Waterman Moylan
Engineering Consultants

Planning Stage Structural Report

Mixed-use Development at Mooretown Phase 3, Swords, Co. Dublin

April 2022

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This document has been prepared and checked in accordance with
Waterman Group's IMS (BS EN ISO 9001: 2015 and BS EN ISO 14001: 2015)

Issue	Date	Prepared by	Checked by	Approved by
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Comments

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Contents

1. Introduction

1.1 Scope

Waterman Moylan has been appointed by Gerard Gannon Properties to provide Structural Consultancy Services for the proposed residential development at Phase 3, Mooretown, Co. Dublin and to develop the scheme to Planning Stage.

The subject site will consist of construction of a residential development of 650 no. units, including 265 No. houses, 119 No. Duplex/Triplex units and 266 No. apartments. A creche and commercial spaces in some of the blocks also forms part of the development.

- Apartment Block A containing 40 no. apartments measuring five storeys in height (including podium and undercroft parking).
- Apartment Block B containing 70 no. apartments measuring five storeys in height (including podium and undercroft parking).
- Apartment Block C containing 8 no. apartments measuring four storeys in height.
- Apartment Block D containing 8 no. apartments measuring four storeys in height.
- Apartment Block E containing 46 no. apartments measuring five storeys in height.
- Apartment Block F containing 21 no. apartments measuring four storeys in height.
- Duplex Blocks A-V, totalling 119 No. units.

The main structural issues covered are as follows:-

- Develop an understanding of site constraints.
- Form of the new structures.
- Advise structural dimensions.
- Review of construction methodology in relation to the site constraints

2. Site Constraints

The site is bounded by agricultural lands to the east, west and partially to the south. On the southern boundary is the Abbeyvale residential development. To the north is the completed Mooretown School Campus and future Mooretown Phase 2. The site location is included in Figure 1 below.

Figure 1 | *Site Location (Source: Google Maps)*

The subject site is a greenfield site approximately 16.52 Ha in area. A topographic survey of the area generally shows a slope from southwest to northeast. The high point is approximately 58.00m OD. The low point is approximately 37.00m OD.

2.1 Site Access

The site will be primarily accessed by via entrances from the Mooretown Distributor Road Extension and from the Mooretown School Access Road.

2.2 Traffic Management

Construction timings and methods, protection and potential temporary detours for both pedestrians and vehicles shall be studied prior to the commencement of construction activities. The Contractor shall agree and submit proposals to Fingal County Council for approval.

2.3 Adjacent residential properties

Dilapidation surveys will need to be undertaken to adjacent properties in addition to monitoring of noise and vibration during demolition and construction.

2.4 Site Gradient

Some areas of the site will be raised will be achieved with imported fill material or excavated material from the site (assuming it is suitable for re-use as fill). The raising of site levels has been considered in the structural substructure design.

3. Structural Concept

The structural scheme has been developed following review of the architectural planning drawings and analysis of floor spans and structural zones.

The structural concept varies between the different building typologies proposed for the development. Below is a table summarising the structures across the development.

Building	Code	Description
Apt Block A 40 Units	BLKA	Five storey apartment block with podium.
Apt Block B 70 Units	BLKB	Five storey apartment block with podium.
Apt Blocks C & D 8 Units	BLKC & BLKD	Four storey apartment blocks.
Apt Block E 46 Units	BLKE	Five storey apartment block.
Apt Block F 21 Units	BLKF	Four storey apartment block.
Duplex Blocks A-V 119 Units	DUPA-DUPV	Duplex Units
Houses 265 Units	HSE	Detached, semi-detached, terraced units.

Table 1 | *Proposed buildings*

3.1 Substructures

From an analysis of the anticipated building loads and the soil conditions described in the preliminary site investigation report, and in consideration of the cut and fill works required on the site, the proposed buildings have been divided into two different substructure typologies.

Building	Description	Substructure Typology	Description
Apt Block A 40 Units	Five storey apartment block with podium.	Type 1	Pilecaps, piles and ground beams under load-bearing walls and columns.
Apt Block B 70 Units	Five storey apartment block with podium.	Type 1	Pilecaps, piles and ground beams under load-bearing walls and columns.

