CLIMATE ACTION ENERGY STATEMENT

FOR

BALLYBIN ROAD LRD, RATOATH,

CO. MEATH

Project:	Ballybin Road LRD, Ratoath, Co. Meath
Client:	Marshall Yards Development Company Ltd
Architects:	John Fleming Architects
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1.0 INTRODUCTION

This document provides an overview of the developments energy strategy and relates to the sustainability and energy targets proposed for the project. The development must approach the energy design in an efficient manner that reduces energy demand initially through passive strategies such as an efficient envelope which in turn reduces the energy demands relating to items such as the heating system. This initial approach in reducing the energy demand significantly aids the project in obtaining the required energy goals. Performance criteria relating to the development's envelope are set out in the following document.

The energy systems design must also focus on specifying energy efficient equipment to ensure the day to day running of the energy systems are optimised to further enhance energy savings and the related energy cost. Specifications relating to efficient heating, lighting and auxiliary equipment are set out in the document.

The report sets out to demonstrate a number of methodologies in Energy Efficiency, Conservation and Renewable Technologies that will be employed in part or in combination with each other for this development. These techniques will be employed to achieve compliance with the building regulations Part L and NZEB standards currently in public consultation.

2.0 PROPOSED DEVELOPMENT

The proposed development is at a site with a total area of 5.48 hectares principally located at Main Street/R125 and Ballybin Road, Ratoath, Co. Meath. The total site contains a proposed residential development site with an area of 3.66 hectares (bisected by a proposed realigned Ballybin Road) and a proposed infrastructural development site with an area of 1.82 hectares (principally for road and related works, water services and open space amalgamation). The site is generally bound by: Fox Lodge Woods and Fox Lodge Manor to the west and north; existing agricultural lands and residential development to the north and east; existing Ballybin Road and Moulden Bridge to the east; and Main Street/R125 and Jamestown Road/L1016 to the south. The site also incorporates parts of: the existing Ballybin Road (north and west of Moulden Bridge), Main Street/R125, Jamestown Road/L1016 and green open space in Fox Lodge Manor.

The proposed development principally consists of the demolition of 2 No. dwellings (594 square metres gross floor area combined) and 1 No. agricultural shed (988.7 square metres gross floor area) and the construction of 141 No. residential dwellings with a gross floor area of 12,428 square metres in buildings of 2 No. and 3 No. storeys. The dwellings include 117 No. houses (57 No. 2-bed, 52 No. 3-bed, 7 No. 4-bed and 1 No. 5-bed) and 24 No. maisonette/duplex units (18 No. 1-bed and 6 No. 3-bed).

The development also proposes a reconfiguration of the road layout at the south (Main Street/R125 and Jamestown Road/L1016) and east (Ballybin Road) of the site. Specifically, it is proposed to demolish/remove the existing 5-arm roundabout and to replace same with a new 4-arm signalised junction and reconfigured access to the existing Ratoath Childcare site. The new junction arrangement will facilitate a proposed realignment of the southern section of the existing Ballybin Road (approximately 172 metres) as the northern arm of the new signalised junction and a revised entrance for the existing dwelling to the north-east of the site at Ballybin Road (known as 'Fox Lodge Farm', Eircode A84 KF97). The proposed road infrastructure works also include: road markings, traffic signals, traffic signage, footpaths and cycle infrastructure.

The development also proposes:

- 2 No. new multi-modal accesses onto the proposed realigned Ballybin Road to serve the bisected residential site;
- 2 No. pedestrian accesses onto Main Street/R125 and 1 No. pedestrian access onto the realigned Ballybin Road;
- Relocation of existing eastbound bus stop at Main Street/R125 approximately 130 metres to the west;
- Repurposing of the closed section of Ballybin Road as a pedestrian/cycle greenway;
- Internal roads and footpaths;
- 228 No. car parking spaces;
- Cycle parking spaces;
- Hard and soft landscaping, including public open space, communal amenity space and private amenity space (as rear gardens and terraces/balconies facing multiple directions);
- Demolition of the wall at the north-west corner of the site interfacing with Fox Lodge Manor and the amalgamation of existing public open in the estate and proposed public open space;
- Boundary treatments;
- Public lighting;
- Rooftop PV panels;
- 2 No. ESB sub-stations; and
- All other associated site and development works above and below ground.

