Waterman Moylan
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Structural Report

Residential Development at Broomfield SHD Lands, Malahide

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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)

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Issue 1	31/03/22	R. Osborne	D. Kelly	R. Osborne
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Comments

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1. Introduction

1.1 Scope

This Structural Report has been prepared by Waterman Moylan as part of the planning documentation for a proposed SHD at Broomfield, Back Road, Malahide, Co. Dublin.

Waterman Moylan has been appointed by Birchwell Developments Ltd. to provide Structural Consultancy Services for the proposed residential development at Broomfield, part of the Broomfield SHD lands, Malahide, Co. Dublin and to develop the scheme to Planning Stage.

The following provides a summary of the advice and encapsulates the information gathered thus far.

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 overall proposed development is divided into 2 sites as indicated in *Figure 1*. The north site is located between the existing Ashwood Hall residential development to the west and the Dublin-Belfast rail line to the east. To the south is agricultural land, the north is bounded by existing residential properties fronting the Back Road.

The southern site is bound by the Hazelbrook development to the west, Brookfield development to the north and agricultural lands to the east. The southern boundary is formed by the Hazelbrook Stream.

The southern site is greenfield in nature. The northern site is predominantly greenfield and was the former location of a rugby club. There is a small area of hardstanding which was previously the club's car park, together with existing structures, formerly the clubhouse and outhouse. These have been extensively vandalised in the form of fire damage, and demolition of the remainder of the structures is included as part of the subject application. The subsoil in the area to the south of the former playing field is an infill area consisting of inert rubble which has been surveyed, sampled, and analysed. This rubble will be excavated and disposed of as appropriate.

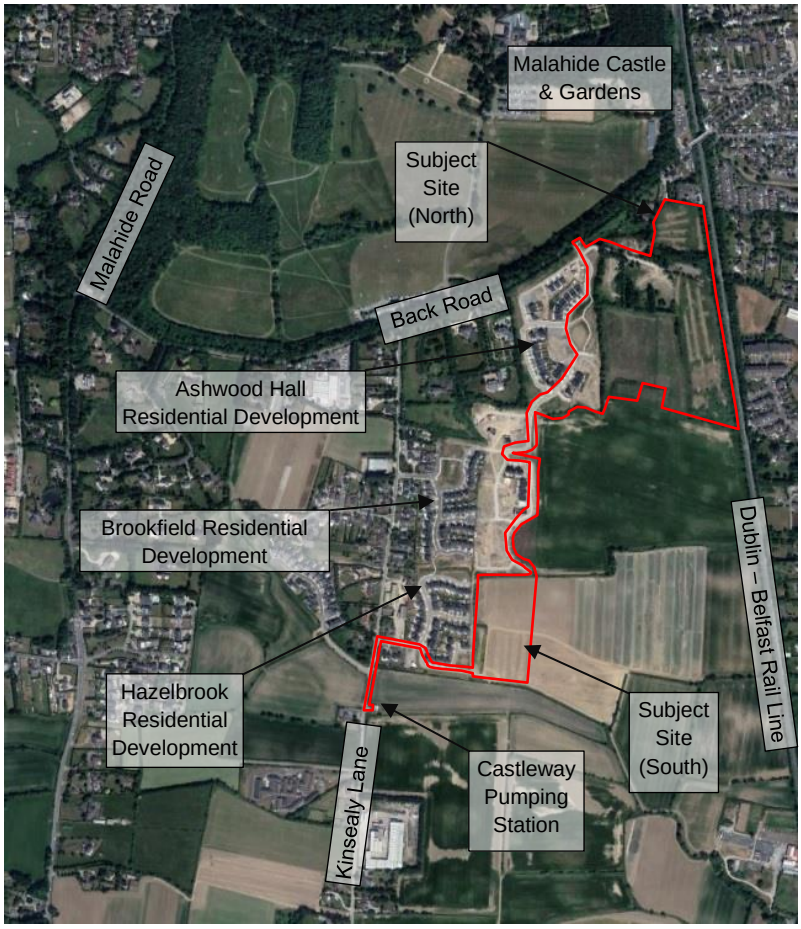


Figure 1 | *Site Location (Source: Google Maps)*

A topographic survey of the area indicated that the north site generally slopes uniformly from north-east to south, from a height of 20.5m to 11.5m, with an existing static ditch system along the south-east boundary,

and ditch to the south-west. The southern site also slopes from north to south from a height of 6m to 4.7m with localised high points and has an existing ditch system along its north boundary and Hazelbrook Steam along the southern boundary.

2.1 Proposed Development

The proposed development consists of a total of 415 No. residential units, comprising of 252 houses, 28 duplex units and 135 apartments. The proposed development will also include the construction of a 476m² creche, projected to cater for 15 staff and 85 children.

The development includes all associated site works, undergrounding of overhead lines, boundary treatments, drainage, and service connections.

