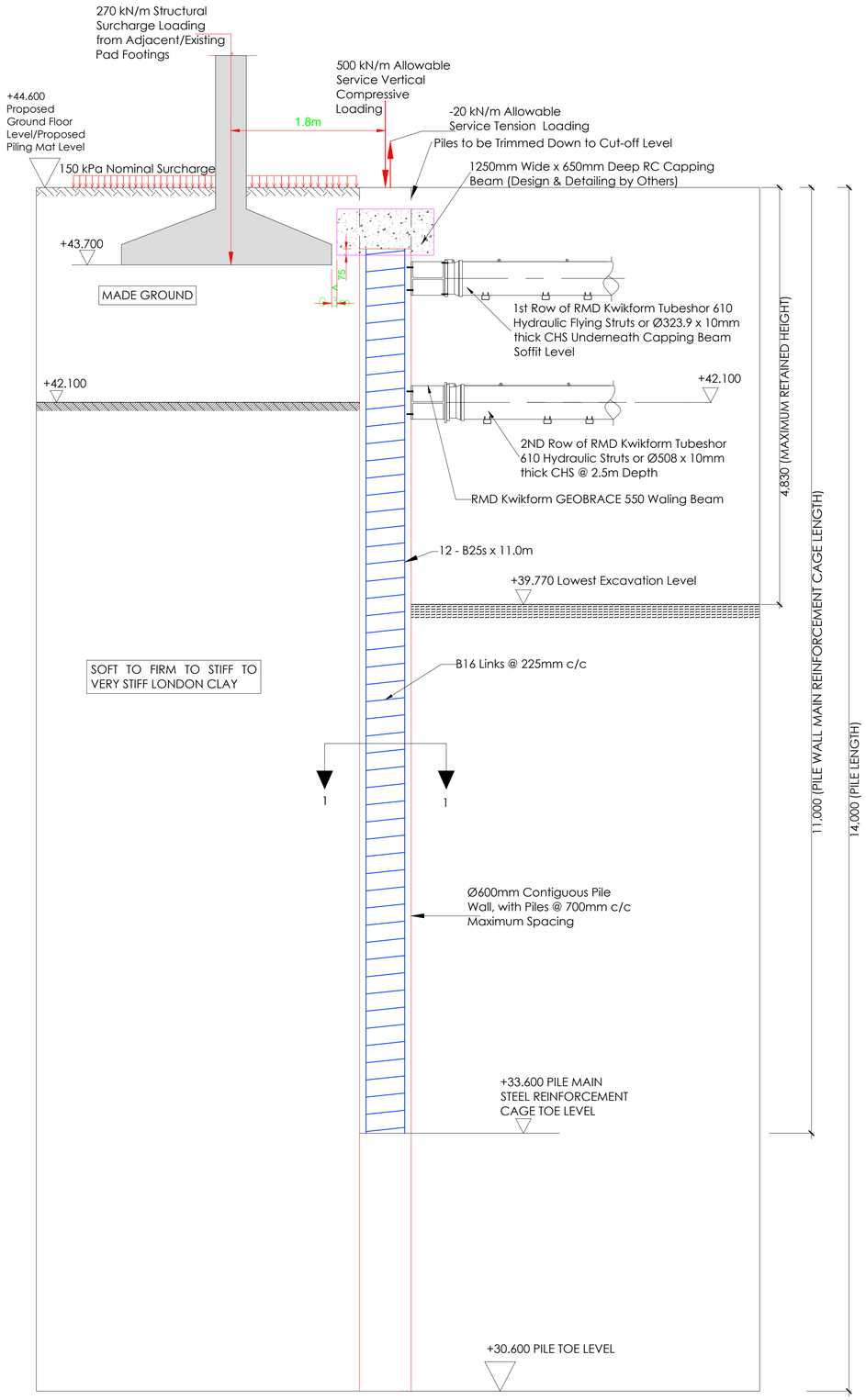
7.1. PILING PLATFORM LEVEL IS UNCONFIRMED AT THIS STAGE. HOWEVER, FOR DESIGN PURPOSE, THE PILING MAT LEVEL FOR THE PERIMETER PILE WALLS AND BEARING PILES IS GENERALLY TAKEN TO BE THE PROPOSED GROUND LEVEL; APPROX. +44.600M OD. NONETHELESS, THE PRINCIPAL CONTRACTOR MUST CONFIRM ACTUAL PILING PLATFORM LEVEL(S) PRIOR TO THE COMMENCEMENT OF PILING WORKS ON THE SITE, SO THAT THE PILE WALL SCHEDULE & BEARING PILE SCHEDULE MAY BE AMENDED ACCORDINGLY.

7.2. A REINFORCED CONCRETE CAPPING BEAM MUST BE CONSTRUCTED ON THE PILE WALL, WHILE TEMPORARY PROPS MUST BE INSTALLED AT LEVELS SPECIFIED BY DFS PRIOR TO THE COMMENCEMENT OF BULK EXCAVATION FOR THE NEW BASEMENT.

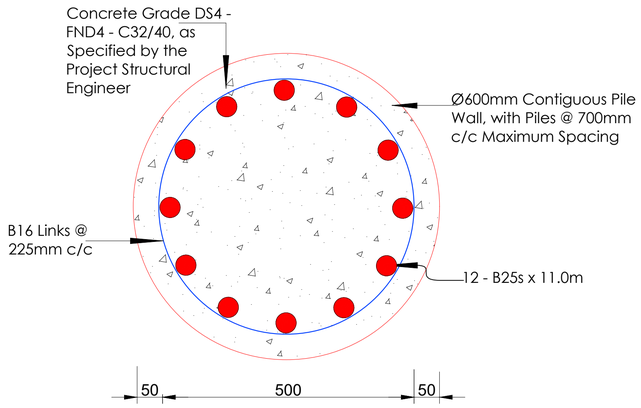
7.3. IN ADDITION, IT IS IMPERATIVE THAT THE CONCRETE MIX DESIGN FOR THE PILES IN THE SECANT & CONTIGUOUS WALL ACCOUNTS FOR 10MM MAXIMUM AGGREGATE SIZE AND SET–RETARDING ADMIXTURES IN ORDER TO EASE THE INSTALLATION OF REINFORCEMENT CAGES INTO CONCRETED DRILLHOLES. REINFORCEMENT CAGE VIBRATORS MAY ALSO BE REQUIRED TO FORCE THE STEEL CAGES DOWN TO THE DESIGN DEPTHS.

EXPECTED MAXIMUM WALL LATERAL DEFLECTION < 10mm

STRICT SUPERVISION OF BULK EXCAVATION BY MAIN CONTRACTOR IS REQUIRED, SO AS TO ENSURE THAT BULK EXCAVATION DOES NOT PROGRESS BELOW THE DIG DEPTH SHOWN IN THIS DRAWING



CONTIGUOUS PILE WALL SECTION A-A



SECTION 1-1 (SCALE 1:6)

PROPOSED SEQUENCE OF CONSTRUCTION:

PILE WALL SECTION A-A (Ø600 PERIMETER CONTIGUOUS PILE WALL, DOUBLY PROPPED, ADJACENT TO EXISTING HEAVILY LOADED FOUNDATIONS UNDERNEATH BARRIE HOUSE BUILDING)

A. INSTALL TEMPORARY GUIDE WALL PRIOR TO THE COMMENCEMENT OF CONTIGUOUS PILE WALL CONSTRUCTION.
B. INSTALL Ø600 PILES @ 700mm C/C INTERVALS FROM PILING PLATFORM LEVEL (+44.600) TO DEPTHS SPECIFIED BY DFS TO FORM CONTIGUOUS PILE WALL; SEE DFS' PILE WALL CONSTRUCTION SCHEDULE FOR MORE DETAILED INFORMATION.
C. BREAK DOWN PILES TO 75mm ABOVE PROPOSED SOFFIT LEVEL OF RC CAPPING BEAM.
D. CONSTRUCT RC CAPPING BEAM AND ON PILE WALL.
E. CARRY OUT INITIAL EXCAVATION DOWN TO A MAXIMUM DEPTH OF 1.5m.
F. INSTALL 1ST ROW OF TEMPORARY PROPS & STRUCTURAL STEEL WALING BEAM UNDERNEATH CAPPING BEAM SOFFIT LEVEL.
G. CONTINUE L BULK EXCAVATION DOWN TO 3M DEPTH.
H. INSTALL 2ND ROW OF TEMPORARY PROPS AND ASSOCIATED STRUCTURAL STEEL WALING BEAM AT 2.5m DEPTH (+42.100).
I. COMPLETE BULK EXCAVATION DOWN TO BASEMENT FORMATION LEVEL; +39.770.
J. PLACE BLINDING OF 50mm MINIMUM THICKNESS AT FORMATION LEVEL.
K. CONSTRUCT 950mm THICK REINFORCED CONCRETE RAFT/BASEMENT FLOOR SLAB WITH WATER-PROOF CONCRETE AND DOWEL INTO PILE RETAINING WALL.
L. COMMENCE THE CONSTRUCTION OF RC LINER WALL WITH WATER-PROOF CONCRETE, IN FRONT OF PILE RETAINING WALL, FROM BASEMENT LEVEL, UP TO 3m DEPTH.
M. REMOVE 2ND ROW OF TEMPORARY PROPS AND ASSOCIATED STRUCTURAL STEEL WALING BEAM AT 2.5m DEPTH (+42.100).
N. CONTINUE THE CONSTRUCTION OF RC LINER WALL UP TO LEVEL OF FIRST ROW OF PROPS.
O. CONSTRUCT GROUND FLOOR SLAB AND CONNECT SAME TO CAPPING BEAM.
P. REMOVE 1ST ROW OF PROPS & WALING BEAM.
Q. COMPLETE RC LINER WALL CONSTRUCTION AND CONNECT TO CAPPING BEAM.
R. CONSTRUCT SUPERSTRUCTURE.

IMPORTANT CONSTRUCTION NOTES

1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE.
2. ALL LEVELS ARE IN METRES UNLESS NOTED OTHERWISE.
3. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS, ENGINEERS, AND SPECIALISTS LATEST DRAWINGS AND SPECIFICATIONS. ANY DISCREPANCIES MUST BE REPORTED TO DFS, ENGINEER AND ARCHITECT IMMEDIATELY.
4. ONLY FIGURED DIMENSIONS ARE TO BE USED. ANY QUERIES MUST BE REFERRED TO DFS.
5. 50mm COVER TO PILE REINFORCEMENT.
6. STRICT SUPERVISION OF BULK EARTH WORKS IS REQUIRED TO ENSURE THAT EXCAVATIONS DO NOT EXCEED THE DESIGN DEPTH SHOWN IN THESE DRAWINGS (4.83m).
7. SECANT & CONTIGUOUS PILE WALLS SHALL BE INSTALLED IN ACCORDANCE WITH THE RECOMMENDATIONS OF THE ICE SPECIFICATIONS FOR PILING AND EMBEDDED RETAINING WALLS (ICESPERW, 2017).
8. THE SECANT & CONTIGUOUS PILE WALLS ARE DESIGNED FOR BOTH TEMPORARY AND PERMANENT USE.
9. THE SECANT & CONTIGUOUS PILE WALLS ARE DESIGNED TO SUPPORT FULL HYDROSTATIC PRESSURE IN THE LONG–TERM, ONCE FACED WITH A PERMANENT RC LINER WALL, IN ACCORDANCE WITH THE RECOMMENDATION OF THE BS8102 (2009).