Apt Block C & D 8 Units	Four storey apartment block.	Type 1	Pilecaps, piles and ground beams under load-bearing walls and columns.
Apt Block E 46 Units	Five storey apartment block.	Type 1	Pilecaps, piles and ground beams under load-bearing walls and columns.
Apt Block F 21 Units	Four storey apartment block.	Type 1	Pilecaps, piles and ground beams under load-bearing walls and columns.
Duplex Blocks A-V 119 Units	Duplex Units	Type 1 & Type 2	Pilecaps, piles and ground beams under load-bearing walls and columns. Reinforced Concrete Strip Footings under load bearing walls.
Houses 265 Units	Detached, semi-detached, terraced units.	Type 2	Reinforced Concrete Strip Footings under load bearing walls.

Table 2 | *Proposed Substructures*

3.1.1 Foundations for typology 1

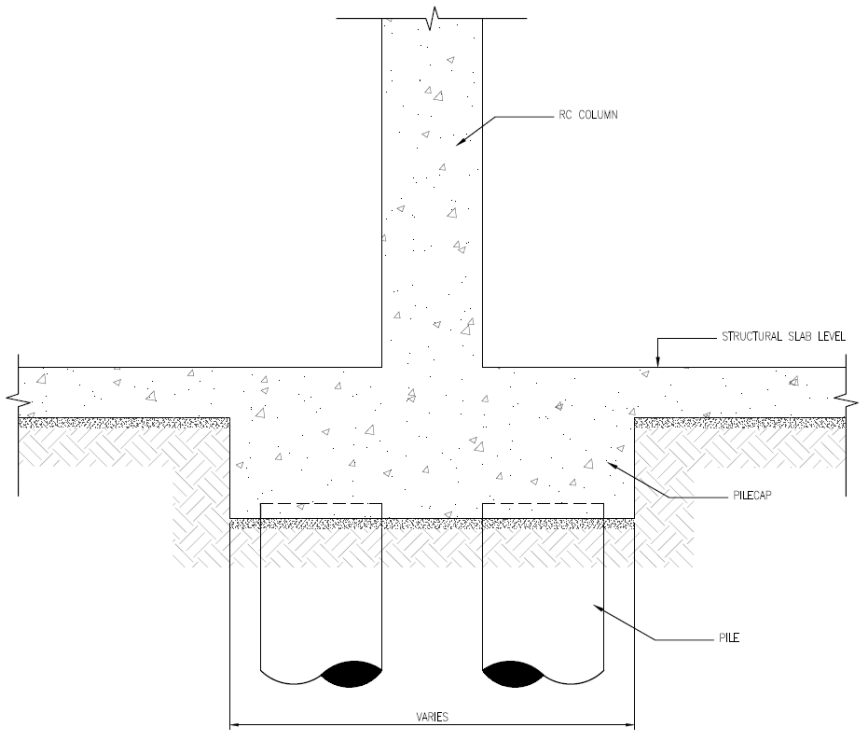
The soil conditions and anticipated building loads would require piled foundations. The proposed piles are to be conventional continuous flight auger (CFA) or rotary bored piles of 600-750mm diameter, subject to a site investigation, and will be designed to resist the vertical and horizontal loads from the structure above.

Rectangular reinforced concrete beams (Ground Beams) will span between pilecaps to support load bearing walls.