3.0 BUILDING ENERGY RATING

As of 2006 all domestic buildings that were newly built and existing buildings that are for sale or rent require a BER (Building Energy Rating) certificate. The actual building energy rating is based on the primary energy used for one year and is classified on a scale of A1 to G with A1 being the most energy efficient. It also gives the anticipated carbon emissions for a year's occupation based on the type of fuel that the systems use. In order to identify Primary energy consumption of the building, the BER assesses energy consumed under the following headings:

- Building type (house, apartment etc.)
- Building orientation
- Thermal envelope (insulation levels of the façade, roofs, ground floor etc.)
- Air Permeability (how much air infiltrates into the building through the façade)
- Heating systems (what type of heat source is used and how efficient)
- Ventilation (what form of ventilation is used. Natural vent, mixed mode mechanical ventilation)
- Fan and pump efficiency (how efficient are the pumps and fans)
- Domestic hot water generation (is a high efficiency boiler used)
- Lighting systems (how efficient is the lighting in the building

Through the specification of an energy efficient façade and HVAC systems, the energy consumption of the building will be reduced compared to a set baseline. This ensures the environmental and economic impact of the operation of the building is reduced. The key philosophy of this plan is to reduce energy consumption by firstly limiting the energy needed by improving the buildings insulation. The second step is to utilise energy in the most efficient way through the selection and installation of energy efficient plant and equipment. The final step is to introduce energy from renewable sources to reduce the burden on Fossil Fuels.

4.0 UTILITIES

Initial discussions have taken place with the ESB regarding existing infrastructure in the locality. The preliminary loading for the site is estimated to be in the region of 400 kVA. (This is subject to change dependent on final renewable considerations etc. Preliminary design estimates would indicate an MV substation and additional unit sub stations will be required.

5.0 STRUCTURE AND BUILDING ELEMENTS

While the construction works will incur an initial investment, the lifetime running cost of the buildings must be considered to reduce water, fuel and electrical energy consumption. To that end methods will be explored to further improve the building's energy rating and reduce the carbon emissions. This includes decreasing the thermal conductivity (heat losses) of the building fabric, take advantage of passive solar gain to reduce the heating demand in the space and increase day lighting to reduce artificial lighting. Natural ventilation may be employed or if deemed as a requirement mechanical ventilation and heat recovery techniques will be employed to recover energy in the exhausted air. The following are some outline u-value specifications which will achieve the required energy specification:

5.1 Fabric 'U' Values Dwelling Duplexes & Maisonettes

- Walls - 0.18 $W/m^2.K$
- Window - 1.2 $W/m^2.K$ (solar fraction (g factor) of 0.7, frame factor of 0.7 or better)
- Roof - 0.16 $W/m^2.K$ (Flat roof)
- Doors - 1.4 $W/m^2.K$ (This is to include frame)
- Ground Floor slab - 0.18 $W/m^2.K$
- Thermal Bridging - Factor of 0.15

5.2 Fabric 'U' Values Dwelling houses

- Walls - 0.18 $W/m^2.K$
- Window - 1.2 $W/m^2.K$ (solar fraction (g factor) of 0.7, frame factor of 0.7 or better)
- Roof - 0.12 $W/m^2.K$
- Doors - 1.4 $W/m^2.K$ (This is to include frame)
- Ground Floor slab - 0.17 $W/m^2.K$
- Thermal Bridging - Factor of 0.08, with junction details to conform with "Limiting Thermal Bridging and Air Infiltration – Acceptable Construction Details"

5.3 Air Permeability (Air Tightness against infiltration)

One of the most significant heat loss factors in any buildings is through controlled and uncontrolled ventilation through the introduction of ambient/outside air into the heated space. The apartments are to be constructed with a high degree of air tightness to a possible value of $3m^3/m^2/hr$ or 0.15 Air Changes with a permeability test conducted post construction to demonstrate this level in accordance with the TGD's.

Dwelling houses are expected to achieve an air permeability level of 0.25 $m^3/hr/m^2$ or less.

5.4 Secondary Heat Source

The Duplexes / Maisonettes / dwellings do not contain a secondary heat source therefore this is not applicable.

6.0 BUILDING SERVICES (M&E) OVERVIEW

6.1 Heating & Ventilation systems Duplexes / Maisonettes

It is proposed to consider various options for heating of duplexes / maisonettes to include air to water heat pumps or exhaust air heat pumps.

