BELTON CONSULTING ENGINEERS

MAYESTONS179A

FOR: FINGAL COUNTY COUNCIL

ENERGY ANALYSIS REPORT

Revision:	P3
Approved:	SHANE BELTON C.Eng MIEI DIRECTOR
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PROJECT NO.: 2302

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1. INTRODUCTION

This energy analysis report statement has been prepared in support of the planning application for the proposed Residential development with creche facility located at Mayeston, Poppintree, Dublin 11. The report outlines how the proposed development will meet the energy strategies set-out in the Climate Action Statement for the development. Relevant technical and planning documentation was:

- Climate Action Statement
- Technical Guidance Document Part L – Conservation of Fuel and Energy for Dwellings
- Fingal Development Plan 2023-2029, Climate Action policy
    - CAP11 Climate Adaptation Actions in the Built Environment (Policy requirements are covered in the Infrastructure Design Report by Downes Associates Ltd.)
    - CAP12 Climate Action Energy Statements
    - CAP13 Energy from Renewable Sources

2. DEVELOPMENT DESCRIPTION

The proposed development relates to a site of c.1.35ha. located within existing residential development referred to as Mayeston, Poppintree, Dublin 11. The site is located north of St Margaret's Road and is bound by the M50 motorway to the north, Mayeston Green and Silloge Green to the east, Mayeston Downs to the south, and to the west by public open space.

The proposed development will include for the provision of 119 no. apartment units consisting of 39 one-bedroom apartments, 68 no. two-bedroom apartments and 12 no. 3-bedroom apartments ranging from 3-6 no. storeys and will also include for car parking, cycle parking, pedestrian and cycle links, storage, services and plant areas. Landscaping will include for high quality private open space, communal amenity areas and public open space provision.

3. TECHNICAL AND STATUTORY REQUIREMENTS

The Building Regulations set out requirements for specific aspects of building design and construction. The requirements concerning conservation of fuel and energy are laid out in Technical Guidance Document Part L. The aim of Part L is to limit the use of fossil fuel energy and related CO2 emissions arising from the operation of buildings, while ensuring that occupants can achieve adequate levels of lighting and thermal comfort. The key issues to be addressed to ensure compliance are as follows.

1. Limitation of primary energy use and CO2 emissions
2. Building fabric standards
3. Building services standards
4. The use of renewable energy sources

3.1. RENEWABLE ENERGY REQUIREMENTS

3.2. LIMITATION OF PRIMARY ENERGY USE AND CO_2 EMISSIONS

Primary energy use and the associated carbon dioxide emissions are calculated using the Dwelling Energy Assessment Procedure (DEAP) and these parameters must not exceed specified target values.

To achieve compliance with primary energy use rate for NZEB the energy performance coefficient (EPC) of a dwelling must be no greater than the Maximum Permitted Energy Performance Coefficient (MPEPC), which is 0.30.

An acceptable carbon dioxide emissions rate for NZEB is achieved if the calculated carbon performance coefficient (CPC) is no greater than the Maximum Permitted Carbon Performance Coefficient (MPCPC), which is 0.35.

Where a building contains more than one dwelling, every individual dwelling or alternative, the average of the dwellings within the development's Energy and Carbon performance coefficients should not exceed the maximum permitted coefficients.

3.3. BUILDING FABRIC STANDARDS

3.3.1. LIMITING OF HEAT LOSS

Best practice fabric U-values and air tightness standards will be implemented to minimise heat flow/loss through the building envelope. Detailed calculations will be undertaken to assist in determining the appropriate envelope build-up, including the type, thickness, and location of thermal insulation. The amount, type and location of glazing will be optimised to achieve an optimal balance between daylight quality and heat gains and losses.

3.3.2. PASSIVE SOLAR SHADING

To ensure that the building does not overheat, particularly in areas where there are higher levels of glazing and internal gains, adequate means of limiting summertime temperatures will be implemented. External shading in the form of window reveals and overhangs, and solar performance glazing will be incorporated into the façade design to assist in the reduction of overheating.