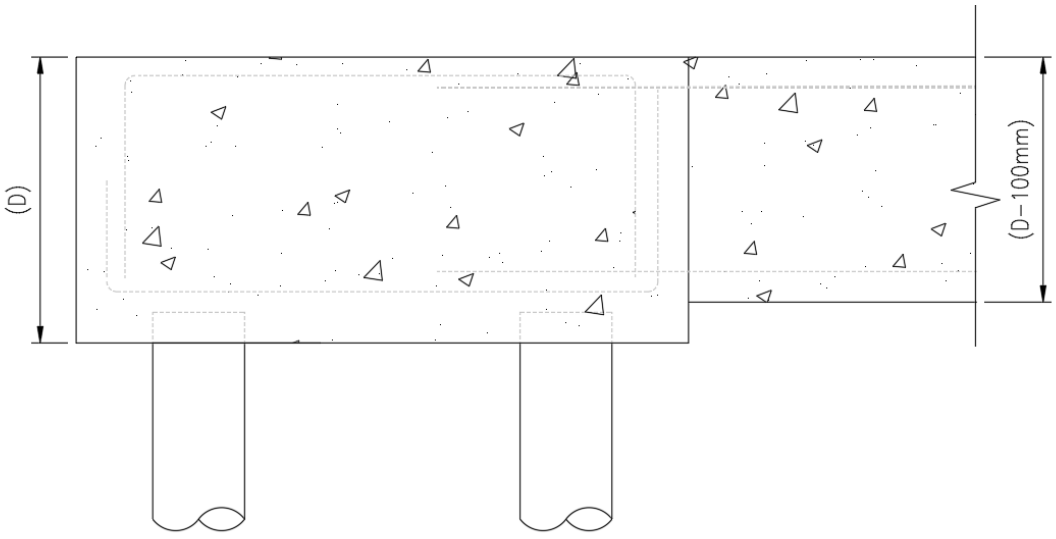
Pile caps will be reinforced concrete cast in-situ elements designed to spread the building loads into the piles. The pile caps are typically 1000 to 1800m deep for 600-750mm diameter piles

- Typical Pile Cap dimension*: 3000x3000x1800mm deep square pilecap under columns.
- Typical Ground Beam dimension**: 700x900mm deep spanning between pilecaps.

***Note**: Dimensions shown above are typical of what will be required but may be subject to change when more detailed Ground Investigation information or other information on site conditions becomes available.



Typical Foundation Type 1

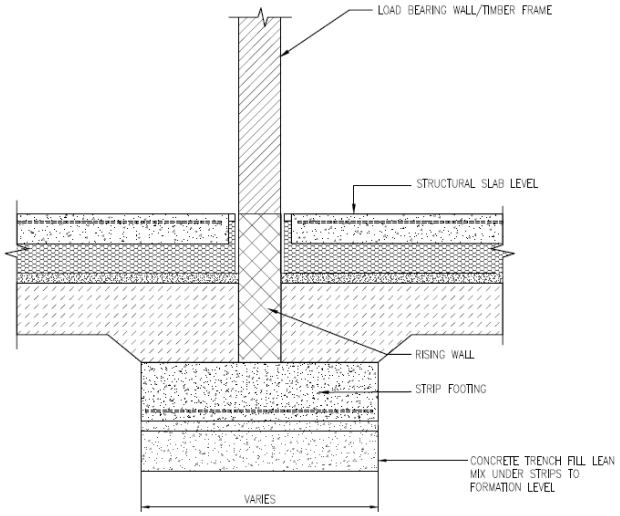


Typical Pilecap-Groud Beam Interface

3.1.2 Foundations for typology 2

From the anticipated soil conditions, it is expected that the structure will be supported on shallow foundations. This will comprise in reinforced concrete strip footings on mass concrete (leanmix) extending to the stiffer ground layers where necessary.

The ground floor slabs are 150mm thick reinforced concrete and ground bearing. The slabs are formed on 50mm T3 Blinding with minimum 225mm T2 hardcore to SR:21 requirements.



Typical Foundation Type 2

- Duplex Blocks A-V
    - Typical Strip Footings: 900 to 1800mm wide by 300mm deep*****.
- Housing
    - Typical Strip Footings: 900 to 1200mm wide by 300mm deep*.

***Note**: Dimensions shown above are typical of what will be requires but may be subject to change when more detailed Ground Investigation information or other information on site conditions becomes available.

3.2 Superstructures

A material options study for the super-structure was undertaken for all the proposed building typologies and can be summarised as follows.