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CLIENT: ARMA PILING LIMITED

JOB TITLE: BROXWOOD VIEW, 29 ST. EDMUND'S TERRACE LONDON NW8 7QH

DRAWING TITLE: CONTIGUOUS PILE WALL SECTION A-A

DATE	DRAWN	CHECKED
15 APR 2023	AR	AA

DRAWING No: DFS221011-02 | REV: 05 | SCALE: SCALE IS AS SHOWN @ A1

HEALTH, SAFETY AND ENVIRONMENT

1. THIS GEO–STRUCTURAL DESIGN HAS BEEN CARRIED OUT AND REVIEWED IN ACCORDANCE WITH THE CONSTRUCTION, DESIGN & MANAGEMENT (CDM) REGULATIONS 2015 AND DOES NOT INCLUDE ANY ABNORMAL RISK ITEM THAT A COMPETENT CONTRACTOR WOULD NOT BE AWARE OF WHEN UNDERTAKING CONSTRUCTION WORKS SHOWN.

2. THE PILE WALL DESIGNS ACCOUNT FOR 1:100 VERTICALITY TOLERANCE (WITH HEAVY DUTY AUGERS), 25mm HORIZONTAL POSITIONAL TOLERANCE (WITH A TEMPORARY GUIDE WALL IN–PLACE) AND 30mm OVER–BREAK IN ACCORDANCE WITH THE RECOMMENDATIONS OF THE ICE SPECIFICATION FOR PILING & EMBEDDED RETAINING WALLS (ICE SPERW, 2015). BASED ON THESE, THERE ARE POTENTIALS FOR PILES IN THE SECANT WALL TO ENCROACH INTO THE BASEMENT AREA BY MAGNITUDES OF UP TO 105MM. IT IS IMPERATIVE THAT THE ARCHITECT, PROJECT STRUCTURAL ENGINEER AND PRINCIPAL CONTRACTOR MAKE ALLOWANCE FOR THIS.

3. THE PRINCIPAL CONTRACTOR AND ASSOCIATED SUB–CONTRACTORS MUST CARRY OUT INDEPENDENT RISK ASSESSMENTS THAT ARE APPLICABLE TO THEIR WORKS AND FULLY COMPLY WITH THE ABOVE STATED REGULATION.

4. THE PRINCIPAL CONTRACTOR AND ASSOCIATED SUB–CONTRACTORS MUST REVIEW THE SITE–SPECIFIC AND HISTORICAL BOREHOLE LOGS OF THE SITE TO HAVE ADEQUATE KNOWLEDGE OF GROUND CONDITIONS ON THE SITE, PRIOR TO COMMENCEMENT OF WORKS.

5. DURING SITE OPERATIONS, IF OBSERVED GROUND CONDITIONS DIFFER FROM THE GENERALISED STRATIGRAPHY SHOWN IN THIS SET OF DRAWINGS, DFS MUST BE INFORMED IMMEDIATELY.

6. IT IS THE RESPONSIBILITY OF THE PRINCIPAL CONTRACTOR AND ASSOCIATED SUB–CONTRACTORS TO ENSURE THAT SITE OPERATIVES ARE COMPETENT AND EXPERIENCED IN THE AREA OF WORKS TO BE UNDERTAKEN.

7. IN ADDITION TO THE RISK/HAZARD TYPICALLY ASSOCIATED WITH THE GROUND ENGINEERING WORKS DETAILED IN THIS DRAWING, ADDITIONAL SITE/WORK–SPECIFIC HAZARDS HAVE BEEN IDENTIFIED THROUGH DESIGN RISK ASSESSMENT. THESE ARE OUTLINED IN 7.1 – 7.3 BELOW. ALL SITE OPERATIONS MUST ACCOUNT FOR ALL USUAL AND SITE/WORK–SPECIFIC HAZARDS.

7.1. PILING PLATFORM LEVEL IS UNCONFIRMED AT THIS STAGE. HOWEVER, FOR DESIGN PURPOSE, THE PILING MAT LEVEL FOR THE PERIMETER PILE WALLS AND BEARING PILES IS GENERALLY TAKEN TO BE THE PROPOSED GROUND LEVEL, APPROX. +44.600M OD. NONETHELESS, THE PRINCIPAL CONTRACTOR MUST CONFIRM ACTUAL PILING PLATFORM LEVEL(S) PRIOR TO THE COMMENCEMENT OF PILING WORKS ON THE SITE, SO THAT THE PILE WALL SCHEDULE & BEARING PILE SCHEDULE MAY BE AMENDED ACCORDINGLY.

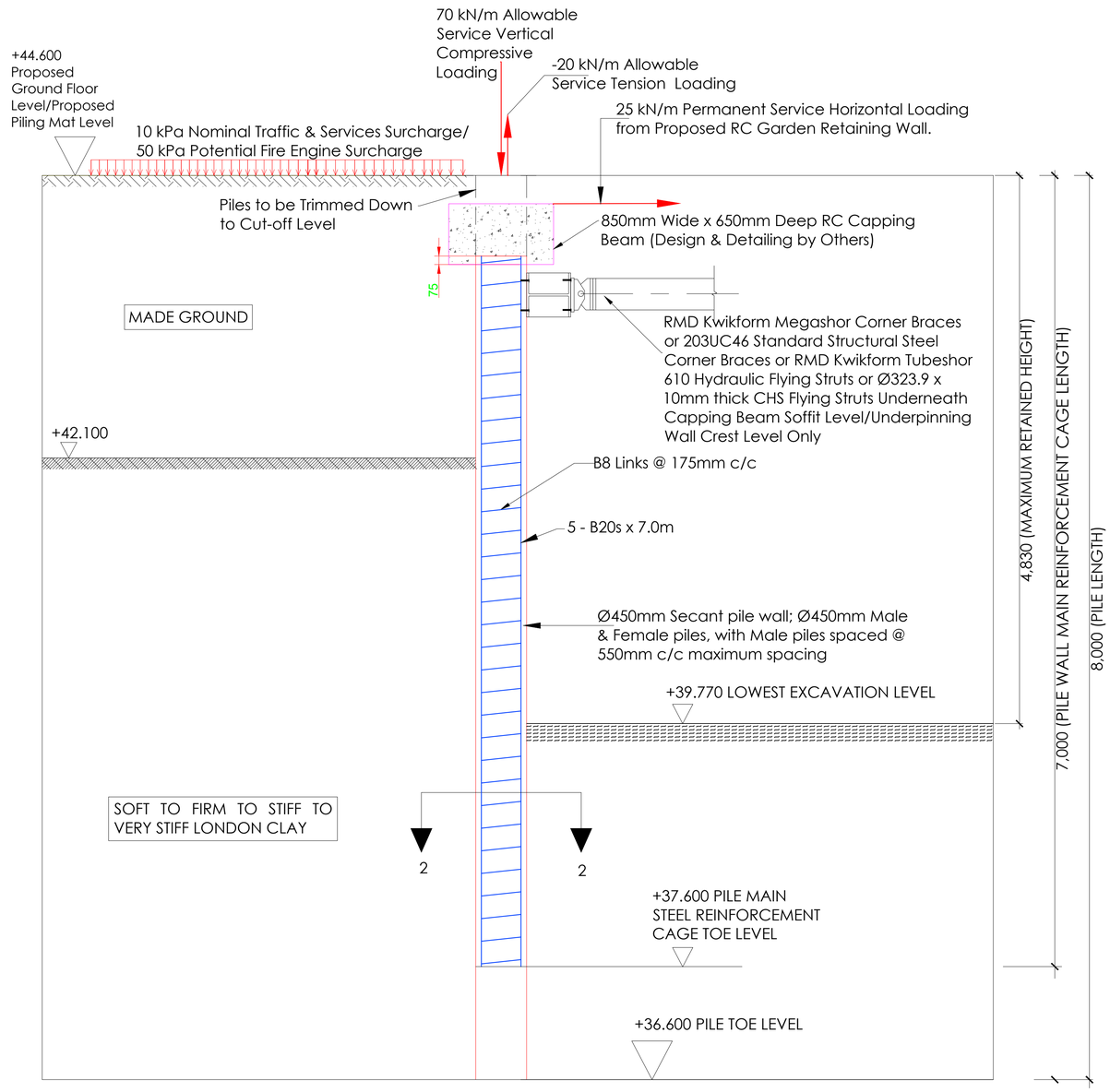
7.2. A REINFORCED CONCRETE CAPPING BEAM MUST BE CONSTRUCTED ON THE PILE WALL, WHILE TEMPORARY PROPS MUST BE INSTALLED AT LEVELS SPECIFIED BY DFS PRIOR TO THE COMMENCEMENT OF BULK EXCAVATION FOR THE NEW BASEMENT.

7.3. IN ADDITION, IT IS IMPERATIVE THAT THE CONCRETE MIX DESIGN FOR THE PILES IN THE SECANT & CONTIGUOUS WALL ACCOUNTS FOR 10MM MAXIMUM AGGREGATE SIZE AND SET–RETARDING ADMIXTURES IN ORDER TO EASE THE INSTALLATION OF REINFORCEMENT CAGES INTO CONCRETED DRILLHOLES. REINFORCEMENT CAGE VIBRATORS MAY ALSO BE REQUIRED TO FORCE THE STEEL CAGES DOWN TO THE DESIGN DEPTHS.

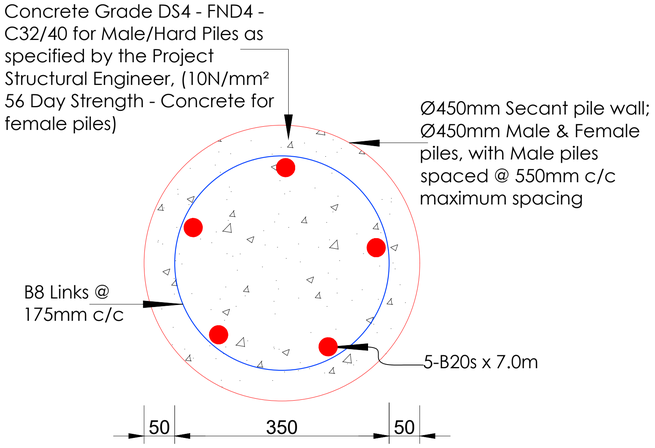
EXPECTED MAXIMUM WALL LATERAL DEFLECTION < 10mm

INSTALL FEMALE PILES TO 6.0m DEPTH ONLY

STRICT SUPERVISION OF BULK EXCAVATION BY MAIN CONTRACTOR IS REQUIRED, SO AS TO ENSURE THAT BULK EXCAVATION DOES NOT PROGRESS BELOW THE DIG DEPTH SHOWN IN THIS DRAWING



SECANT PILE WALL SECTION B-B (SCALE 1:25)



SECTION 2-2 (SCALE 1:5)

PROPOSED SEQUENCE OF CONSTRUCTION:

PILE WALL SECTION B - B (Ø450 PERIMETER SECANT PILE WALL, SINGLY PROPPED, OTHER AREAS OF PROPOSED BASEMENT.

