ENERGY STATEMENT & UTILITIES OVERVIEW

FOR

DEVELOPMENT AT BELMOUNT, NAVAN, CO. MEATH

Project:	Belmount, Navan
Client:	Coindale Ltd
Architects:	CCK
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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 approx. 544 residential units at Belmont, Academy Street, Navan. The site will comprise approximately 260 dwelling houses, 198 apartments, 86 duplex units 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

4.1 ESB

Initial discussions have taken place with the ESB regarding existing infrastructure in the locality. There are a number of existing overhead ESB lines which will require diversion. Initial discussions have taken place and it has been confirmed by the ESB that the lines are 10kv. A formal application cannot be made at this stage but will be made as soon as the planning permission is granted.

The preliminary loading for the site is estimated to be in the region of 1.2MVA. (This is subject to change dependent on final renewable considerations etc. A number of sub stations will be required subject to finalized ESB design.

4.2 GAS

Gas Networks Ireland have been contacted and an existing gas network map for the area surrounding the proposed development has been obtained and is attached.

There is an existing 125mm medium-pressure (4 bar) gas main in the road adjoining the site as shown in the attached layout.

4.3 EIR

Eir have been contacted and an existing Eir map for the area surrounding the proposed development has been obtained and is attached.

There is existing Eir Networks infrastructure in the vicinity of the site. A formal application cannot be made at this stage but will be made as soon as the planning permission is granted. The Eir infrastructure will allow for multiple broadband providers.

4.4 VIRGIN

There is existing Virgin Network infrastructure in the vicinity of the site. A formal application cannot be made at this stage but will be made as soon as the planning permission is granted.

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 $3m^3/m^2/hr$ or 0.15 Air Changes with a permeability test conducted post construction to demonstrate this level in accordance with the TGD's.

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 apartment'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.

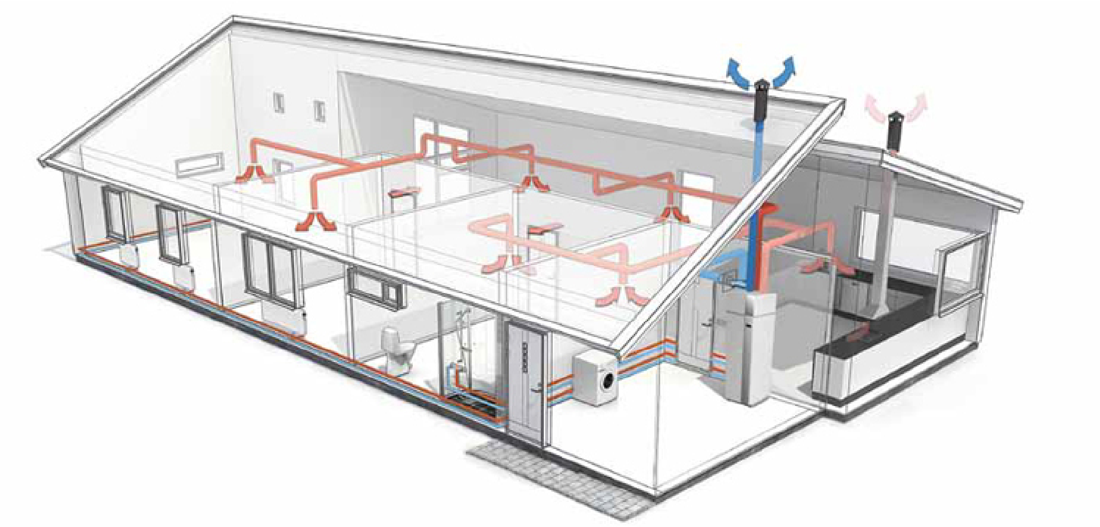


Figure 1: Typical Exhaust Air Source HP arrangement

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 gas boilers or 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

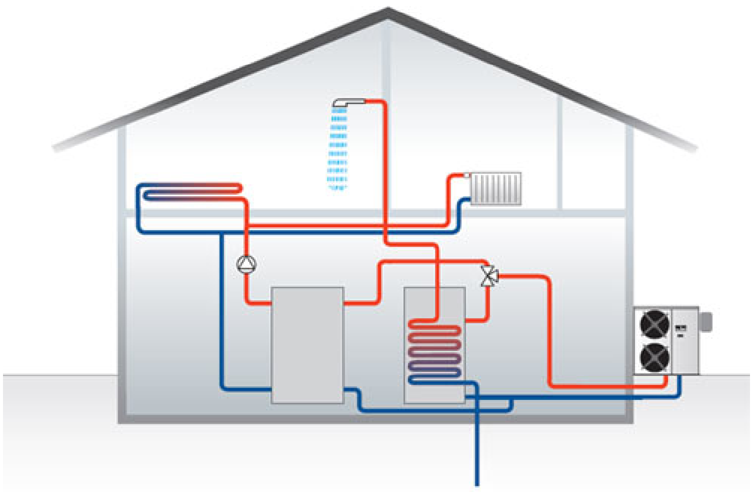
6.2 Heating & Ventilation systems dwellings

Various heating options are under consideration for the dwelling units with both heat pump and gas boiler systems currently under review.

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.

Gas heating options would comprise a high efficiency gas boiler for provision of heating and hot water. Photovoltaic panels would be installed in conjunction with the gas boiler option to achieve the Part L renewable energy requirements.

Figure 1: Typical Air Source HP arrangement for proposed dwellings



6.3 Heating & Ventilation systems commercial

Various heating options are under consideration for the commercial units with both heat pump and gas boiler systems currently under review. Sufficient plant space has been provided at undercroft level to allow for installation of condensors which can serve heat pumps or air conditioning units. An indicative route for a gas boiler flue has also been allowed for in the event that tenants require gas for heating, hot water or cooking purposes.

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.

Gas heating options would comprise a high efficiency gas boiler for provision of heating and hot water. Photovoltaic panels would be installed in conjunction with the gas boiler option to achieve the Part L renewable energy requirements.

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. these may be considered by the developer The on-site generation of electricity can supplement the electrical requirement for lighting, motors, etc & reduce the electrical demand and from the grid.

Utilising this technology 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 CO2 emissions by some 0.47Kg/kWh generated.

Figure 3: Roof Mounted Photovoltaics

6.4 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 2011 = 0.21]	0.18	N/A
	Floor to have minimum 100MM PIR with thermal conductivity of 0.022 w/m2.k	
Roof [Max, Part L 2011 = 0.16 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 2011 = 0.21]	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 2011 = 3.0]	1.4	1.4
Window [Max Av, Part L 2011 = 1.6], 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	Up to 2 No. 290w PV panel per unit if required dependent on orientation and heating system utilised.	Up to 2 No. 290w PV panel per unit if required dependent on orientation and heating system utilised.
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 = 0.4]	0.293	0.275
CPC [MPCPC = 0.46]	0.276	0.26
Renewable contribution [kwhrs]	17.5	22