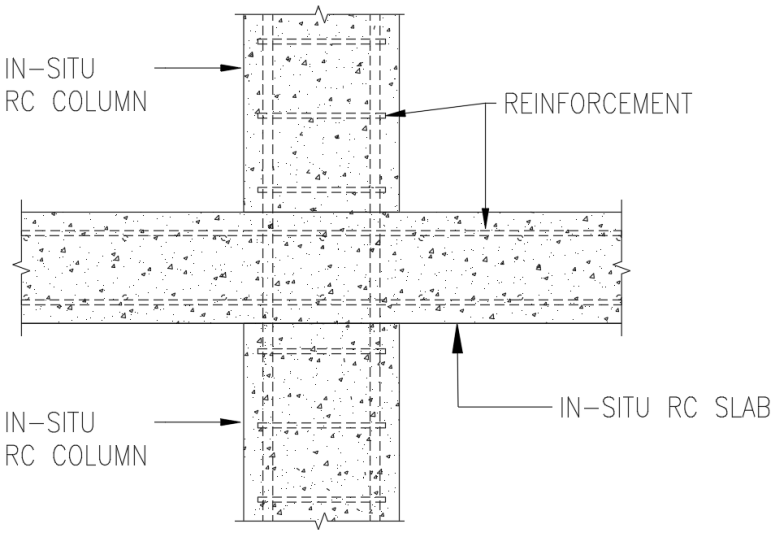
Duplex Blocks A-V					
	Framing Layout	Speed-of-Construction	Fire Resistance	Acoustic Performance	Vibration Performance
Masonry Walls & Precast Concrete	Average	Average	Good	Good-Average	Good
Timber Frame	Good	Good	Average	Average	Average
Masonry Walls & Timber Floors	Good	Average	Average	Average	Average
Light Gauge Steel (LGS Frame)	Good	Good	Good	Average	Average

For the duplex apartment blocks, it is proposed to use a masonry and precast system.

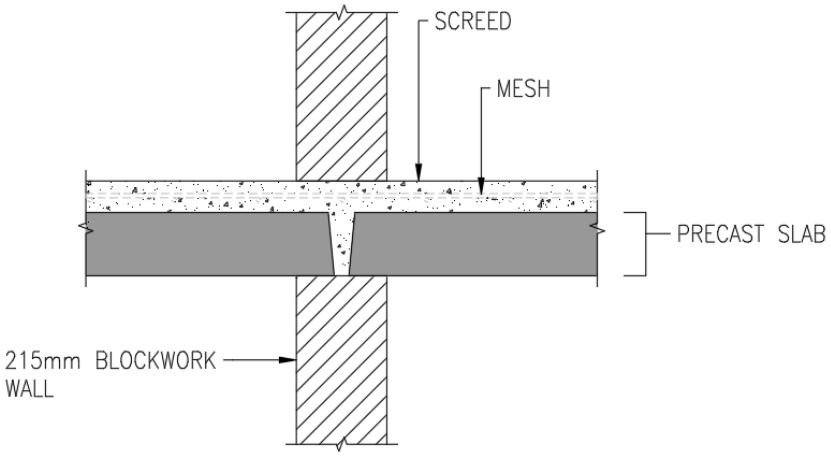
Apt Block A, B, C, D, E, F					
	Framing Layout	Speed-of-Construction	Fire Resistance	Acoustic Performance	Vibration Performance
Hybrid Precast Hollowcore & Crosswalls	Good	Good	Good	Good-Average	Good
In-situ Concrete Frame	Good	Poor	Good	Good	Good
Steel Frame & Precast Concrete	Good	Good	Average	Good-Average	Average
Masonry Walls & Precast Concrete	Poor	Poor	Good	Good-Average	Good

Apartment Blocks A, B, C, D, E, F: The proposed structure is to be a masonry and precast concrete structure with in-situ reinforced concrete transfer elements over undercroft parking.