A. INSTALL TEMPORARY GUIDE WALL PRIOR TO THE COMMENCEMENT OF SECANT PILE WALL CONSTRUCTION.
B. INSTALL Ø450 INTERLOCKING MALE AND FEMALE PILES, WITH MALE PILES SPACED @ 550mm C/C INTERVALS FROM PILING PLATFORM LEVEL (+44.600) TO DEPTHS SPECIFIED BY DFS TO FORM SECANT PILE WALL; SEE DFS' PILE WALL CONSTRUCTION SCHEDULE FOR MORE DETAILED INFORMATION.
C. BREAK DOWN PILES TO 75mm ABOVE PROPOSED SOFFIT LEVEL OF RC CAPPING BEAM.
D. CONSTRUCT RC CAPPING BEAM ON PILE WALL.
E. CARRY OUT INITIAL EXCAVATION DOWN TO A MAXIMUM DEPTH OF 1.5m.
F. INSTALL TEMPORARY PROPS AND STRUCTURAL STEEL WALING BEAM UNDERNEATH CAPPING BEAM SOFFIT LEVEL.
G. CONTINUE BULK EXCAVATION DOWN TO BASEMENT FORMATION LEVEL; +39.770.
H. PLACE BLINDING OF 50mm MINIMUM THICKNESS AT FORMATION LEVEL.
I. CONSTRUCT 950mm THICK REINFORCED CONCRETE RAFT/BASEMENT FLOOR SLAB WITH WATER-PROOF CONCRETE AND DOWEL INTO PILE RETAINING WALL.
J. COMMENCE THE CONSTRUCTION OF RC LINER WALL WITH WATER-PROOF CONCRETE, IN FRONT OF PILE RETAINING WALL, FROM BASEMENT LEVEL, UP TO WALING BEAM SOFFIT LEVEL.
K. CONSTRUCT GROUND FLOOR SLAB AND CONNECT SAME TO CAPPING BEAM.
L. REMOVE TEMPORARY PROPS AND WALING BEAM.
M. COMPLETE RC LINER WALL CONSTRUCTION AND CONNECT TO CAPPING BEAM.
N. CONSTRUCT SUPERSTRUCTURE.

IMPORTANT CONSTRUCTION NOTES

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2. ALL LEVELS ARE IN METRES UNLESS NOTED OTHERWISE.
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JOB TITLE: BROXWOOD VIEW, 29 ST. EDMUND'S TERRACE LONDON NW8 7QH

DRAWING TITLE: SECANT PILE WALL SECTION B-B

DATE	DRAWN	CHECKED
15 APR 2023	AR	AA

DRAWING No.	REV.	SCALE
DFS221011-03	05	SCALE IS AS SHOWN @ A1

DFS' Pile Wall Construction Schedule

BROXWOOD VIEW, 29 ST. EDMUND'S TERRACE LONDON NW8 7QH
450mm Dia. Secant & 600mm Dia. Contiguous Pile Retaining Walls
Wall Schedule - 450mm Dia. Secant Male & Female Piles, with Male Piles Spaced @ 550mm c/c & 600mm Dia. Contiguous Piles Spaced @ 700mm c/c
Rev 05

SHEET NO.: of
ENQUIRY NO. JOB NO.:
CREATED BY: AR CHECKED BY: AA
DATE: **15/04/2023** DATE: 15/04/23

Wall Section	Wall Type	Piling Technique	Temporary Condition	Permanent Condition	Wall Length	Asumed PPL	Lowest Excavation Level	Design Retained Level for Pile Wall	P/H	Min excavation level inc. Overdig	Retained Height	Pile Dia	Male Pile Spacing c/c	Required Male Pile Toe Level	Required Female Pile Toe Level	No. of Hard Piles Required	Bored/Concreted Male Pile Length	Bored/Concreted Female Pile Length	Estimated Maximum Pile Lateral Deflection	Anticipated Maximum Pile Lateral Deflection	Required Steel Reinforcement in Male Piles	Steel Top	Steel Reinforcement Cage Toe Level	Steel Reinforcement Cage Length
					(m run)	(mOD)	(mOD)	(mOD)		(mOD)	(m)	(mm)	(mm)	(mOD)	(mOD)		(m)	(m)	(mm)	(mm)		(mOD)	(mOD)	(m)
SECTION A - A	600mm Dia. Perimeter Contiguous Pile Wall	CFA Drilling with Heavy Duty Augers	Doubly Restrained with 2 No. Rows of Structural Steel Struts @ Just Underneath Capping Beam Level & 2.5m Depth (+42.100)	Restrained by the Basement Raft and the Ground Floor Slab	12.5	44.600	39.770	44.600	1.90	39.270	4.83	600	700	30.600	N/A	18	14.0	N/A	10	10	12 - B25 x 11m & B16 links @ 225mm c/c	44.600	33.600	11.0
SECTION B - B	450mm Dia. Perimeter Secant Pile Wall	CFA Drilling with Heavy Duty Augers	Singly Restrained with 1 No. Row of Structural Steel Struts @ Just Underneath Capping Beam Level	Restrained by the Basement Raft and the Ground Floor Slab	56.5	44.600	39.770	44.600	0.66	39.270	4.83	450	550	36.600	38.600	103	8.0	6.0	8	10	5 - B20 x 7m & B8 links @ 175mm c/c	44.600	37.600	7.0
					69.0 m run									**Total**		**18**								

18 No. 600mm Dia. Contiguous Piles
103 No. 450mm Dia. Male Secant Piles
104 No. 450mm Dia. Female Secant Piles

Design Notes:

RC Capping Beam
It is Imperative that the Project Structural Engineer Designs the RC Capping Beam on the Pile Wall to Safely Span over a Minimum Length of 8m under 160 kN/m Service Horizontal Loading Across Openings at Ground Floor Level in the Permanent Condition

Support to Vertical Axial Loading
Based on the Recommended Male/Hard Pile Lengths in the Above Table, the Pile Wall can Safely Support Service Vertical Compressive and Tension Loading of up to 500 kN/m & -20 kN/m Run of Wall Respectively, as Specified by the Project Structural Engineer.

Groundwater Cut-off
Install Female Piles to 6m Depth, as Specified in the Above Table; Minimum Embedment of 1m in the Stiff to Very Stiff London Clay Layer below Basement Formation Level is Required.

Concrete Grade DS4-FND4-C32/40 for Male/Hard Piles, as Specified by the Project Structural Engineer. For Female Piles, Provide 10 N/mm2 Concrete (56 day-strength) for Permanent Groundwater Cut-off.

50mm cover to pile reinforcement

Revision Notes: **Rev 05**

DFS' Bearing Pile Construction Schedule

Ref			
Made By	AR	Date	30/11/2022
Verified	AA	Date	30/11/2022
Page			Revision: 02

BROXWOOD VIEW, 29 ST. EDMUND'S TERRACE, LONDON NW8 7QH - 300mm Dia. Bearing Piles

Bearing Pile Schedule - No Pile Load Testing Requirements

Pile Indentification No.		No. of Piles	Shaft Diameter (mm)	Piling Technique	Piling Platform Level (m OD)	Estimated Lowest Pile Cut-Off Level (m OD)	Concreting/Steel Termination Level	Service Overturning Moment kNm	Service Horizontal Loading KN	Maximum Service Compression KN	Service Tension KN						Compression Toe Level (m OD)	Tension Toe Level (m OD)	Bore Length from PPL (m)	Main Reinforcement Cage: Concreted Length (m)	No. of Bars	Bar dia. mm	Links	Length (m)	Tension Reinforcement (CFA): Bar & No.	Length (m)
P1		1	300	CFA/SFA	44.600	TBC	44.600	19	10	250	-25							29.60	37.10	15.0	15.0	4	B25	R6 @ 120	8		
P2		1	300	CFA/SFA	44.600	TBC	44.600	19	10	250	-25							29.60	37.10	15.0	15.0	4	B25	R6 @ 120	8		
P3		1	300	CFA/SFA	44.600	TBC	44.600	19	10	250	-25							29.60	37.10	15.0	15.0	4	B25	R6 @ 120	8		
P4		1	300	CFA/SFA	44.600	TBC	44.600	19	10	250	-25							29.60	37.10	15.0	15.0	4	B25	R6 @ 120	8		
P5		1	300	CFA/SFA	44.600	TBC	44.600	19	10	100	-25							34.60	37.10	10.0	10.0	4	B25	R6 @ 120	8		
	TOTAL :	5																								

SUMMARY

No. of Piles	Pile Diameter (mm)	Max Service Compression (KN)	Lowest Toe Level (m OD)	Ave Bore Length (m)	Ave Concreted Length (m)	Main Reinforcement: No. of Bars	Dia (mm)	Type	Length (m)	Tension Reinforcement	Concrete Volume (m^3)					Bore Max Length (m)		Bore Min Length (m)
						300mm DIA. PERMANENT BEARING PILES												
5	300	+250/-25	29.600	14.0	14.0	4-B25 x 8m & R6 Links @ 120mm c/c x 5 No's					5.0					15.0		10.0

Project Structural Engineer's Drawings

GENERAL NOTES

1. This drawing is to be read in conjunction with all relevant Engineers and Architects drawings and specification that should be used to verify layout, setting out, finishes etc. Any discrepancies are to be brought to the attention of the Architect and Structural Engineer prior to construction.
2. Work to figured dimensions only. All dimensions are in millimetres unless noted otherwise.
3. Do not scale from the drawings.
4. The Contractor is to inform the Architect and Structural Engineer if the existing fabric, including foundations, is opened up and found to be inadequate, unsuitable to support the proposed works, or at variance from the details shown on the drawings.
5. The Contractor should note that he is fully responsible for undertaking surveys of the existing building to ensure existing building elements as shown on the drawings are accurate.
6. Items noted on the drawings "to be confirmed on site" are to be exposed by the Contractor for inspection by the Structural Engineer at the earliest opportunity.
7. Do not cut any holes or chases through any structural members without first obtaining the written consent of the Structural Engineer. For Contractor designed elements that require cast-in fixings R.T.A. to be informed prior to reinforcement order.
8. Refer to Architect's drawings for:
a. Site, building and setting out grids.
b. Details of all rebates, arises, chamfers, cast in fixings etc.
c. Details of all damp proofing, insulation and sealants.
d. Location and details of required surface finishes.
9. Refer to services drawings for the following information:
a. Drainage layouts and details and levels.
b. Builders work details.
c. Service pit requirements.
10. Contractor to inform R.T.A. prior to reinforcement order of any Contractor designed elements that require cast-in fixings into structure designed by R.T.A.
11. Slip membrane shall be minimum 250um polythene U.N.O.

