ENERGY STATEMENT

FOR

CARPENTERSTOWN APARTMENT DEVELOPMENT

Project:	Carpenterstown apartment development
Client:	Glenveagh Homes Ltd.
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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 project consists of 5 apartment blocks comprising approx. 192 apartment units. There is a common basement over 3 blocks and there is a provision for mixed commercial and amenity spaces.

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, commercial 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 600 kVA. (This is subject to change dependent on final renewable considerations etc. A sub station and associated switch room will be required and are indicated on the architectural plans.

5.0 STRUCTURE AND BUILDING ELEMENTS

While the construction works will incur an initial investment, the lifetime running cost of the building 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 apartments

- Walls - 0.18 W/m2.K
- Window - 1.3 W/m2.K (solar fraction (g factor) of 0.7, frame factor of 0.7 or better)
- Roof - 0.19 W/m2.K (Flat roof)
- Doors - 1.4 W/m2.K (This is to include frame)
- Ground Floor slab - 0.18 W/m2.K
- Thermal Bridging - Factor of 0.08, with junctions details to conform with "Limiting Thermal Bridging and Air Infiltration – Acceptable Construction Details"

5.2 Fabric 'U' Values Commercial

- Walls - 0.18 W/m2.K
- Window - 1.4 W/m2.K (solar fraction (g factor) of 0.7, frame factor of 0.7 or better)
- Roof - N/A
- Doors - 1.6 W/m2.K (This is to include frame)
- Ground Floor slab - 0.18 W/m2.K
- Thermal Bridging - Factor of 0.08, with junctions 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 3m³/m²/hr or 0.15 Air Changes with a permeability test conducted post construction to demonstrate this level in accordance with the TGD's.

5.4 Secondary Heat Source

The apartments do not contain a secondary heat source therefore this is not applicable.

6.0 BUILDING SERVICES (M&E) OVERVIEW

6.1 Heating & Ventilation systems apartments

It is proposed to consider various options for heating of apartments to include possible 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 heatpump 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.

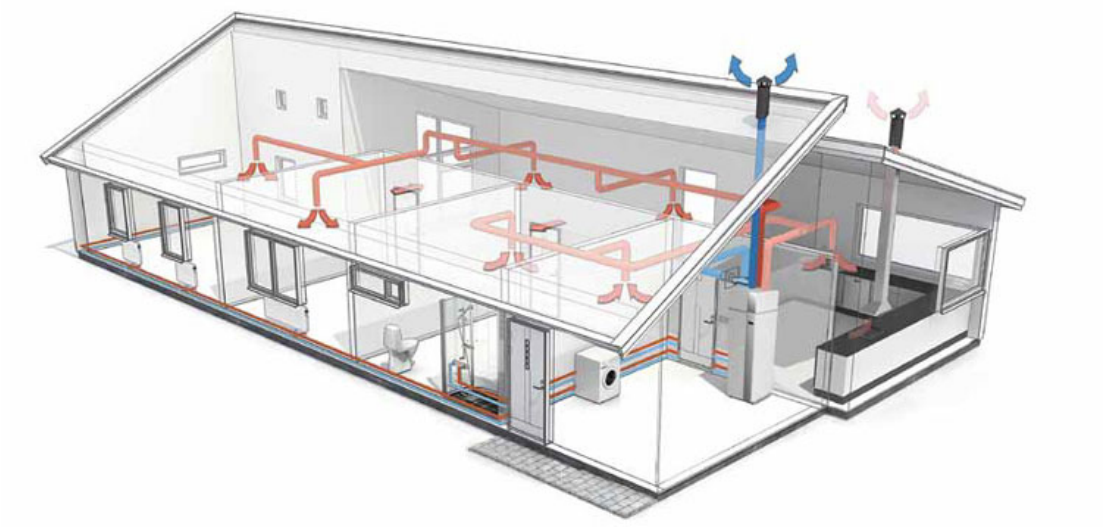

Figure 1: Typical Exhaust Air Source HP arrangement

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 apartment units as heating emitter. 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 to each zone is to provided (e.g. via 2-port valves). Such zones may consist of:

- living areas,
- Bedrooms
- Domestic Hot water

6.2 Heating & Ventilation systems commercial

Various heating options have been considered for the commercial units with heat pumps proposed as heating and hot water source following appraisal of available technologies.

Sufficient plant space has been provided at undercroft level to allow for installation of condensors which can serve heat pumps or air conditioning units.

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.

6.3 Lighting

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

Table 1: Summary of Part L compliance for apartment units

	Typical Ground/top floor apartment	**Typical Mid floor apartment**
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/m2.k	
Roof [Max, Part L 2019 = 0.2 Insulation on Ceiling/rafter]	0.19	N/A
	Flat ceiling insulation to be minimum 140mm Moy with thermal conductivity 0.024 wm2.k or similar	
Wall [Max, Part L 2019 = 0.18]	0.18	0.18
	Wall insulation to comprise 100mm PIR board with thermal conductivity 0.023 w/m2.k or similar	
Door [Max, Part L 2019 = 1.4	1.4	1.4
Window [Max Av, Part L 2019 = 1.4], solar factor 0.73	1.3	1.3
	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	N/A	N/A
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/m2	Air permeability @ 3 m^3/hr/m2
Thermal bridging	Factor of 0.08, junctions details to conform with "Limiting Thermal Bridging and Air Infiltration – Acceptable Construction Details"	Factor of 0.08, junctions details to conform with "Limiting Thermal Bridging and Air Infiltration – Acceptable Construction Details"
Secondary heating	N/A	N/A
BER results	49 (A2)	44 (A2)
EPC [MPEPC = 0.3]	0.293	0.275
CPC [MPCPC = 0.35]	0.276	0.26
Renewable contribution [kwhrs]	17.5	22

Table 2: Summary of Part L compliance for typical commercial unit

U-values	
	[w/m2.k]
Floor [Max, Part L 2019 = 0.18]	0.18
	Floor to have minimum 100MM PIR with thermal conductivity of 0.022 w/m2.k
Roof [Max, Part L 2019 = 0.2 Insulation on Ceiling/rafter]	N/A
Wall [Max, Part L 2019 = 0.18]	0.18
	Wall insulation to comprise 100mm PIR board with thermal conductivity 0.023 w/m2.k
Door [Max, Part L 2019 = 3.0]	1.6
Window [Max Av, Part L 2019 = 1.6], solar factor 0.73	1.4
	Windows to have minimum solar factor 0.65
Mechanical plant	
Heating/cooling source	Air conditioning split heat pump unit SSEER <2
Heating controls	Time and temperature control of heating/hot water with individual heating zones
Heat emitters	Heat/cooling via ventilation grilles
Solar requirements	None
Hot water	Via heat pump
Ventilation	Ventilation provided via ducted air supply from external. Extract from wet areas in accordance with CIBSE requirements. Specific fan power 1.2 w/l/s minimum
Additional requirements	
Lighting	Lighting to have minimum 80 lumens/watt with lighting controls to incorporate daylight/occupancy sensing
Air permeability	Air permeability @ 3 m^3/hr/m2
Thermal bridging	Factor of 0.08, junctions details to conform with "Limiting Thermal Bridging and Air Infiltration – Acceptable Construction Details"
BER results	(A3)
EPC [MPEPC = 1]	<1
CPC [MPCPC = 1.15]	<1.15
Renewable contribution	20% Minimum