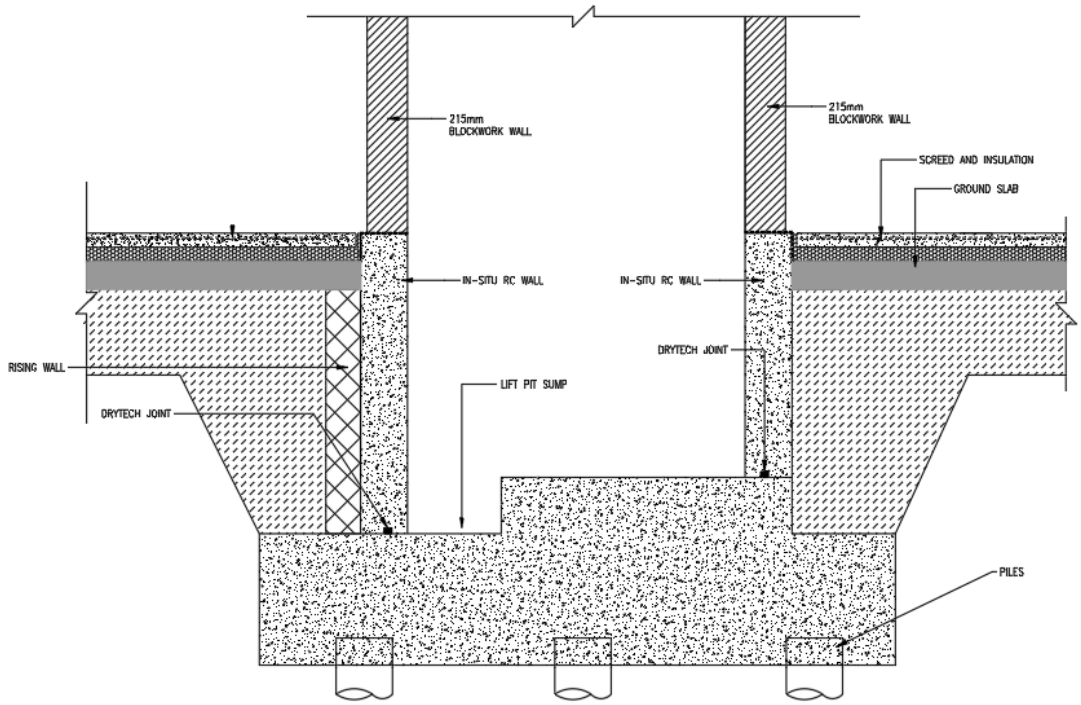
Housing: The house units will be constructed in traditional load-bearing masonry and timber floors/roofs.



Typical In-Situ Reinforced Concrete Floor Structural Build-up



Typical Masonry Walls & Precast Concrete Floor Structural Build-up

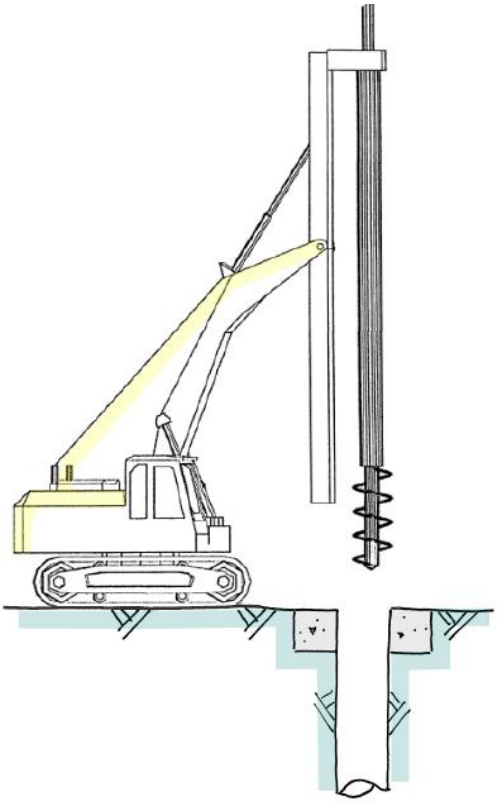


Typical Lift Pit
(Masonry Walls & Precast Concrete Floor Superstructure)

4. Construction Methodology

4.1 Foundations Type 1

The sequence of works for the construction of Blocks A, B, C, D, E and F will be as follows:



