5 Substructure

Foundations

Following on from the ground investigation and the structural framing of the building, a piled foundation solution has been developed. A raft foundation was investigated but the different loads across the footprint of the building combined with the differential heave pressures created a high risk of differential movement that does not exist with a piled foundation.

Columns loads are between 4000kN and 8500kN and as such a combination of 600m diameter and 750mm diameter piles are proposed. The shear and retaining walls will also have tension loads which will need to be supported by the piles. The adjacent LINAC building is founded on piles as is the current car park and RFT Podium structure. The Contractor is to agree an acceptable factor of safety for the pile design with the Building Control Officer. It is anticipated that tension reinforcement will be required in some locations.

Design Status: The design and setting out of the piles will need to account for the existing piles below the car park structure. The contractor will need to survey existing pile locations once the car park has been demolished and may have to undertake design changes to suit the location of these and other below ground obstructions, for both the substructure design and the design of the below ground utilities. At this stage, due to limited information about the existing pile capacity and the pile locations, no account has been made to reuse these piles. The contractor may wish to consider this as the design develops, although appropriate warranties will have to be in place for the RFT. The pile caps have been approximately sized to allow for pricing, the final detailed design will be carried out by the contractor's engineer based on the loads capacities issued by the piling subcontractor.

Perimeter Retaining Walls

The retaining walls to the perimeter of the site will predominantly be constructed using in-situ concrete within the area created by the temporary works strategy. The walls from L00 to L01 have been designed as un-propped cantilevers for the initial stage and then as a propped cantilever for the permanent case. The walls above L01 to L02 are designed as propped cantilevers with lateral loads supported by the shear walls and adjacent retaining walls. The contractor's retaining wall design and temporary works strategy to account for the following:

- Groundwater hydrostatic pressures – refer to the geotechnical report
- Adjacency of tree roots
- Mitigating impact on adjacent buildings

Level L00 Slab

Ground level slab L00 to account for the following:

- 450mm thick slab on a 1200 gauge DPM (insulation by Architect)
- Heave from the clay below the excavated section of the building footprint.
- Groundwater hydrostatic pressures.
- Trenches and recesses for plant rooms and services.
- Plant room loading – including water storage tanks.

Design Status: Noting the loads from above, the pressures expected from the ground water and heave pressures are based on various scenarios that need to be considered with reference to the Site Investigation. Initial calculations for the heave suggest parts of the slab could be subjected to uplift pressures in the order of 65-70kPa, while the remaining areas would give around 45-50kPa soil heave pressure plus around 40kPa water pressure. The contractor will undertake a detailed study to assess all the uplift forces that the slab will need to support, along with the relevant tension loads into the piled foundation.

Below Ground Waterproofing

The building shall be designed in accordance with BS 8102:2009. All areas including laboratory, office, stairs and cores and basement plant rooms must achieve minimum Grade 3 water-resistance. No water penetration is acceptable. To achieve this grading, a secondary waterproofing system, such as an internal drained cavity system could be used to achieve the required basement grade.