CONCRETE

1. Concrete in contact with ground to be DS4-FND4**-C32/40 - minimum cement content of 400 kg/m³ and maximum water/cement ratio of 0.40. Else DS1-FND2-C32/40 in accordance with BS8500. Minimum cement content of 340 kg/m³ and maximum water/cement ratio of 0.50. Maximum aggregate size 20mm. Concrete to be in accordance with the National Structural Concrete Specification.
2. Materials and workmanship are to comply generally with BS 8110-1 and BS 8000-2.
3. Formed and unformed finishes: Refer to Architects specification.
4. Concrete level tolerance to be in accordance with Architects specification.
5. Concrete grade GEN.1 to be used for blinding, mass fill etc.
6. Cover to concrete in contact with the ground to be 50mm else 25mm U.N.O.
7. All reinforcement to be grade 500B or C to BS 8666:2005. Min lap length to be 40 x bar diameter.
8. All reinforced concrete and mass concrete to be cast against shuttered or concrete blinded faces. All shutters to be fully designed by Contractor. Existing walls must not be surcharged.
9. All holes in reinforced concrete are to be formed.
10. No cutting, coring or removal of placed concrete is permitted without prior agreement of Richard Tant Associates.
11. The position and details of all construction joints not shown on the drawings are to be agreed with Richard Tant Associates in good time.
12. Concrete receiving water proofing slurry to be either blast tracked or pressure washed at high pressure 230bar to remove latent defects to waterproofing designer's specification.
13. The Contractor shall provide details of all admixtures to be used in the concrete and agree their use with the Engineer before any concrete is delivered to site.
14. Concrete for padstones is to be 2:3:6 (cement : fine sand : coarse sand) nominal mix, with OPC and 10mm max aggregate.
15. Ready mixed concrete must be obtained from a plant which holds a current Certificate of Accreditation under the Quality Scheme for Ready Mixed Concrete.
16. Site-mixed concrete may be used when agreed with the Engineer. An agreed pre-batched and bagged proprietary concrete must be used unless an alternative site batched concrete has been agreed with the Engineer.
17. Do not place concrete when the ambient air temperature is less than 5°C and take all necessary measures to ensure that the temperature of the placed concrete will not fall below 5°C for the specified curing period.
18. Concrete Cubes to be tested for compressive strength for all reinforced concrete elements. 3 samples per pour or per 50m³. One 7 day test, one 28 test and one sample for future testing if required. All tests to be carried out by UKAS accredited laboratory or equivalent. Testing to BS EN 206-1, annex B and BS 8500-1, annex B.
19. The Contractor is to provide suitable curing for all concrete elements to comply with the requirements of BS 8110-1:1997, Table 6.1.
20. All holes shall be formed and all inserts cast in at the time of pouring concrete. No part of the concrete works shall be drilled or cut away without the approval of the Structural Engineer.
21. Reinforcement shall be fixed adequately using tying wire or steel clips. Concrete cover is to be as specified on the drawings. Chairs and spacers are to be provided as necessary to maintain the specified cover.
22. Unless noted otherwise on drawings, all reinforcement is to be lapped 40d (where d is diameter of the larger bar).
23. All formwork and supporting members shall be sufficiently strong to resist the pressure of the wet concrete and to ensure that the specified tolerances for the finished work are achieved. Formwork and supporting structure to be designed by the Contractor.
24. Unless otherwise specified by the Structural Engineer or Architect the formwork shall be such that the resulting concrete finish shall be Type A of Clause 6.2.7.3 of BS 8110-1:1997, i.e.: Type A finish. This finish is obtained by the use of properly designed formwork or moulds of timber, plywood, plastics, concrete or steel. Small blemishes caused by entrapped air or water may be expected, but the surface should be free from voids, honeycombing and other blemishes. Prior to casting of concrete the Contractor is to confirm finish required from the Architect in writing.
25. The minimum period before striking formwork shall be in accordance with BS 8110-1:1997 Table 6.2.
26. All reinforced concrete to be cast against shuttered or concrete blinded faces. All shutters to be fully designed by Contractor. Existing walls must not be surcharged.

REBAR ESTIMATE FOR COSTING

- Raft Slab: 130 kg/m3
- Walls: 225kg/m3
- Columns : 300 kg/m3
- Beams: 300 kg/m3
- Slab: 225 kg/m3
- Underpin: 200 kg/m3

MASONRY

1. Masonry below ground to be built in either blockwork with a min. compressive strength of 10 N/mm² and with a min. density of 1500 kg/m³ or Class 'B' Engineering bricks both to be laid in Class (i) or (ii) mortar in accordance with BS 5628.
2. All external brickwork to be in facing brick as specified by the Architect & laid in class (iii) mortar.
3. All masonry to be laid in accordance with good practice as stated in NHBC guidelines & BS 5628: Code of Practice for Masonry.
4. Timber wall plates to be strapped down using M2.5 x 30 galvanised M.S. 'L' straps at Max. 2m ctrs. Straps to be at least 1000mm long & screwed to wall with Min. 4 Number no.10 x 50mm long screws, unless noted otherwise.
5. Brick ties to be ST1 stainless steel by 'Ancon Ltd' or similar approved, unless noted otherwise.
6. All masonry units to be class FL.
7. Individual masonry units to be 20kg or less.
8. New blockwork is to be minimum strength 7.0 N/mm.
9. Brickwork and blockwork are to be laid properly bonded as agreed with the Architect and fully bonded into existing work.
10. Do not use frozen materials or lay masonry when the ambient air temperature is at or below 3°C and falling or unless it is at least 1°C and rising.
11. Cavity wall ties shall be stainless steel flat double triangle ties to BS 1243 spaced at 450crs vertically or 6 courses, 750crs horizontally staggered, and at 225crs vertically or 3 courses 150mm from all openings, corners and reveals to BS5268 unless noted otherwise. Minimum embedment to be 50mm into each masonry leaf. Contractor to adopt appropriate ties where required that do not compromise water proofing system.
12. Wall ties elsewhere are to be stainless steel flat double triangle ties, to BS 1243, as noted on the drawings. Minimum to accomodate water proofing system embedment to be 50mm into each masonry leaf. Contractor to adopt appropriate ties where required that do not compromise water proofing system.
13. Bricks and blocks shall not be stored on any floor without first obtaining consent from the Engineer. The Contractor shall ensure that the loadings imposed on the permanent works by the storage of materials do not overstress any part of the permanent works or cause excessive deflection and not to exceed 1.5kN/m².
14. In dry weather, bricks are to be soaked in water before being laid and tops of walls to be raised are to be similarly soaked before work is recommenced.
15. Brickwork and blockwork is to be carried up in a uniform manner and is to be raked back and not toothed up, no section rising more than one metre above the remainder. Brickwork built with standard 65mm bricks shall rise at the rate of four courses to 300mm. No more than sixteen courses shall be built in a day without prior permission of the Engineer.
16. Crack control brick reinforcement is to be provided over doors, over and under windows and at changes in profile (e.g. where the building steps from two storeys to one storey), as follows: 2 layers of BRC Bricktor or Brickforce inthe two bed joint immediately adjacent to the opening. To extend 600mm beyond the opening onboth sides and 600mm either side of the change in profile.
17. Vertical movement joints should be provided in masonry walls to minimise the risk of major cracking, as shown in the following table:

Material	Joint Width (mm)	Normal Spacing
Clay brick	16	12m (15m maximum)
Calcium silicate brick	10	7.5 to 9m
Concrete block and brick	10	6m
Any masonry parapet wall	10	Half the above spacing and 1.5m from corners (double the frequency)

The spacing of the first movement joint from a return should not be more than half of the above dimension.
Provide flat straight stainless steel ties within the joint at 225mm vertical centres de-bonded over one half. Joints to be filled with suitable compressible material with minimum 10mm deep weather proof sealant to the external leaf. In cavity walls, provide cavity wall ties (as clause 11), at 225mm centres vertically within 225mm of either side of the joint. Position of joints to be agreed with the Architect prior to construction.
18. Steel columns, posts and proprietary windposts to be tied to internal block leaf within cavity walls using Halfen HTS framing cramps at 225mm vertical centres, or similar approved product, fixed to steel in accordance with manufacturers specification.
19. Proprietary wall starter systems such as Furfix or similar may be used to tie new masonry extensions to existing masonry in locations where approved by the Structural Engineer.
20. Use proprietary head restraints as detailed by Halfen or Ancon to tie tops of internal block walls to the underside of floor slabs.
21. Slip membrane shall be minimum 250µm polythene U.N.O.

STEELWORK

1. The Contractor to design all steel connections from loads provided by RTA. The design, fabrication and erection of the structural steelwork is to be in accordance with the current version of BS 5950 and the latest edition of the National Structural Steelwork Specification for Building Construction, and all clauses, including appendices are deemed to be part of this specification.
2. All structural steel sections are to be Grade S355 JR to the applicable code from the following list; BS 4-1, BS EN 10210-2.
3. All bolts are to be grade 8.8 Black Bolts to BS 4190 and BS EN 20898 unless shown otherwise on the drawings.
4. All welding is to comply with BS EN 1011 Parts 1 & 2. Site welding shall not be permitted except with the written approval of the Structural Engineer. Where permitted, all site welding to be tested in accordance with the National Structural Steelwork Specification. All site weld test reports to be submitted to the Structural Engineer at least 10 working days prior to the covering of the site welded areas with permanent finishes.
5. All welds are to be full strength butt welds unless noted otherwise on the drawings. Carry out additional weld testing in accordance with the National Structural Steelwork Specification for Building Construction on any critical welds specified by the Structural Engineer.
6. The steelwork fabricator is to obtain dimensions from site. Setting out dimensions are to be obtained from the Architect's drawings. Shop fabrication drawings showing layout, connections and fixing details, are to be submitted to the Engineer for comment at least two weeks before any fabrication is carried out.
7. All painting shall be carried out in accordance with BS 5493, clauses 4.6 and 5.5 of BS 5950: Part 2 and the paint manufacturer's instructions. After preparation by blast cleaning to Sa 2½ to BS 7079: Part A1, all surfaces, which shall be dry, shall be painted with one coat of zinc phosphate primer (100 microns dry film thickness (dft) Leigh's Paints Epigrip C400V3). This coat should be applied in the works with any subsequent damage made good on site. Steelwork in cavities is to be painted, in addition, with 1 coat 125 micron dft black bituminous paint (Leigh's Paints Jetrone). A similar compatible paint specification may be substituted by the Contractor if approved by the Engineer.
8. Where indicated on the drawings the steelwork and fixings shall be hot dipped galvanised to BS 729 in order to give a uniform zinc deposit of aleast 100 microns.
9. Galvanised steelwork that is to be painted should then be treated as follows:
- De-grease with an emulsifying agent, i.e. washing-up detergent.
- Lightly abrade surface.
- Paint with one coat of etch primer (Leigh's Paints K179) brushing to 10 microns dft.
- A minimum of 4 hours later and a maximum of 48 hours later, paint with one coat of undercoat (Leigh's Paints Metagrip L654) to 50 microns dft and one finish coat (Leigh's Paints K267 M10, light grey) to 50 microns dft.
10. Where steelwork is galvanised, in order to minimise problems with Liquid Metal Assisted Cracking (LMAC), the following restrictions should be adhered to for all connections designed by the Contractor:
• Partial end plates – Avoid: use full end plates or bolted cleat connections.
• Part depth stiffeners – Avoid: use full depth stiffeners welded with intermittent fillet welds.
• Use intermittent fillet welds for attachment of brackets.
Prior to erection or application of other coatings, all galvanised structural steelwork is to be visually inspected for cracks or indications of LMAC cracking. Inspection is to be carried out by a suitably qualified person trained and competent in visual inspection for LMAC. Where suspected LMAC defects are identified inform the Engineer immediately.
11. Fire protection to all steelwork is to be to the Architect's details. Any structural steel elements to be left exposed in the permanent condition are to be protected using intumescent paint system as specified by Leigh's Paints to suit the steel section size, and level of fire protection required by the Architect.
12. Unless noted otherwise ends of all steelwork built into brickwork are to be concrete encased. Min 50mm concrete cover unless noted otherwise.
13. Unless noted otherwise, steel frames within box frames installed to form openings in existing masonry walls are to be bolted to the existing masonry using M12 resin anchors at 600mm c/c staggered vertically. Use RAWL R-KEM+ resin system or similar approved.
14. Base plates to be grouted in accordance with manufactures instructions, minimum compressive strength to be 50 N/mm², unless noted otherwise.
15. Steel beams to have a bearing of 100mm on to padstones, unless noted otherwise.
16. All structural hollow sections are produced in accordance with standard BS EN 10210:2006, hot finished S355 J2H.
17. Cold formed hollow section not to be used.
18. All steelwork built in external walls to be coated with appropriate corrosion protection coating carried out as clause 7 and to extend 300mm internally.