Typical Piling Installation

- Raise levels/Install Piling Mat
- Install Piles
- Construct RC Ground Beams and Pile Caps
- Construct Rising Wall Structures (Insitu RC or blockwork)
- Construct Ground Floor Slab
- Construct Rising Superstructure and Slabs

4.2 Foundations Type 2

The sequence of works for the construction of the type 2 foundations will be as follows:

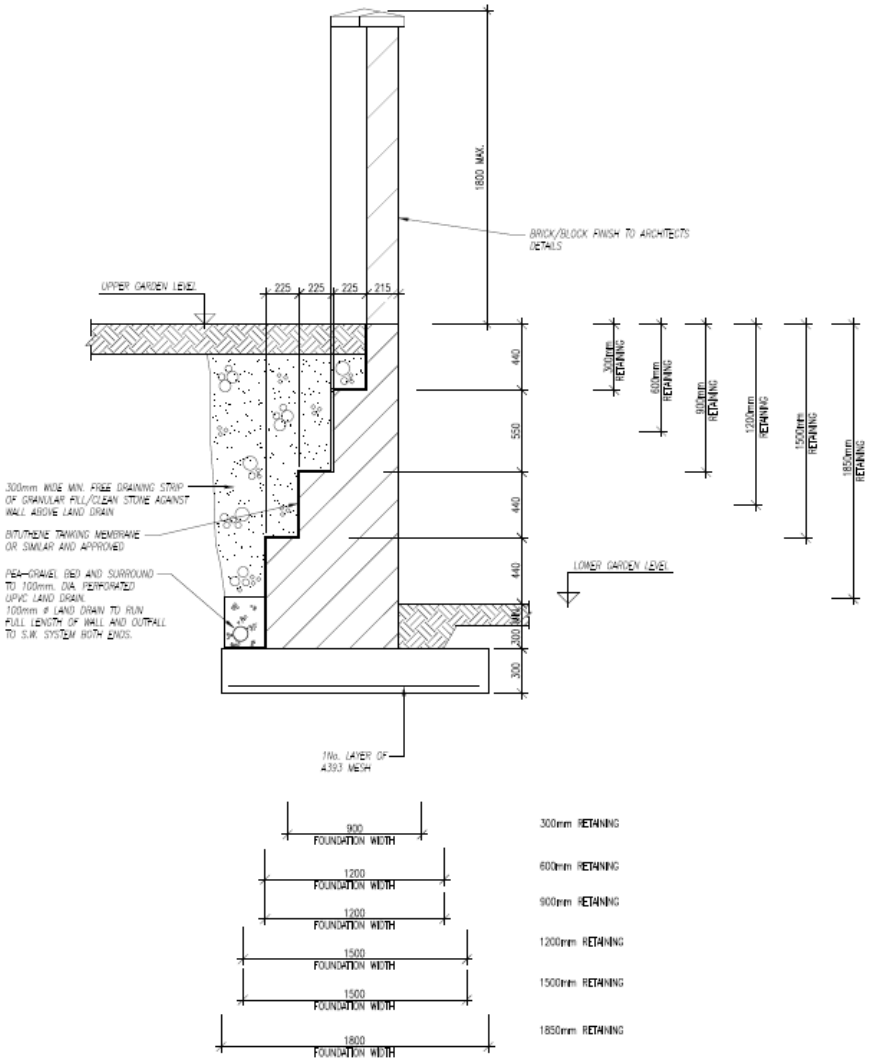
- Excavate to formation level
- Place lean mix to reach foundation level (if required)
- Construct RC Strip footings
- Construct masonry rising walls
- Place and compact approved granular fill to the underside of ground floor slab
- Construct RC Ground Floor Slab