3.3.3. PASSIVE SOLAR HEAT GAIN

Sunlight will be used where possible to reduce the need for heating on cold days. This resource will be harnessed by allowing sunlight to enter the buildings to areas with high thermal mass such as exposed concrete.

3.3.4. NATURAL DAYLIGHT

The design will seek to maximise the use of natural daylight through the development in order to reduce energy consumption from artificial lighting. This will be achieved through an integrated approach utilising a combination of building form, light wells, glazing systems and day-light responsive control systems.

Building Regulations Part L outlines the acceptable levels of provisions necessary to ensure that heat loss through the fabric of a building is minimised. The technical document discusses various aspects, including:

- Insulation levels to be achieved by the plane fabric elements.
- Thermal bridging.
- Limitations of air permeability.

The maximum permitted area-weighted U-values in Part L 2022 are as follows:

- Pitched Roof 0.16
- Flat Roof 0.20
- Walls 0.18
- Ground Floors 0.18
- Other Exposed Floors 0.18
- External Personnel Doors, Windows and Rooflights 1.4

The maximum area-weighted U-Values may be relaxed for individual elements where necessary for design or construction reasons, (e.g., dormer cheek) but the maximum elemental U-Values still applies. Additional insulation will be required in the same elements to ensure that the maximum area-weighted averages are met. Heat losses

due to thermal bridging are considered in the DEAP calculation and thus in the calculation of the EPC, CPC and RER.

Part L requires an air permeability level no greater than $5m^3/h/m^2$ at 50 Pascals.

3.4. BUILDING SERVICES STANDARDS

Part L sets out minimum requirements for space heating, water heating, and ventilation services and associated controls in new dwellings.

3.4.1. SPACE HEATING

Space heating via decentralised air to water heat pumps or exhaust air heat pumps within each dwelling subject to detail design is currently being proposed for the dwellings. To meet compliance with the renewable energy requirements set out in Part L, a heat pump with the appropriate seasonal efficiency for space and water heating will be selected.

3.4.2. DOMESTIC HOT WATER

Domestic hot water is currently proposed by the local heat pump unit within the dwelling.

3.4.3. MECHANICAL VENTILATION

The following mechanical ventilation systems shall be considered for the development to maintain indoor air quality specifically for the tenant areas such as apartments/units/houses.

- Whole-house mechanical ventilation with heat recovery
- A centralized mechanical extract system that continuously extracts.

3.4.4. ARTIFICIAL LIGHTING (INTERIOR AND EXTERIOR)

Energy-efficient lighting will be implemented throughout the development to achieve the appropriate light levels, as recommended by CIBSE. The design of lighting systems shall ensure that lighting is only used when required, and only the specific areas where lighting is needed.

3.5. RENEWABLE ENERGY TECHNOLOGIES

New dwellings are required to install renewable energy systems to comply with the Renewable Energy Provision. Renewable energy technologies are solar thermal systems, solar photovoltaic systems, biomass systems, biofuel systems, heat pumps, wind power generators and other similar small-scale systems.

Where the EPC ≤ 0.30 and the CPC ≤ 0.35 the ratio of primary energy from renewable energy technologies to total primary energy use (known as the Renewable Energy Ratio, or RER) should be at least 0.20. An RER of 0.2 represents a 'significant level of energy provision from renewable energy technologies' in NZEB.

The following LZC technologies have been considered for this development, as listed below:

- Individual Air to Water heat pumps.
- Individual Exhaust Air Heat Pumps
- Photo voltaic, PV system for on–site electricity use (refer to figures 1 and 2)

Air to Water heat pumps, Exhaust Air Heat Pumps and PV panels are classified as renewables under Part L. These LZC technologies will be analysed in the detail design phase to ensure that the required renewable energy targets can be achieved within proposed development.