FOUNDATIONS

1. New foundations have either been designed using load bearing concrete piles as shown on Richard Tant Associates piling layout and loads drawing, refer to the piling performance specification on the drawing, or on the ground floor drawing or underpinning drawing.
2. If the Building Control Officer requests amendments to the foundations or if conditions differ from those noted above, the Contract Administrator and Structural Engineer are to be notified immediately. The Contractor shall not proceed without receiving instructions from the Contract Administrator.
3. Foundations are to be cast symmetrically about piers, stanchions, or walls, unless noted otherwise on the drawings.

WATERPROOFING

1. The Contractor is responsible for the design, detailing and installation of all waterproofing products including workmanship.
2. The Contractor is to design the waterproofing to the basement assuming that there will be two means of defence against ground water ingress into the basement throughout.

PILING - CAST INSITU CONCRETE PILES TO BE CFA NOT DRIVEN

1. The general design for the piles shall be in accordance with BS 8004 - the Code of Practice for Foundations.
2. No pile shall be more than 75mm off the true centre position and vertical errors shall not exceed 40mm per 3m depth of pile.
3. All pile loads given in the Pile Schedule are unfactored Safe Working Loads (SWL). A minimum factor of safety of 2.6 in compression and 3.0 in tension is required on all pile loads.
4. Integrity test using a sonic impulse method employed by N. D. Technology (023 8046 5992) to be applied to all cast-insitu concrete piles. Testing to be carried out at least seven days after casting.
5. The piles are to be cast to a minimum of 200mm above the designed cut-off level.
6. Vertical reinforcement in all piles shall project a minimum of 40 times the bar diameter above the designed cut-off level and bent over horizontally into the top of the pile caps, ground beams or structural slabs.
7. The piling designer shall carry out an asset search and confirm location of any assets within the proposed piling locations and issue to the design team prior to starting works.
8. All pile locations shall be probed and any obstructions found (except live services) shall be removed by main Contractor and voids backfilled with compacted hoggin.
9. Piles including contiguous and secant shall be designed and specified by a specialist.
10. All piles shall be bored and not driven.
11. Soils report to be carried out by piling specialist and to include for a sulphates test and to be issued to R.T.A. prior to any concrete order. Concrete to be suitabily specified for possible sulphates.
12. Positive values are compressive forces, negative values bracketed are uplift forces i.e. tension forces.
13. Refer to sulphate conditions in CGL factual report dated June 2022 and piles to be designed accordingly.

ADDITIONAL NOTES

1. Refer to Architect's details for fire protection to structural elements.
2. Contractor to ensure no loss of ground below extg foundations where new footings abut all voids to be filled solid with min C20 concrete.
3. Refer to Architect's details for: drainage details, damp course membrane details and waterproofing.
4. Contractor to take full responsibility for all temporary works including design and erection.
5. Temporary works to be checked by specialist prior to any demo works.
6. We note the following regarding ground gas. Ref. CGL letter dated 22 June 2022 the risk to future site occupiers from ground gas is considered low as the site is considered to confirm CSI and no ground gas protection measures are proposed. It is recommended the absence of gas protection measures is approved by the project warrantors and building control prior to commencing construction as additional monitoring visits may be requested.

EXCAVATION AND FILLING

1. A number of trial pits and boreholes have been excavated and records of them are available and are issued with the tender documents. Refer to Site Investigation & Basement Impact Assessment Report dated April 2015 prepared by GEA Ltd. The Contractor should make arrangements to complete any further site investigation he deems necessary.
2. Before beginning any excavation the Contractor must ensure that he has located any live services in the neighbourhood of the intended excavation.
3. No excavation within 3 metres of an existing foundation is to be taken below the level of the existing foundation unless a method statement has been agreed in writing with the Engineer.
4. The Contractor must not excavate below the level of the underside of a party wall foundation within 3 metres, or undermine the bearing of a Party Wall foundation within a 45 degree line from the edge of the base within 6 metres until all necessary Party Wall awards are in place.
5. The Engineer and Building Control Officer shall be given the opportunity of examining all excavations, filling and hard-core before they are concreted or covered up. The Contractor shall give at least 24 hours' notice of when excavations will be ready for inspection. If a good foundation bearing is not obtained at the level shown, the Engineer is to be informed.
6. Excavations shall not be left exposed longer than necessary in order to avoid deterioration from the weather or other causes, and if necessary they should be protected. In clay formations the excavations shall not be left exposed for more than 24 hours. If the formation deteriorates it shall be cleaned out and reformed to the Engineer's satisfaction before any concrete is placed.
7. The Engineer is to be informed immediately if any significant change in strata occurs at formation level.
8. Hard-core for filling shall consist of selected clean broken stone, concrete, hard sound brick, slag or other approved materials, and shall be chemically inert. The materials shall be broken down to a maximum 75mm gauge with a sufficient proportion of fines for thorough compaction. Hard-core shall be well consolidated by means of roller, vibrating plate or mechanical punner. Care shall be taken that no damage is caused to foundation walls and services.

LINTELS

1. Precast concrete lintels are to be to BS 5977-2 by Naylor Lintels Ltd, Tel. 0800 542 4192. Sizes and types as indicated on the drawings. End bearing lengths are to be at least 150mm for spans up to 1.5m, and 225mm for spans up to 2m, unless noted otherwise on the drawings.
2. Galvanized steel lintels are to be to BS 5977-2 by Caradon Catnic Ltd, Pontgwindy Industrial Estate, Caerphilly, Mid Glamorgan CF83 2WJ, Telephone 01222 337900. Sizes and types as indicated on the drawings. End bearing lengths are to be at least 150mm for spans up to 1.5m, and 225mm for spans up to 2m, unless noted otherwise on the drawings.
3. Pre-fabricated masonry lintels to BS 5977-2 to be by Bulmer Brick Cutting to be designed for the loads on RTA drawings.
4. The Contractor shall obtain the Contract Administrator's written approval, prior to commencement of the work, to the use of lintels by alternative manufacturers to those listed above.

MATERIALS AND WORKMANSHIP

1. All articles, materials and goods shall be new and of good quality, suitable for the required purpose and shall conform to the appropriate British Standard where such exists. Where references to the above are made it shall be inferred that the latest edition applies, together with subsequent amendments, unless otherwise specified.
2. The Contractor is to ensure no deleterious materials are used.

STABILITY

1. The Contractor is to accept full responsibility for the stability and structural integrity of the works during the Contract and provide temporary support as necessary. He shall also prevent overloading of any completed or partially completed elements.

DEMOLITION CONSTRAINTS

1. The nature and extent of demolition works are shown on the Architect's drawings. The Contractor is to note the engineering constraints given below and refer to the demolition schedule.

a. The Contractor shall submit and have approved a detailed method statement for the sequence of demolition and new build work before any work commences on site.
b. The Contractor is to integrate the temporary works during demolition to ensure that the stability of the existing structure is maintained at all times over the course of the works. Associated method statement and calculations to be submitted prior to work commencing on site.
c. Do not cut or break out existing foundations without the engineer's approval.

TEMPORARY WORKS

1. The Contractor is entirely responsible for maintaining the stability of all existing buildings and structures, within and adjacent to the works, and of all the works from the date for possession of the site until practical completion of the works.
2. The Contractor shall design, install and maintain all necessary temporary works and shall submit proposals for temporary supports and sequence of construction for the works, to the Structural Engineer and Contract Administrator at least 10 working days prior to starting on site. These proposals shall be supported by design calculations unless agreed otherwise by the Structural Engineer in writing.

TOLERANCES

1. All tolerances are to be agreed with the Architect, and the Contractor will be responsible for ensuring that sufficient tolerances are provided and integrated throughout all elements of the works.
2. The Contractor is to take account of tolerances detailed elsewhere on the drawings and appended Specifications when complying with the above clause.
3. Unless otherwise indicated on the drawings the setting out dimensions and levels of the finished works shall be within the maximum tolerances given below:
Maximum Tolerance
All dimensions of 3m and over: +/- 5mm
All dimensions less than 3m: +/- 3mm