4.3 Civil Works / Retaining Structures

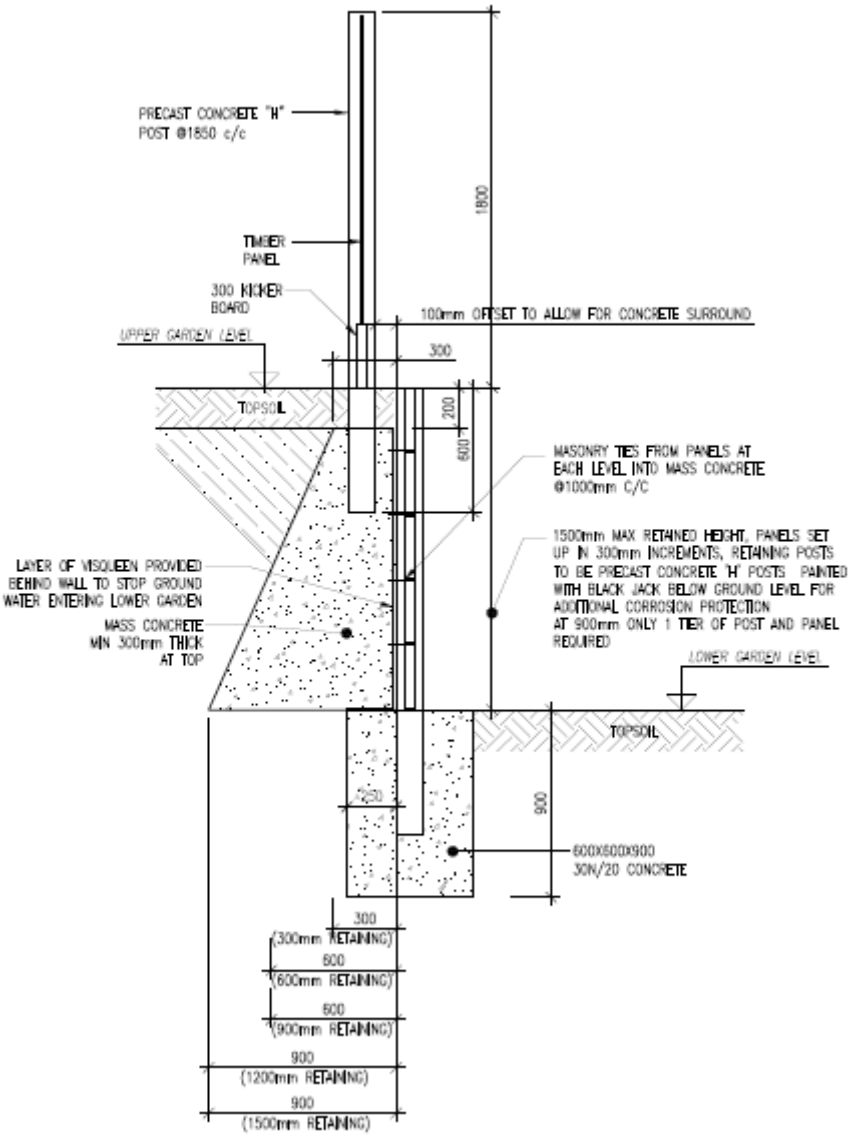
Back of garden areas/boundaries will be treated with various types of retaining wall structures. The finished boundary structure above retaining level may vary (blockwork, timber post and panel, railings, etc.) Depending on retained heights, the form of the retaining structure may be as follows:

- Post and Panel Retaining (w/Mass Concrete)
    - Up to 1.5m Retaining
- Blockwork Retaining
    - Up to 1.85m Retaining

Example retaining sections are included below. Given the levels on site it is not anticipated that significant retaining will be required.



Typical Blockwork Retaining Wall



Typical Post and Panel Retaining Wall

4.4 Measures to Protect Adjacent/Nearby Structures

The following measures have been considered in design over the Planning Stage to protect the adjacent/neighbouring structures:

(1) No basements are proposed, therefore no undermining of adjacent structures/roads is anticipated and therefore should also result in very limited change to existing groundwater levels.

(2) The structures have been set-out and positioned away from the site boundaries.

(3) Driven piles if used will have monitoring stations set up to confirm that piling vibrations are below acceptable limits.

(4) CFA Piling is also an option to minimise noise and vibration during the works.

