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Foundation Design Peer Review

Darwin Green, BDW1

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Project Name: Darwin Green BDW1 – Foundation Design Peer Review

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P01	First Issue.	M Harber	I Rollinson	June 2023
P02	Updated to include NHBC Inspection Review	M Harber / I Rollinson	I Rollinson	June 2023

Contents

Introduction

Simpson TWS have been instructed by Barratt David Wilson Cambridgeshire (BDW) to review foundation design carried out for the BDW1 phase of the Darwin Green development in Cambridge.

The development comprises of residential housing and low-rise apartments. We understand this phase of the development was completed in June 2021.

The review is limited to observations on the foundation strategy including an assessment of foundation depths. No review of superstructure design and foundation widths has been undertaken.

Simpson TWS have also been instructed to review the differences between the foundation and ground floor details for BDW1 and BDW2 due to significant issues that have arisen within the BDW2 substructure. This review is limited to an initial comparison of the details only and does not constitute a detailed assessment of foundation depths for the BDW2 phase of works.

Information used for the foundation review.

The following information has been provided by BDW and has been used for the review –

1. GRM Development Solutions, Site Inspection Report – Beagle Road – Darwin Green Estate, Cambridge, P10083_SiteIns_1, 4th August 2022
2. RSK, 25459-01 (00), NIAB1 Phase 1, Report for Main Site Investigation, 25 October 2012
3. Rolton Group Supplementary Report, Additional Investigation for Apartment Block at Darwin Green, 16-0045 XL002, 4th January 2018
4. Rolton Group, Phase 1 Foundation Layout, BHDG-RGL-00-FN-DR-S-120-001-A Revision C02,
5. Rolton Group, Phase 2 Foundation Layout, BHDG-RGL-00-FN-DR-S-120-003 Revision P2,
6. Rolton Group, Foundation: General Arrangement Block A&B BHDG-RGL-AB-PL-DR_S-121-001-A Revision C04,
7. Rolton Group, Foundation: General Arrangement Block C, BHDG-RGL-C-PL-DR_S-121-001-A Revision C03,
8. Rolton Group, Foundation: General Arrangement Block D, BHDG-RGL-D-PL-DR_S-121-001-A Revision C03,
9. Rolton Group, Foundation: General Arrangement Block E&F, BHDG-RGL-EF-PL-DR_S-121-001-A Revision C03
10. Rolton Group, Foundation: General Arrangement Block G, BHDG-RGL-G-PL-DR_S-121-001-A Revision C03,
11. Rolton Group, Foundation: General Arrangement Block H, J&K, BHDG-RGL-HJK-PL-DR_S-121-001-A Revision C2,
12. Rolton Group, Foundation Details, BHDG-RGL-00-FN-DR-S-420-001 Revision C1,
13. The Landscape Agency, Detailed Planting Plans, 628.17-200 - 205 Revision A, and 250 – 255.
14. NHBC Schedule of RI’s and Inspections Spreadsheet

Ground Conditions

RSK, 25459-01 (00), NIAB1 Phase 1, Report for Main Site Investigation, 25 October 2012

The original ground investigation report prepared by RSK records the that the site is underlain with a variable thickness of topsoil overlying River Terrace Deposits, over Gault Clay

Review of the ground investigation suggests that competent natural soils are at a depth where trench fill foundations would be suitable and economical for the development. The river terrace deposits, and Gault clay are defined as shrinkable clays of medium and high-volume change potential respectively. To mitigate against the risks of ground movement, foundations should be designed in accordance with Chapter 4 of the NHBC Standards including provision of suitable heave protection measures. Deepening of foundations would be required to allow for existing and proposed trees/planting.

The ground investigation recommends a minimum foundation depth of 900mm.

No desiccation was reported in the ground investigation report.

Rolton Group Additional Investigation for Apartment Block at Darwin Green, 16-0045 XL002, 4th January 2018

The Rolton ground investigation report was produced in 2018 to provide further ground investigation for the area of proposed 4 storey apartment blocks.

