ENERGY STATEMENT

FOR

SANTRY AVENUE LRD RESIDENTIAL DEVELOPMENT,

DUBLIN 9

Project:	Santry Avenue LRD Residential Development, Dublin 9
Client:	Dwyer Nolan Developments Limited
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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

Dwyer Nolan Developments Ltd. wishes to apply for permission for a Large-Scale Residential Development (LRD) on this site, c. 1.5 hectares, located at the junction of Santry Avenue and Swords Road, Santry, Dublin 9. The development site is bounded to the north by Santry Avenue, to the east by Swords Road, to the west by Santry Avenue Industrial Estate, and to the south by the permitted Santry Place development (granted under Dublin City Council Ref.s. 2713/17 (as extended under Ref. 2713/17/X1), 2737/19 & 4549/22).
The proposed development provides for 321 no. apartments, comprised of 104 no. 1 bed, 198 no. 2 bed, & 19 no. 3 bed dwellings, in 4 no. seven to thirteen storey buildings, over basement level, with 3 no. retail units, a medical suite / GP Practice unit and community/arts & culture space, all located at ground floor level, as well as a one storey residential amenity unit, facing onto Santry Avenue, located between Blocks A & D.
The proposed development consists of the following:

(1) Demolition of the existing building on site i.e. the existing Chadwicks Builders Merchants (c. 4,196.8m^2).

(2) Construction of 321 no. 1, 2, & 3 bed apartments, retail units, medical suite / GP Practice, community/arts & culture space, and a one storey residential amenity unit in 4 no. buildings that are subdivided into Blocks A-G as follows:

- Block A is a 7-13 storey block consisting of 51 no. apartments comprised of 22 no. 1 bed, 23 no. 2 beds & 6 no. 3 bed dwellings, with 2 no. retail units located on the ground floor (c. 132sq.m & c.172sq.m respectively). Adjoining same is Block B, which is a 7 storey block consisting of 38 no. apartments comprised of 6 no. 1 bed, 26 no. 2 bed, & 6 no. 3 bed dwellings, with 1 no. retail unit (c.162sq.m) and 1 no. medical suite / GP Practice unit located on the ground floor (c. 130sq.m). Refuse storage areas are also provided for at ground floor level.

- Block C is a 7 storey block consisting of 53 no. apartments comprised of 14 no. 1 bed & 39 no. 2 bed dwellings. Adjoining same is Block D which is an 8 storey block consisting of 44 no. apartments comprised of 22 no. 1 bed, 15 no. 2 bed, & 7 no. 3 bed dwellings. Ground floor, community/arts & culture space is proposed in Blocks C & D, with refuse storage area also provided for at ground floor level.

- Block E is an 8 storey block consisting of 49 no. apartments comprised of 7 no. 1 bed & 42 no. 2 bed dwellings. A refuse storage area, substation, & switchroom are also provided for at ground floor level. Adjoining same is Block F which is a 7 storey block consisting of 52 no. apartments comprised of 13 no. 1 bed & 39 no. 2 bed dwellings. Ground floor, community/arts & culture space is proposed in Blocks E & F. A refuse storage area, bicycle storage area, substation, & switchroom are also provided for at ground floor level of Blocks E & F.

- Block G is a 7 storey block consisting of 34 no. apartments comprised of 20 no. 1 bed & 14 no. 2 bed dwellings. A refuse storage area & bicycle storage area are also provided for at ground floor level.

(3) Construction of a 1 storey residential amenity unit (c. 166.1sq.m) located between Blocks A & D.

(4) Construction of basement level car park (c.5,470.8sq.m), accommodating 171 no. car parking spaces, 11 no. motorbike parking spaces & 677 no. bicycle parking spaces. Internal access to the basement level is provided from the cores of Blocks A, B, C, D, E, & F. External vehicular access to the basement level is from the south, between Blocks B & C. 33 no. car parking spaces & 58 no. bicycle parking spaces are also provided for within the site at surface level.

(5) Public open space of c. 1,791sq.m is provided for between Blocks C-D & E-F. Communal open space is also proposed, located between (i) Blocks E-F & G, (ii) Blocks A-B & C-D, and (iii) in the form of roof gardens located on Blocks A, C, & F and the proposed residential amenity use unit, totalling c.3,142sq.m. The development includes for hard and soft landscaping & boundary treatments. Private open spaces are provided as terraces at ground floor level of each block and balconies at all upper levels.

(6) Vehicular access to the development will be via 2 no. existing / permitted access points: (i) on Santry Avenue in the north-west of the site (ii) off Swords Road in the south-east of the site, as permitted under the adjoining Santry Place development (Ref. 2713/17).

(7) The development includes for all associated site development works above and below ground, bin & bicycle storage, plant (M&E), sub-stations, public lighting, servicing, signage, surface water attenuation facilities etc.

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 900 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 not be required.

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 - 1.2 W/m².K (solar fraction (g factor) of 0.7, frame factor of 0.7 or better)
- Roof - 0.16 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 - 0.08

5.2 Fabric 'U' Values Commercial

- Walls - 0.18 W/m².K
- Window - 1.2 W/m².K (solar fraction (g factor) of 0.7, frame factor of 0.7 or better)
- Roof - 0.16 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 - 0.08

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.

Dwelling houses are expected to achieve an air permeability level of 0.25 m³/hr/m² or less.

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 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.

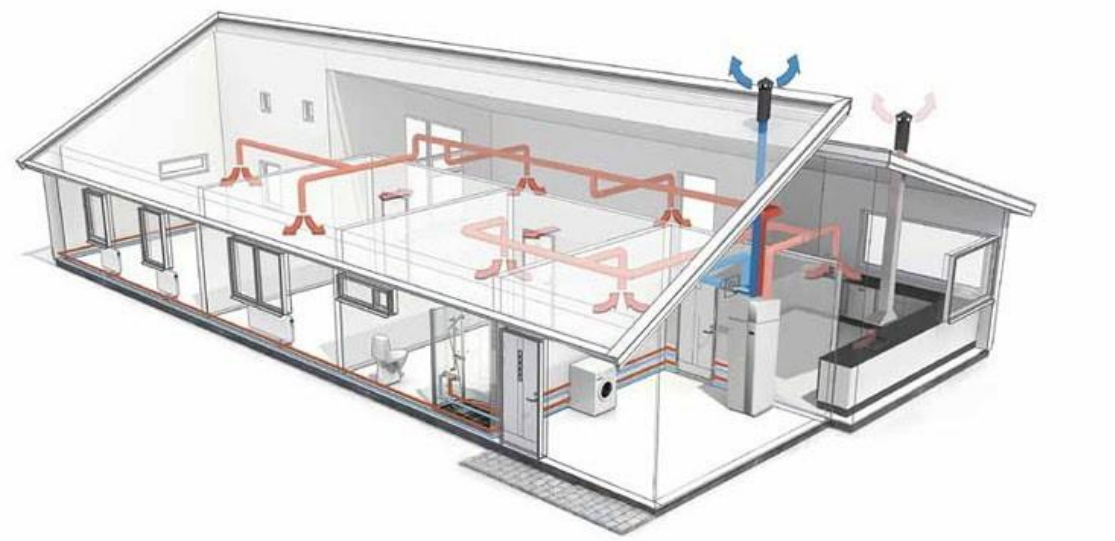

Figure 1: Typical Exhaust Air Source HP arrangement

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 apartment 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

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 CO2 emissions by some 0.47Kg/kWh generated.

Figure 3: Roof Mounted Photovoltaics

6.2 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 apartment	**Typical Mid & Top 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/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 0.08	Factor of 0.08
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 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