Air source heat pumps utilize low grade heat from external ambient air and transfer heat to heating system pipework. These systems operate with very high efficiencies (>400%) which provides significant carbon reductions in comparison to a traditional boiler system.

Exhaust air heat pumps utilise an exhaust air heat pump type system for heating, hot water and ventilation of the apartment units. This will re-cycle the heat from your house's ventilation system. These machines are ideal for apartments and more compact air-tight low energy or passive homes. Air is drawn through ducts to the heat pump from the bathrooms, utility and kitchen areas. The cold waste air is discharged to outside through another duct, and condensation to a drain. Additional heat generated internally from lighting, people and domestic appliances is also utilised through heat recovery.

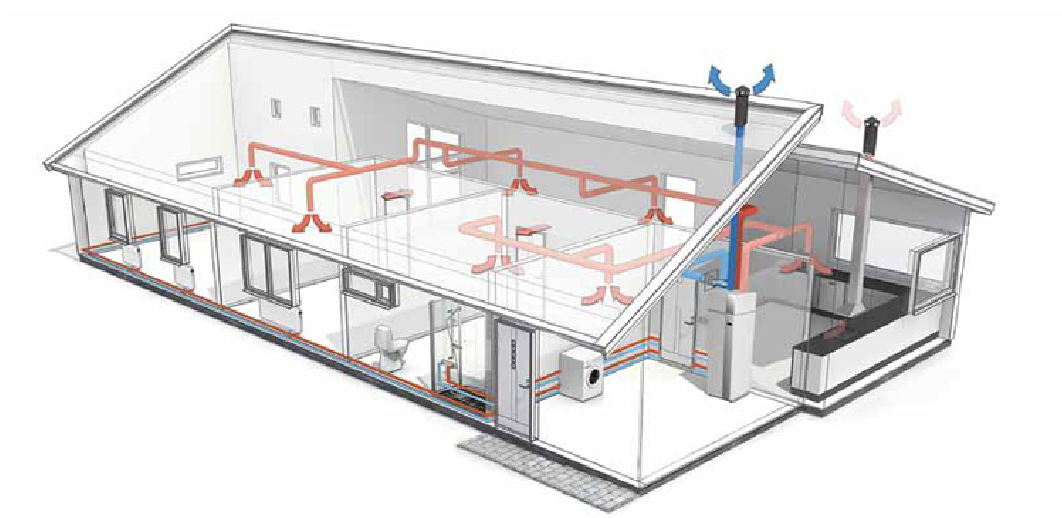

Figure 1: Typical Exhaust Air Source HP arrangement

For every unit of electricity used to operate the heat pump, up to four to five units of heat are generated. Therefore, for every unit of electricity used to generate heat, 4-5 (400-500%) units of heat are produced. Efficiencies in order of 600% may also be achieved depending on ambient conditions.

It is proposed to utilise radiator heating in the duplexes / maisonettes units as heating emitters. These can be employed with heat pumps which utilise the low heating temperature from the heat pump. A central time clock and separate time and temperature controls for each zone are to be provided (e.g. via 2-port valves). Such zones may consist of:

- Living areas,
- Bedrooms
- Domestic Hot water

6.2 Heating & Ventilation systems dwellings

The heating option that is under consideration for the dwelling units is an air to water heat pump and exhaust air heat pump.

Air source heat pumps utilize low grade heat from external ambient air and transfer heat to heating system pipework. These systems operate with very high efficiencies (>400%) which provides significant carbon reductions in comparison to a traditional boiler system.

Figure 2: Typical Photovoltaic Arrangement

Photovoltaic panels are best suited to sites which have an unobstructed southerly and south-easterly elevations. PV is particularly suitable due where there is a simultaneous requirement for heating, hot water and electrical demand. The on-site generation of electricity can supplement the electrical requirement for lighting, motors, etc & reduce the electrical demand and from the grid.

Applying this to each dwelling would considerably reduce the demand from the grid and consequently reduce losses and emissions from power stations. Such is the benefit of on site or distributed generation, the DEAP model determines that each kWh offset from PV equates to circa 2.5 times the thermal equivalent and reduces CO_2 emissions by some 0.47Kg/kWh generated.