The Rolton report appears to concur with the RSK report with regard to ground conditions and bearing capacity and concludes that an adequate bearing capacity can be achieved for houses and apartments across the phase.

GRM Development Solutions, Site Inspection Report – Beagle Road – Darwin Green Estate, Cambridge, P10083_SiteIns_1, 4th August 2022

An investigation was undertaken by GRM in July 2022 to inspect and report on cracking in the garden (lawn/topsoil) and minor movements of paving slabs. This was attributed to the high-volume change soils and adjacent hedges, including Hawthorne. No movement or damage was reported to the adjacent houses/garages.

Foundation Review (BDW1)

Foundation details for houses and garages for phase BDW1 have been provided on Rolton Group foundation layouts, BHDG-RGL-00-FN-DR-S-120-001-A Revision C02 and BHDG-RGL-00-FN-DR-S-120-003 Revision P2.

Foundation details for the apartments have been provided on Rolton Group drawings 6. Rolton Group, BHDG-RGL-AB-PL-DR_S-121-001-A Revision C04, BHDG-RGL-C-PL-DR_S-121-001-A Revision C03, BHDG-RGL-D-PL-DR_S-121-001-A Revision C03, BHDG-RGL-EF-PL-DR_S-121-001-A Revision C03 BHDG-RGL-G-PL-DR_S-121-001-A Revision C03, BHDG-RGL-HJK-PL-DR_S-121-001-A Revision C2.

The foundation layout drawings show foundation widths, foundation depths, locations of steps in formation and any requirement for heave protection measures (Claymaster/Heaveguard).

The minimum foundation depth adopted appears to be in excess of the minimum depth recommended by RSK and in accordance with NHBC guidance.

The foundation layouts show tree influence lines for both existing and proposed trees/planting. The dimensional spacing of the zones of influence are appropriate for the tree species involved and volume change potential of the soils.

The existing tree species to the southern boundary of the eastern parcel of the phase could not be verified from the information provided.

A review of foundation depths where units extend into the zones of tree influence was undertaken and depths were found to be appropriate.

Suitable heave protection measures have been defined on the drawings where plots extend into the zone of influence of existing trees.

Included within the pack of information provided for review is Detailed Planting Plans (sheets 01-06) produced by The Landscape Agency. The arrangement of the proposed trees does not accord with the Rolton group foundation plans and has therefore not been reviewed as part of this assessment.

The NHBC Standards, Chapter 4.2 provides guidance on the provision of heave protection to foundations in shrinkable soils. The guidance requires heave protection to be provided to foundations deeper than 1.5m, unless the NHBC is satisfied the soils are not desiccated.

The Rolton Group foundation plans show heave protection (Claymaster) to foundations within the zone of existing tree influence, where foundations are greater than 1.5m deep. This complies with the NHBC guidance.

A typical foundation section for foundations with heave protection measures has been provided on Rolton Group drawing BHDG-RGL-00-FN-DR-S-420-001 Revision C1 (Foundation Details) and was found to be in accordance with NHBC guidance.

Ground floor slabs are shown as suspended precast beam and block on the Roltons foundation plans and details. A 300mm sub floor void has been specified below the floor which is in accordance with NHBC guidance to mitigate against the effects of potential clay heave.