(5) Additional measures will be adopted by the Contractor during construction as per health and safety requirements and best practice.

5. Fire Protection of the Structures

It is currently understood that a 90-minute fire protection will be required generally for the apartments, with 120 minutes required for certain cores and escape routes, and 60 minutes for the houses and duplex apartment blocks, subject to the Fire Consultants Report.
240 minutes is required in electrical ESB substation rooms.

Fire protection to all concrete elements will be achieved as follows, as per IS EN 1992-2:

Core walls and Columns	-	RC concrete cover and minimum element dimensions. Blockwork achieves the desired fire rating.
Horizontal members and hollowcore slabs	-	RC concrete cover and minimum element dimensions. Blockwork achieves the desired fire rating.
120 minute areas	-	RC concrete cover and minimum element dimensions.
240 minute areas	-	RC concrete cover and minimum element dimensions.

6. Proposed Loadings

6.1 Design Loadings and Service Movements

6.1.1 Vertical Loads

These comprise superimposed live loads [due to occupancy, plant, storage, etc.], superimposed dead loads [due to M&E services, etc.] and self-weight of structure plus cladding. Superimposed live loads and dead loads are listed below and the design takes into account structure and cladding self-weight.

6.1.2 Horizontal Loads

These comprise either wind loading on the building façade or "EHF – Equivalent Horizontal Forces" as defined in Eurocode. EHF loads occur due to lack of fit of the structure, etc. The combination of these two are used in the design in accordance with IS EN 1990.

6.1.3 Service Movements

Horizontal and vertical movements due to superimposed live loads and wind loads are limited to the following:

Horizontal building sway [wind load] = $\frac{height}{500}$

Vertical slab/beam deflections [superimposed live load]:

i] Floor beams = $\frac{span}{360}$

ii] Slab/Beam supporting cladding = $\frac{span}{500}$ or 10 mm whichever is less.

6.1.4 Loading Table (Subject to Final Confirmations of Superstructure)

A	Typical Apartment Floor	
	200mm HC + Screed	4.90 kN/m^2
	Floor Finishes	0.35 kN/m^2
	Ceiling & Services	0.25 kN/m^2
		5.50 kN/m^2
	Imposed load (Class A2)	3.0 kN/m^2
	[Including 1.0kN/m^2 partitions]	

B Typical Podium (Building Footprint)

450 normal weight slab	11.25 kN/m^2
Finishes	0.50 kN/m^2
75mm Screed (2000kg/m^3)	1.50 kN/m^2
Floor insulation	0.05 kN/m^2
Ceiling &services	0.45 kN/m^2
	13.75 kN/m^2
imposed load (Class A2)	3.0 kN/m^2
[Including 1.0kN/m^2 partitions]	

C Typical Podium (Landscaped Area)

550 normal weight slab	13.75 kN/m^2
Landscaping (TBC)	10 kN/m^2
Waterproofing	0.5 kN/m^2
Insulation	0.20 kN/m^2
Ceiling & Services	0.45 kN/m^2
	24.9 kN/m^2
Imposed load (Vehicle Access)	None

D Roof Areas

200mm HC + Screed	4.90 kN/m^2
Sedum	3.00 kN/m^2
Waterproofing	0.30 kN/m^2
Insulation	0.20 kN/m^2
	8.40 kN/m^2
imposed load (MEP)	7.5 kN/m^2
Imposed load (PVs)	3.0 kN/m^2
Access/Maintenance	0.6 kN/m^2

E Corridor / Lobby Areas

200mm HC + Screed	4.90 kN/m^2
Floor Finishes	0.35 kN/m^2
Ceiling & Services	0.45 kN/m^2
	5.70 kN/m^2
Imposed load	5.0 kN/m^2

F Disproportionate Collapse

The structures will be checked for disproportionate collapse in accordance with IS EN 1991-1-7:2006 Annex A and Building Regulations.

Accidental loading at 34 kN/m^2 will be applied to "key elements", i.e. columns and beams carrying columns, and criteria in regard to perimeter ties and tying forces.

UK and Ireland Office Locations