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	Description
Apartment Blocks	Four & Five storeys apartment blocks
Houses	Terraced, Semi-detached and detached units
Duplex Apartment Blocks	Duplex blocks

3.1 Substructures

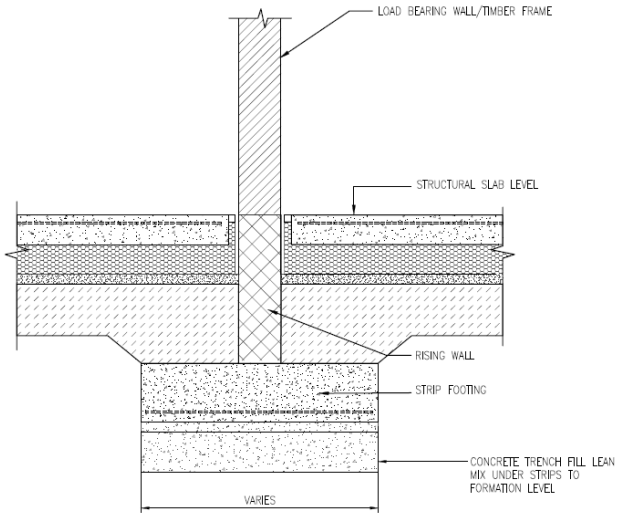
From an analysis of the anticipated building loads and the soil conditions described in the preliminary site investigation report, the proposed buildings have been divided in three different substructure typologies.

Building	Description	Substructure Typology	Description
Apartment Blocks	Four & Five storeys apartment blocks	Type 1	Reinforced Concrete Strip Footings under load bearing walls and columns
Houses	Terraced, Semi-detached and Detached units	Type 1	Reinforced Concrete Strip Footings under load bearing walls
Duplex Apartment Blocks	Duplex blocks	Type 1	Reinforced Concrete Strip Footings under load bearing walls

3.1.1 Foundations for typology 1

From a review of the 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 1

- Semi Detached Houses Typical Strip Footings: 900 to 1500mm wide by 300mm deep*****.
- Duplex Apartment Blocks Typical Strip Footings: 900 to 1800mm by 300mm deep*****.
- Apartment Block Strip Footings: 900 to 2000mm by 500mm 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.

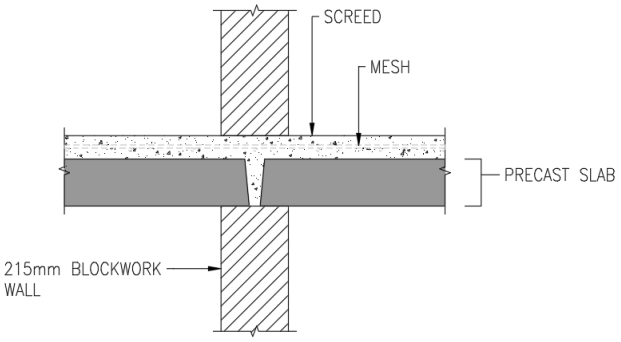
Houses and Duplex Apartment Blocks					
	Framing Layout	Speed-of-Construction	Fire Resistance	Acoustic Performance	Vibration Performance
Masonry Walls & Precast Concrete	Average	Average	Good	Good-Average	Good
Timber Frame	Good	Good	Average	Average	Average
Masonry Walls & Timber Floors	Good	Average	Average	Average	Average

For the houses it is proposed to use either Masonry Walls and Timber Floors (Traditional build) or Timber Frame for the superstructure.

For the duplex apartment blocks, it is proposed to use Masonry Walls & Precast Floors for the superstructure, or a combination of Masonry Walls and Precast Floors for the ground floor unit and Timber Frame or Traditional Build for the unit above.

Apartment Blocks					
	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

For the apartment blocks, it is proposed structure is to use Masonry Walls & Precast Floors for the superstructure.



Typical Masonry Walls & Precast Concrete Floor Structural Build-up

3.3 Foundations Type 1

The sequence of works for the construction of the type 1 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. 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
Horizontal members and hollowcore slabs	-	RC concrete cover and minimum element dimensions.
120 minute areas	-	RC concrete cover and minimum element dimensions.
240 minute areas	-	RC concrete cover and minimum element dimensions.

5. Proposed Loadings

5.1 Design Loadings and Service Movements

5.1.1 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.

5.1.2 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.

5.1.3 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.

5.1.4 Loading Table (Subject to Final Confirmations of Superstructure)

A Typical Apartment Floor

200 Precast Slab	3.00 kN/m^2
75mm Screed	1.80 kN/m^2
Floor Finishes	0.35 kN/m^2
Ceiling & Services	0.25 kN/m^2
	5.40 kN/m^2
Imposed load (Class A2) [Including 1.0kN/m^2 partitions]	3.0 kN/m^2

B Typical Podium (Building Footprint)

750 normal weight slab	18.75 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
	21.25 kN/m^2
imposed load (Class A2) [Including 1.0kN/m^2 partitions]	3.0 kN/m^2

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 (Landscape/Vehicle Access)	10 kN/m^2

D Roof Areas

200 Precast Slab	3.00 kN/m^2
75mm Screed	1.80 kN/m^2
Sedum	3.00 kN/m^2
Waterproofing	0.30 kN/m^2
Insulation	0.20 kN/m^2
	8.30 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

200 Precast Slab	3.00 kN/m^2
75mm Screed	1.80 kN/m^2
Floor Finishes	0.35 kN/m^2
Ceiling & Services	0.45 kN/m^2
	5.60 kN/m^2
Imposed load	5.0 kN/m^2

F Disproportionate Collapse

The structure is in excess of five storeys and therefore 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.

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