UNDERPINNING

1. The Contractor shall be responsible for ensuring that his operations do not in any way impair the safety or condition of the existing structure or the adjacent properties. He shall provide any temporary supports required for this purpose, and shall carefully inspect the condition of the structure both before and during the execution of the work and immediately inform the Architect if he considers that any more stringent procedure than that specified is necessary.
2. Before starting the work the Contractor is to check for any services that could be damaged by the underpinning work and shall provide for the maintenance of drainage services during the underpinning operation and for the reinstatement of any services interrupted or disturbed by the excavations.
3. Underpinning is to be carried out in short sections not exceeding 1000mm in length, in the numbered sequence shown on the drawings unless noted otherwise.
4. Projecting portions of the existing footings are to be carefully cut off where directed and the underside of the footings are to be cleaned and hacked free of any dirt, soil or loose material before underpinning.
5. The Engineer and Building Control Officer shall be given the opportunity of examining all excavations, prior to any underpinning being carried out.
6. The body of the reinforced concrete underpinning is to be constructed in designated concrete RC40 in accordance with BS8500 and BS EN 206-1, and is to be cast to the widths and depths shown on the drawings. As far as practicable excavation and concreting of any section of underpinning shall be carried out on the same day. Un-concreted sections shall be kept covered to prevent the ingress of water. Refer to the specification above for the mix for the reinforced concrete underpins.
7. The reinforced concrete is to be stopped off approximately 100mm (unless noted otherwise) below the underside of the existing footing, and the final pinning up over the whole extent of the latter is to be carried out with a semi-dry fine concrete, well rammed in as soon as possible after the foundation has set hard. The pinning-up concrete is to consist of 1 part by volume of sulphate resistant cement to 3 parts of aggregate (well graded from 10mm maximum size down to fine sand) with a water/cement ratio by weight of 0.35 with Fosroc Cebex 100 additive.
8. Excavation to any section of underpinning shall not be commenced until at least 48 hours after completion of any adjacent section of the work.
9. The joint between adjacent sections of underpinning is to be formed by creating a rough surface against which the first section is cast. Then, having thoroughly cleaned the exposed concrete face, the adjacent section may be cast and no less than 6 B12 dowel bars used spaced uniformly resin fixed into the adjacent pin unless noted otherwise.
10. The Contractor shall prepare a Sequence of Work and submit it to the Contract Administrator for his comments prior to the commencement of the work.
11. The Contractor is to keep a record of the sequence and dimensions of the underpinning actually carried out, including details of excavation, casting concrete and pinning up for each section.
12. Refer to specific underpinning notes on the underpinning drawings and details.
13. The main contractor is to employ a specialist sub-contractor, who is a member of the 'Association of Specialist Underpinning Contractors' to carry out the underpinning work and associated temporary works.
14. The main contractor must employ a specialist engineer to determine an underpinning installation sequence, and design the required temporary works scheme for the underpinning.
15. Prior to, and during the works the appointed specialists are to fulfil their duties under Construction (Design and Management) Regulations 2015 and produce relevant method statements and guidance notes to all parties concerned with the project regarding their design portion.
16. The contractor shall provide a method statement outlining their proposed method and sequence of underpinning works.

SUGGESTED SEQUENCE FOR UNDERPINNING

1. Excavate stools type 1 (maximum stool length 1000mm) & fit sacrificial vertical props. refer to * below
2. Fit joggle joint as required to form key to adjoining stools to approval of building inspector.
3. After formation level has been approved by building inspector (& engineer if required) cast underpinning to concrete to within 75mm of soffit of extg foundation
4. Wait until concrete has sufficiently matured for a minimum of 24 hours
5. Fill 75mm (nominal) gap with cement/sharp sand (1:3) & Fosroc Cebex 100 expanding plasticising grout admixture by Fosroc, mixed hand damp & rammed in solid
6. Wait until dry pack has matured for a min of 24 hours (or 48 hours if work is to be carried out on adjoining stools)
7. Repeat 1-6 for stools type 2
8. Repeat 1-6 for stools type 3
9. Repeat 1-6 for stools type 4
10. Repeat 1-6 for stools type 5
(i.e. suggested underpinning sequence - 1,2,3,4,5)

The underpinning sequence shown above is a suggestion only & the contractor may submit alternative proposals for consideration by "Richard Tant Associates"

The contractor is to undertake all necessary precautions to safely uphold the extg structure & excavation sides at all times during the course of the works

The contractor is to ensure that ground beneath the floor slab is undisturbed & any remaining voids are filled solid with concrete

* Where underpinning in the corners and/or if labourers are working under wall sacrificial vertical props are to be used to support the above masonry

Notes.

REV.	AMENDMENTS	BY	DATE	CHECKED
K	Piling note, point 9 - contiguous piles added.	AR	23.02.2022	RT
J	Piling note, point 9 amended.	AR	20.02.2022	RT
H	As clouded.	AR	20.01.2022	RT
G	Waterproofing note amended.	AR	06.10.2022	RT
F	Concrete note - item 1 added.	AR	04.10.2022	RT
E	Notes amended. Issued for tender.	AR	07.09.2022	RT
D	Notes added / amended.	AR	11.08.2022	RT
C	Basement plan moved to drg. 5295-S02. Drawing title amended.	AR	05.08.2022	RT
B	Manhole information added. Site trial hole information added. As clouded.	AR	30.06.2022	RT
A	Plans updated to Architect's drawings. As clouded. Suggested Sequence For Underpinning added.	AR	16.06.2022	RT

DO NOT CONSTRUCT FROM THIS DRAWING T.B.C. AFTER C.L.T. LOADS CONFIRMED **APART FROM ONLY PILING AS SHOWN WITHIN DOUBLE BUBBLES.**

Construction Issue for Piling Only. Refer to Note Above.

PROJECT
Broxwood View
Barrie House

TITLE
Notes

ARCHITECTS
Carbogno Ceneda Architects

DRAWING No.
5295-S01K

DATE	22.04.2022
SCALE	As shown @ A1
DRAWN	AR
CHECKED	RT
REVIEWED	-

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Notes.

NOTES

1. This drawing is to be read in conjunction with the specification and all relevant Engineers and Architects drawings.
2. Work to figured dimensions only.
3. For general notes see drawing 5295 - S01.

Position of Thames Water underground trunk taken from Midland Survey LTD drg. U07932

Assumed position of Thames Water underground trunk

Boundary line

C/L

1250

Zone where plant is prohibited to track

450Ø secant piles to be fully designed by specialist. Set out piles to comply with geotechnical consultants requirements. Piling specialist to confirm this can be achieved

600Ø contiguous piles to be fully designed by specialist. Set out @ 700 c/c to comply with geotechnical consultants requirements. Piling specialist to confirm this can be achieved

450Ø secant piles to be fully designed by specialist. Set out piles to comply with geotechnical consultants requirements. Piling specialist to confirm this can be achieved

Prefabricated sump pit fully designed by specialist

Prefabricated manhole fully designed by specialist

400wide x 900long R.C. column

400wide x 550long R.C. column

400wide x 600long R.C. corbel column

400sq. R.C. column

400sq. R.C. column

250wide x 400long R.C. column

200thk. R.C. lining wall

200thk. R.C. lining wall

200thk. R.C. wall

200thk. x 1400long R.C. wall

200thk. x 1400long R.C. wall

200thk. x 1600long R.C. wall

400thk. x 2000long R.C. wall

R.C. wall

400thk. x 800long R.C. column

350thk. R.C. liner wall

250wide x 400long R.C. column

250wide x 600long R.C. column

300thk. R.C. lining wall

950thk. raft slab SSL= 40.770 FFL= 41.100

Min. 325 from face of existing pad

Min. 325 from face of existing pad

Min. 325 from face of existing pad

Min. 325 from face of existing pad

Min. 325 from face of existing pad

750 from face / projection of existing building

1000 from face/ projection of existing building

Existing R.C. column & pad footing

Existing R.C. column & pad footing

Existing pad footing SSL= 44.350

Existing pad footing SSL= 44.350

250thk. R.C. retaining wall

300thk. R.C. stairs

250thk. R.C. underpin or thickness of wall above, whichever is greater

250thk. R.C. wall constructed in a hit & miss sequence

Transitional stepped R.C. underpin

350thk. R.C. underpin or thickness of wall above, whichever is greater (constructed in a hit & miss sequence)

600thk. R.C. footing under raft slab

Extent of fence wall above

300thk. R.C. slab SSL= T.B.C. FFL= 43.175

Max 1m

Possible fire appliance location (for pile design)

P1 P2 P3 P4 P5

A B C D E F

For continuation refer to drg. 5295-S03

Pile Schedule	
Pile No.	Safe Working Load (kN)
P1	250
P2	250
P3	250
P4	250
P5	100

All loads are unfactored S.W.L.
All piles to have a tensile capacity of 25 kN.
Safe horizontal shear at cut off level to be 10 kN for all piles.

Piled wall to be designed for a surcharge imposed load of 10 kN/m² + fire appliance load (refer to plan) + 270 kN/m² under existing pad foundations + vertical load D.L. = 60 kN/m (450 kN/m between gridline 5 and 12 for 600ø piles) + 20 kN/m tensile load + L.L. = 10 kN/m (50 kN/m between gridline 5 and 12 for 600ø piles) + retained soil loads. All loads are characteristic safe working loads.

§ :600mm diameter piles, sleeved to a depth of 5m and installed in a hit and miss approach, noting piles installed first hit should be allowed to cure for a minimum of 24 hours to achieve strength before the remaining piles are constructed. Piles centres to be 700mm c/c in accordance with geotechnical consultants requirements . Piling specialist to confirm this can be achieved. As per recommendations from CGL, allow for a minimum concrete C30/37 is required as per the eurocode, alongside an initial moment of inertia of 0.00848m⁴/m.

:From trial hole info.

:Piles to be fully designed by specialist. Depth of piles to be confirmed by piling designer.

:R.C. underpin. For wall thickness refer to plan.

X : Suggested Sequence of Underpinning & Pouring R.C. Walls (1,2,3,4,5,6). Refer to Suggested Sequence of Underpinning, drg. 5295-S01.

:R.C. retaining wall with water resistant additive. For wall thickness refer to plan.

:350thk. mass concrete underpin or thickness of wall above, whichever is greater (constructed in a hit & miss sequence).

Secant & contiguous piles locations shown indicatively. Pile locations and loads to be determined in detailed design. Layout may change.

For piling note - refer to drg. 5295-S01.

H

Proposed Partly Basement

Scale 1 : 50

DO NOT CONSTRUCT FROM THIS DRAWING T.B.C. AFTER C.L.T. LOADS CONFIRMED **APART FROM ONLY PILING AS SHOWN WITHIN DOUBLE BUBBLES.**

Construction Issue for Piling Only. Refer to Note Above.

REV.	AMENDMENTS	BY	DATE	CHECKED
H	600Ø secant piles replaced with 600Ø contiguous piles. As clouded.	AR	23.02.2023	RT
G	450Ø & 600Ø contiguous piles replaced with 450Ø & 600Ø secant piles.	AR	20.02.2023	RT
F	Piles distance from existing pads clarified - as clouded.	AR	31.01.2023	RT
E	As clouded.	AR	20.01.2022	RT
D	Plan updated to Architect's drawings. Assumed position of Thames Water underground trunks amended. As clouded. Pile P5 added.	AR	27.09.2022	RT
C	Plan updated to Architect's drawings. Issued for tender. RC column, gridline E/12-13 - not required. Diameter of contiguous piles and walls along gridline E amended.	AR	07.09.2022	RT
B	Ground Floor plan moved to drg. 5295-S04. Drawing title amended. Plan updated to Architect's drawings.	AR	05.08.2022	RT
A	Minor amendments.	AR	30.06.2022	RT