NHBC Inspections

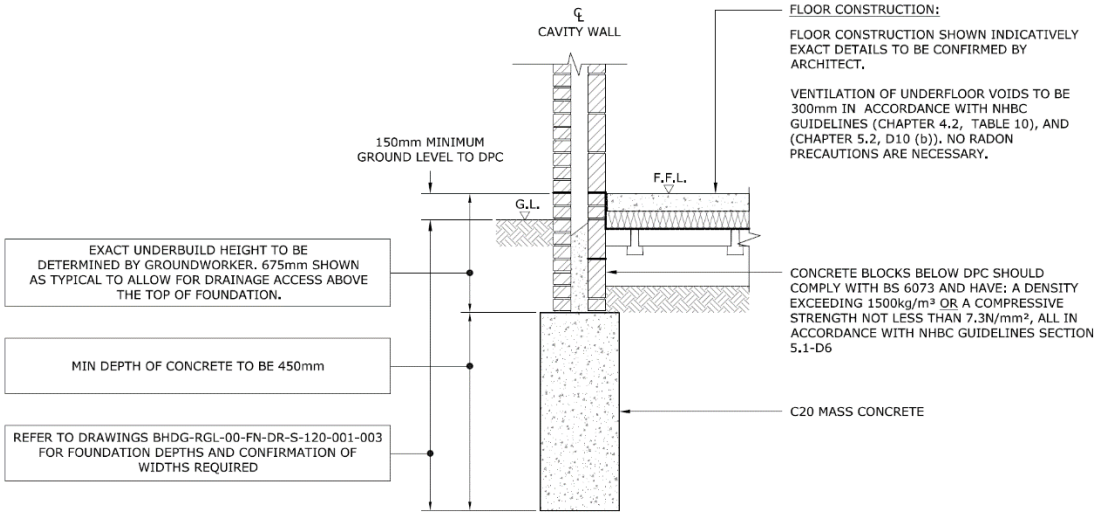
Inspection logs from the NHBC show that all plots for BDW1 were regularly inspected on site between May 2018 and June 2021 and, as is standard, would have included review of formation levels against the foundation design information prior to placing of concrete.

On the basis the NHBC signed off the design and provided the associated Building Warranty, this would strongly indicate that all as-built foundation depths coincided with the Rolton Group drawings and thus were appropriate for the soil conditions encountered.

BDW2 Comparison

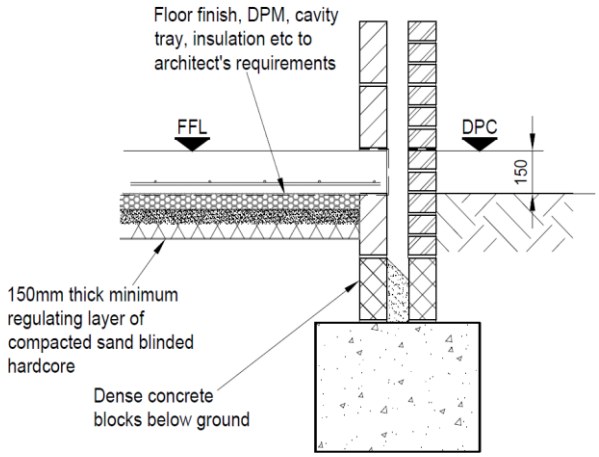
The BDW2 phase of the Darwin Green development is adjacent to BDW1 and as such the ground conditions are relatively similar, with medium to high volume change potential clays located at shallow depths.

The substructure design of BDW1 was carried out by Rolton Group which adopted a suspended precast beam and block ground floor system as described above and shown in Figure 1 below.



TYPICAL FOUNDATION SECTION

The substructure design of BDW2 was carried out by Ecotech Engineers Ltd which adopted an in-situ "suspended" concrete slabs which are cast on insulation and compacted hardcore as shown in Figure 2 below.



Typical Perimeter Section
1:20

The adopted detail for BDW1 minimises the risk of the underlying clays from heaving as the ground is free to swell within the substructure void provided.

The insitu slab detail for BDW2 has very little capacity to resist these potential forces without the provision of a void former, and as such this could cause movement and damage to the slab if the soils below the compacted hardcore are subject to heave.

Conclusions

Review of the drawing information received for the BDW1 development site indicates that the foundation strategy, depths and heave protection measures are appropriate based on the ground conditions recorded in the ground investigation reports and comply with the guidance provided in the NHBC Standards Chapter 4.2.

The adoption of a fully suspended floor system with 300mm sub floor void is considered appropriate to minimise the risk of potential heave of the underlying clay soils.

NHBC inspection logs indicate that regular on-site review of formation depths was undertaken to all plots on BDW1 to ensure foundations were installed in accordance with the Rolton Group design and drawings.

We have received a copy of the Peer Review undertaken by Cundall ref. BDW1-CDL-ZZ-XX-RP-GE-60200 dated 15 June 2023 and our above assessment concurs with the conclusions made within the Cundall Report.

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