Figure 3: Roof Mounted Photovoltaics

6.3 Lighting

All lighting to be energy efficient with provision made for low energy lamps such as Compact Fluorescent Lamps (CFLs) which use 80% less electricity and last up to 10 times longer than ordinary light bulbs in the dwellings.

Table 1: Summary of Part L compliance for apartment units

	Typical Ground floor Duplexes / Maisonettes	**Typical Mid & Top floor Duplexes / Maisonettes**
U-values		
	W/m².K]	[W/m².K]
Floor [Max, Part L 2019 = 0.18]	0.18	N/A
	Floor to have minimum 100mm PIR with thermal conductivity of 0.022 W/m.K	
Roof [Max, Part L 2019] = 0.2 [Flat Roof]	N/A	0.16
	Flat roof insulation to be minimum 130mm Xtrodeck with thermal conductivity 0.021 W/m.K	
Wall [Max, Part L 2019 = 0.18]	0.18	0.18
	Wall insulation to comprise 110mm PIR board with thermal conductivity 0.022 W/m.K	
Door [Max, Part L 2019 = 1.4]	1.4	1.4
Window [Max Av, Part L 2019 = 1.4], solar factor 0.73	1.2	1.2
	Windows to south façade to have minimum solar factor of 0.5	
Mechanical plant		
Heating source	Exhaust air source heat pump.	Exhaust air source heat pump.
Heating controls	Time and temperature control of heating/hot water with individual heating zones	Time and temperature control of heating/hot water with individual heating zones
Heat emitters	Oversized radiators with mean water temperature 40 Deg C	Oversized radiators with mean water temperature 40 Deg C
Solar requirements	Up to 1 No. 300W PV panel per unit dependent on orientation	Up to 1 No. 300W PV panel per unit dependent on orientation
Hot water cylinder	180 litre cylinder	180 litre cylinder

Ventilation	Centralised ducted extract system serving heat pump. Specific fan power 0.33 W/L/s minimum	Centralised ducted extract system serving heat pump. Specific fan power 0.33 W/L/s minimum
Additional requirements		
Lighting	100% energy efficient lighting	100% energy efficient lighting
Air permeability	Air permeability @ 3 $m^3/hr/m^2$	Air permeability @ 3 $m^3/hr/m^2$
Thermal bridging	Factor of 0.15 - Default	Factor of 0.15 - Default
Secondary heating	N/A	N/A
BER results	25 -49 (A2)	25 -49 (A2)
EPC [MPEPC = 0.3]	<0.3	<0.3
CPC [MPCPC = 0.35]	<0.35	<0.35
Renewable contribution [RER]	>0.2	>0.2

Table 2: Summary of Part L compliance for typical dwelling house

U-values	
	[W/m².K]
Floor [Max, Part L 2019 = 0.18]	0.17
	Floor to have minimum 100mm PIR with thermal conductivity of 0.022 W/m.K
Roof [Max, Part L 2019 = 0.16 Insulation on Ceiling/rafter]	0.12
	Pitched roof with ceiling insulation to be minimum 300mm earth wool with thermal conductivity 0.04 W/m.K
Wall [Max, Part L 2019 = 0.18]	0.18
	Wall insulation to comprise 110mm PIR board with thermal conductivity 0.022 W/m.K
Door [Max, Part L 2019 = 1.4]	1.4
Window [Max Av, Part L 2019 = 1.4], solar factor 0.73	1.2
	Windows to have minimum solar factor 0.71
Mechanical plant	
Heating source	Air to water Heat Pump
Heating controls	Time and temperature control of heating / hot water with individual heating zones
Heat emitters	Oversized radiators with mean water temperature 42.5 Deg C
Solar requirements	None
Hot water cylinder	200 litre cylinder
Ventilation	Centralised ducted extract system serving heat pump. Specific fan power 0.33 W/L/s minimum
Additional requirements	
Lighting	100% energy efficient lighting
Air permeability	Air permeability @ 3 m³/hr/m²
Thermal bridging	Factor of 0.08, junction details to conform with "Limiting Thermal Bridging and Air Infiltration – Acceptable Construction Details"
Secondary heating	N/A
BER results	25 -49 (A2)
EPC [MPEPC = 0.3]	<0.3
CPC [MPCPC = 0.35]	<0.35
Renewable contribution [RER]	>0.2