PROJECT
Broxwood View
Barrie House

TITLE
Proposed Basement Floor
Sheet 1/2

ARCHITECTS
Carbogno Ceneda Architects

DRAWING No.
5295-S02H

DATE	22.04.2022
SCALE	As shown @ A1
DRAWN	AR
CHECKED	RT
REVIEWED	-

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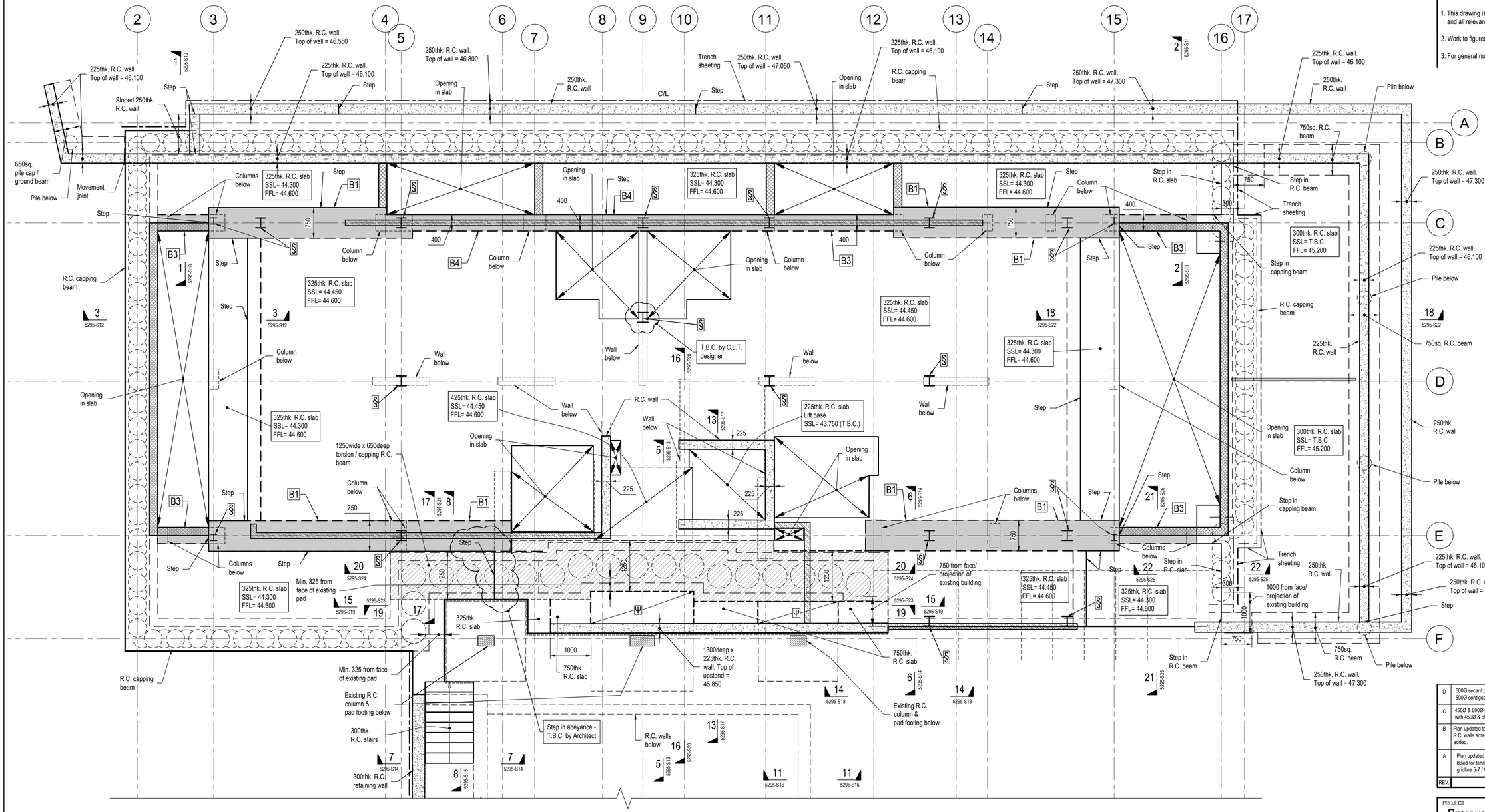

For continuation refer to drg. 5295-S05

: Vertical slip joint - 2 layers of polythene per joint.

: R.C. beams - refer to Beams Schedule.

: R.C. wall - refer to plan for wall thickness.

§ :254UC steel column - refer to B&K Structures drawing, drg. number 01812-S-SK-1010.

Ψ :150 thk. R.C. slab - refer to Section 5-5, drg. 5295-S13.

: 200thk. R.C. upstand.

: 140thk. R.C. upstand.

C.L.T. panel load bearing elements - T.B.C.
C.L.T. panel load - T.B.C.

Beams Schedule		
Beam No.	Depth (mm)	Width (mm)
B1	750	750
B2	750	400
B3	750	400
B4	750	400

Proposed Partly Ground Floor

Scale 1 : 50

DO NOT CONSTRUCT FROM THIS DRAWING T.B.C. AFTER C.L.T. LOADS CONFIRMED

Tender Issue (for QS purposes only)

Notes.

NOTES

1. This drawing is to be read in conjunction with the specification and all relevant Engineers and Architects drawings.
2. Work to figured dimensions only.
3. For general notes see drawing 5295 - S01.

REV.	AMENDMENTS	BY	DATE	CHECKED
D	600Ø secant piles (below) replaced with 600Ø contiguous piles (below).	AR	23.02.2023	RT
C	450Ø & 600Ø contiguous piles (below) replaced with 450Ø & 600Ø secant piles (below).	AR	20.02.2023	RT
B	Plan updated to Architect's drawings. External R.C. walls amended / added. R.C. upstand added.	AR	27.09.2022	RT
A	Plan updated to Architect's drawings. Issed for tender. Beams B5 & 6 not required - gridline 5-7 / C-D.	AR	07.09.2022	RT

PROJECT
Broxwood View
Barrie House

TITLE
Proposed Ground Floor
Sheet 1/2

ARCHITECTS
Carbogno Ceneda Architects

DRAWING No.
5295-S04D

DATE	03.08.2022
SCALE	As shown @ A1
DRAWN	AR
CHECKED	RT
REVIEWED	-

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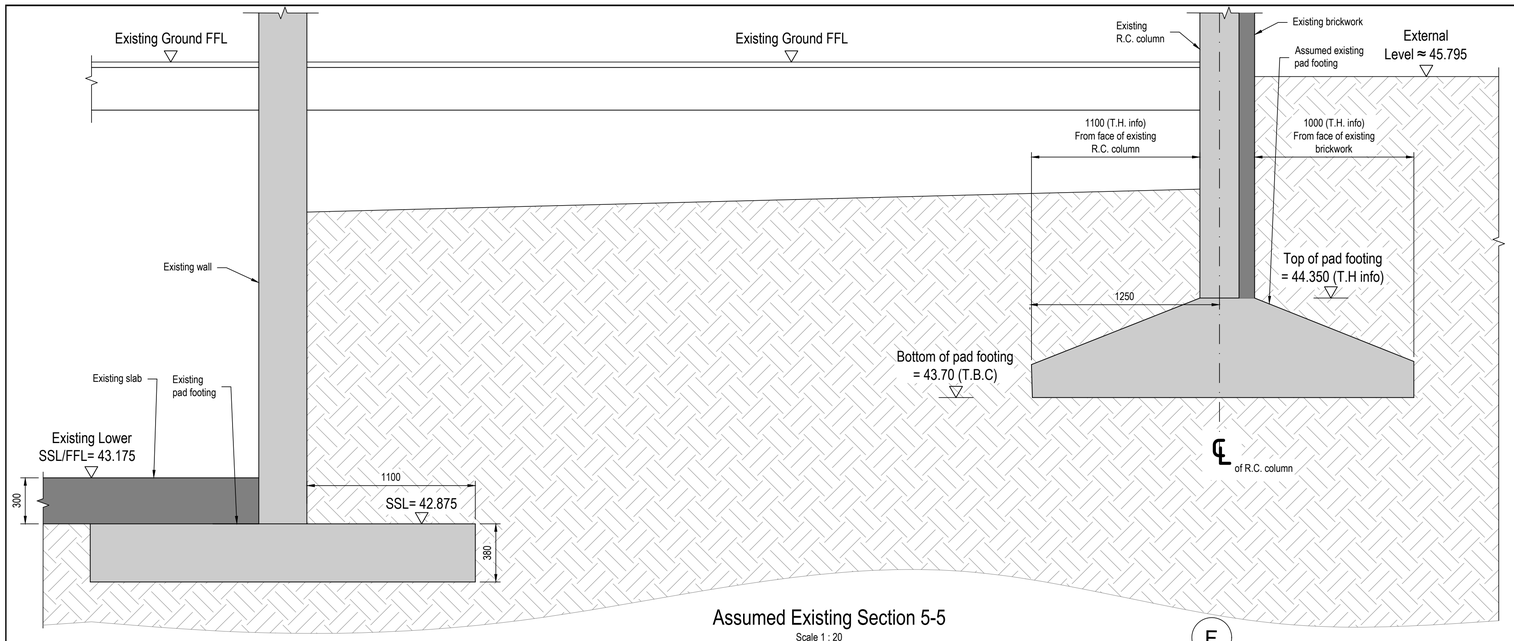
Tender Issue
(for QS purposes only)

DO NOT CONSTRUCT FROM THIS DRAWING T.B.C. AFTER C.L.T. LOADS CONFIRMED

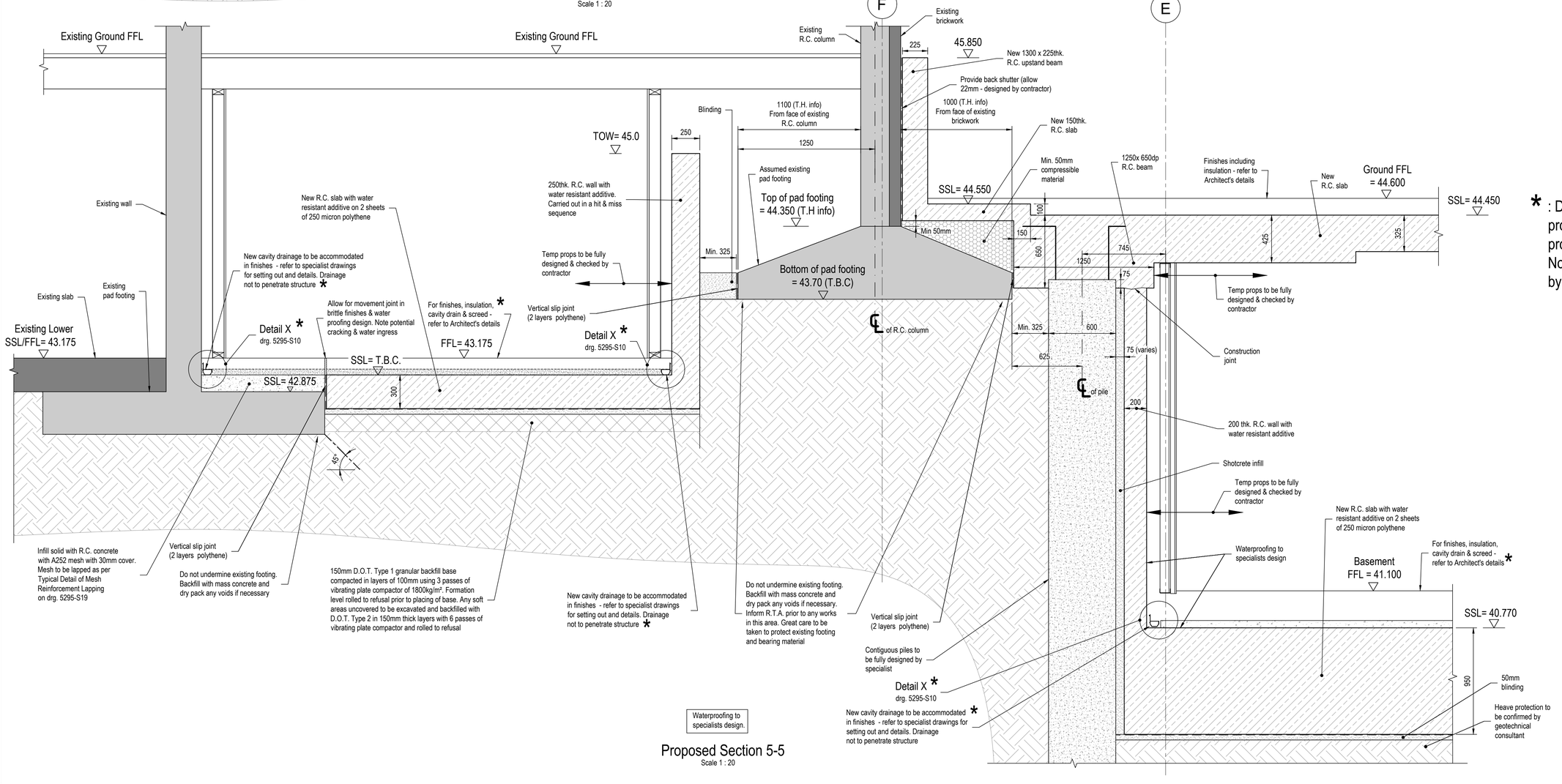
Notes.

NOTES

1. This drawing is to be read in conjunction with the specification and all relevant Engineers and Architects drawings.
2. Work to figured dimensions only.
3. For general notes see drawing 5295 - S01.



Assumed Existing Section 5-5
Scale 1 : 20



Waterproofing to specialists design.

Proposed Section 5-5
Scale 1 : 20

Heave protection to be confirmed by geotechnical consultant.

* : Details to be fully designed by water proofing specialist & refer to details proposed by water proofing specialist. No liability for water proofing is taken by R.T.A.

REV.	AMENDMENTS	BY	DATE	CHECKED
G	600Ø secant piles replaced with 600Ø contiguous piles.	AR	23.02.2023	RT
F	600Ø contiguous piles replaced with 600Ø secant piles.	AR	20.02.2023	RT
E	Section 5-5 - piles / RC wall distance from existing pads clarified.	AR	31.01.2023	RT
D	Section 5-5 - minor amendments.	AR	27.09.2022	RT
C	Issued for tender. Drawing title amended. Section 5-5 amended.	AR	07.09.2022	RT
B	Section 5-5 amended.	AR	05.08.2022	RT
A	Section 5-5 amended.	AR	30.06.2022	RT

PROJECT
Broxwood View
Barrie House

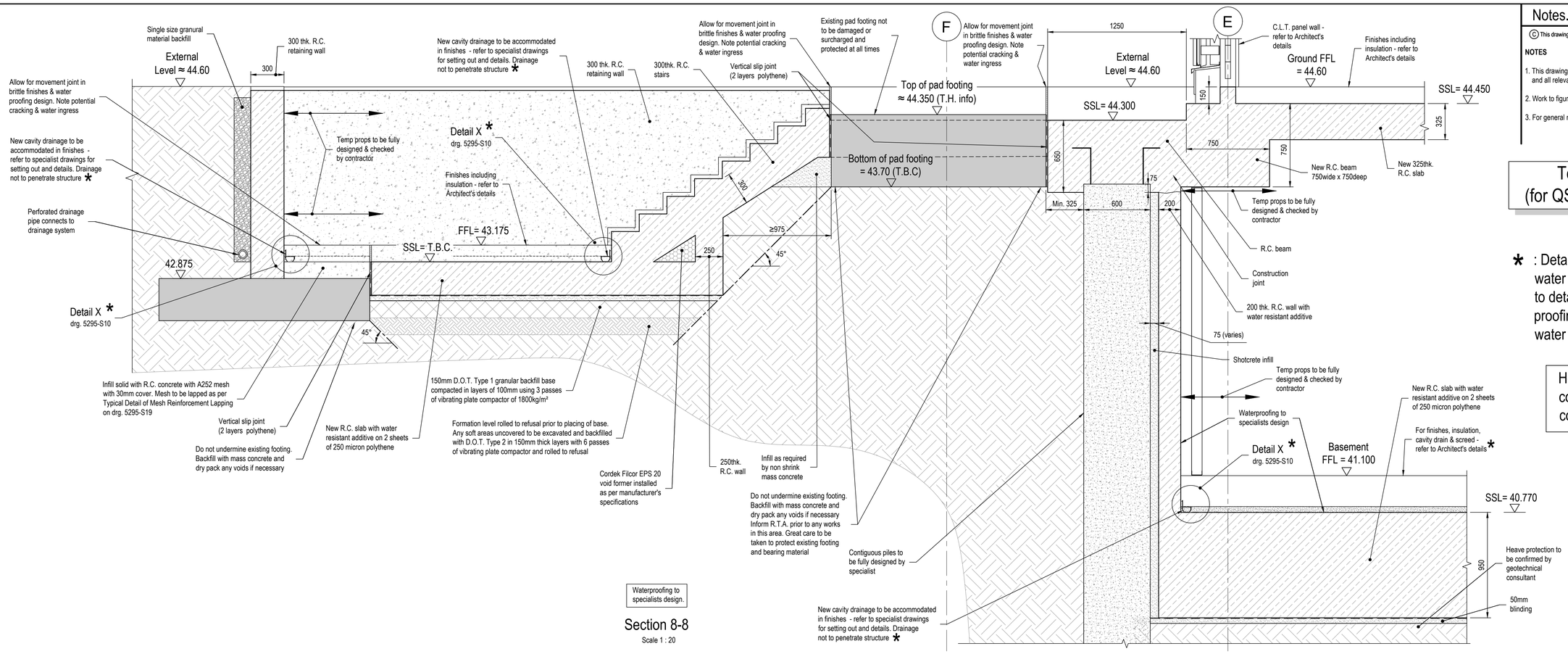
TITLE
Section 5-5

ARCHITECTS
Carbogno Ceneda Architects

DRAWING No.
5295-S13G

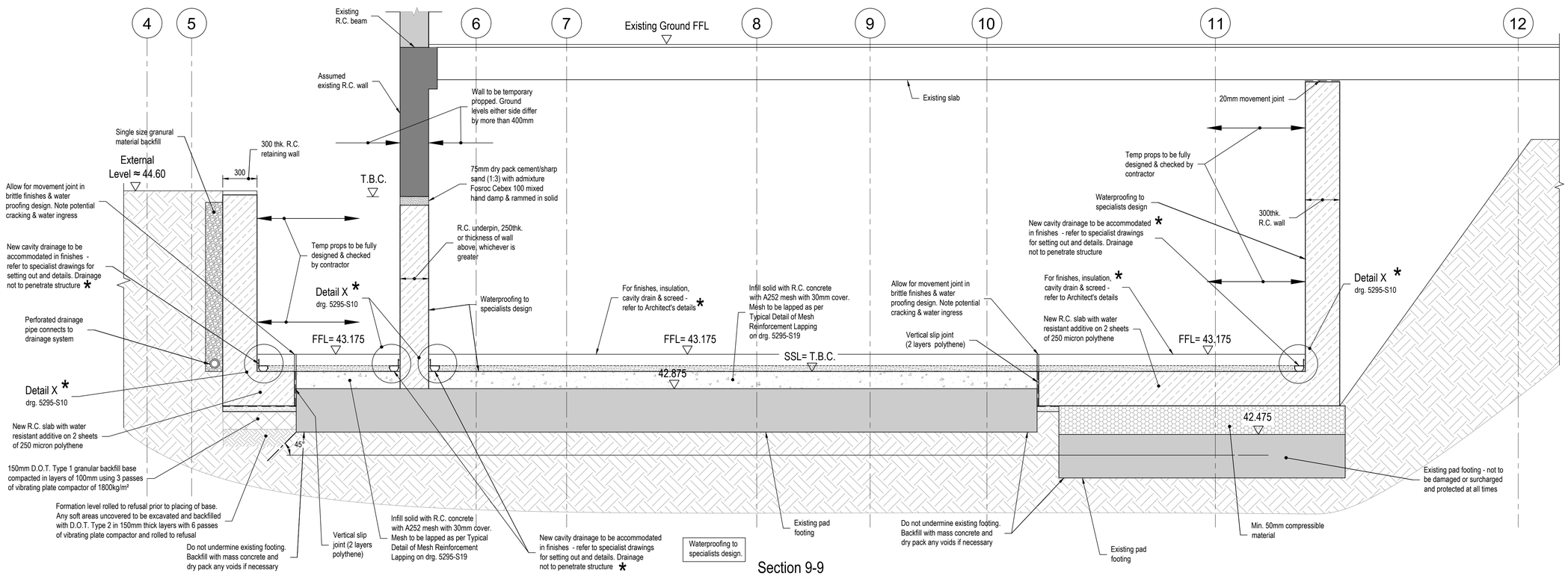
DATE	16.06.2022
SCALE	As shown @ A1
DRAWN	AR
CHECKED	RT
REVIEWED	-

Richard Tant Associates
Consulting Civil & Structural Engineers
54 LISSON STREET LONDON NW1 5DF
TEL: 020 7724 1002 FAX: 020 7224 8883
info@richardtantassociates.com



Section 8-8

Scale 1 : 20



Section 9-9

Scale 1 : 20

Notes.

NOTES

1. This drawing is to be read in conjunction with the specification and all relevant Engineers and Architects drawings.
2. Work to figured dimensions only.
3. For general notes see drawing 5295 - S01.

Tender Issue (for QS purposes only)

* : Details to be fully designed by water proofing specialist & refer to details proposed by water proofing specialist. No liability for water proofing is taken by R.T.A.

Heave protection to be confirmed by geotechnical consultant.

DO NOT CONSTRUCT FROM THIS DRAWING T.B.C. AFTER C.L.T. LOADS CONFIRMED

REV.	AMENDMENTS	BY	DATE	CHECKED
F	Section 8-8 - 600Ø secant piles replaced with 600Ø contiguous piles.	AR	23.02.2023	RT
E	Section 8-8 - 600Ø contiguous piles replaced with 600Ø secant piles.	AR	20.02.2023	RT
D	Section 8-8 - piles distance from existing pads clarified.	AR	31.01.2023	RT
C	Issued for tender. Drawing title amended. Section 8-8 amended.	AR	07.09.2022	RT
B	Section 8-8 amended.	AR	05.08.2022	RT
A	Sections 8-8 & 9-9 amended.	AR	30.06.2022	RT

PROJECT
Broxwood View
Barrie House

TITLE
Sections 8-8 & 9-9

ARCHITECTS
Carbogno Ceneda Architects

DRAWING No.
5295-S15F

DATE	16.06.2022
SCALE	As shown @ A1
DRAWN	AR
CHECKED	RT
REVIEWED	-

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