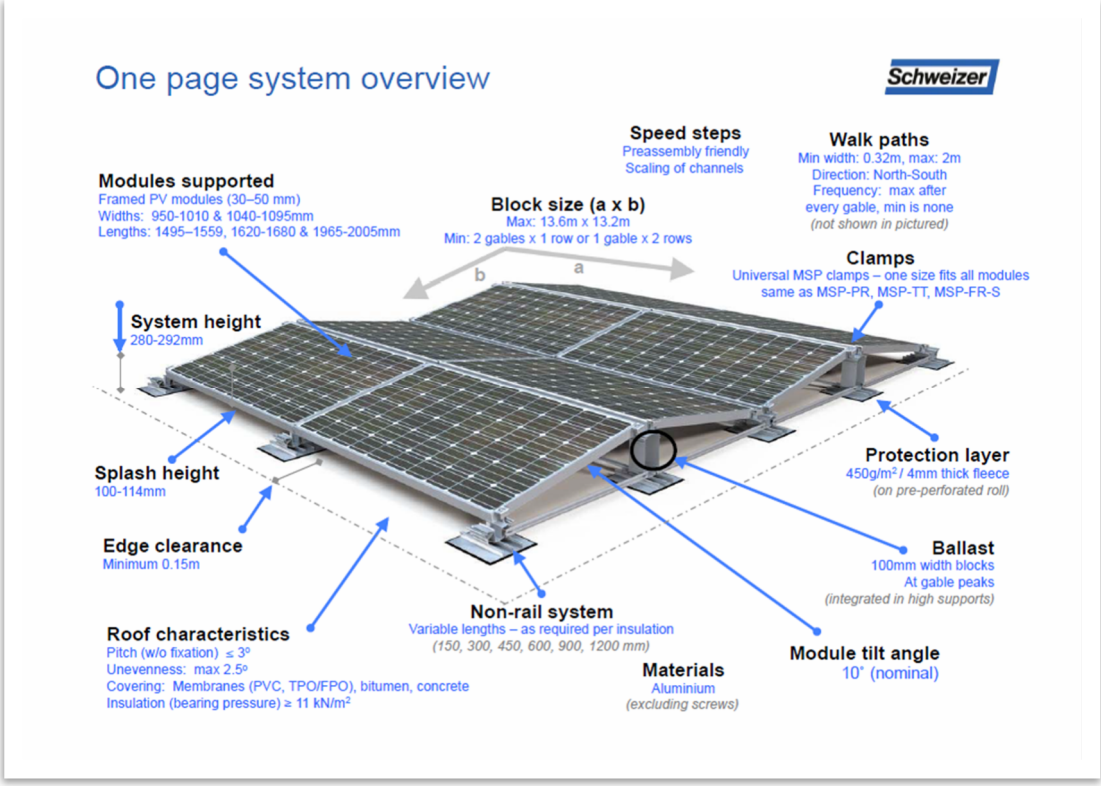

Figure 1: Typcial Photovoltaic module array

Figure 2: Typlical PV arracy installation

The energy balance for this mixed-use scheme means that a decentralised heat pump scheme with supplementary photovoltaic would be the most practical option for meeting the renewable energy requirements.

4. ENERGY AND CARBON REDUCTION MEASURES

In keeping with the Climate Action Energy Statement, the energy and carbon reduction measures were broadly structured under CAP11 compliance and TGD Part L Compliance.

4.1. CAP11 COMPLIANCE

The following NZEB technologies have been considered for this development, as listed below and which can be referenced to the requirements of CAP11:

- Decentralized Exhaust Air to Water heat pumps for space heating, domestic hot water and extract ventilation as per CAP11 parts b + e.
- Decentralized split air to water heat pump providing heating and domestic hot water with a separate ventilation system as per CAP11 parts b + e.
- Decentralized mono-bloc air to water heat pump providing heating and domestic hot water with a separate ventilation system as per CAP11 parts b + e.
- Photo voltaic system for on–site electricity use as per CAP11 e.
- Solar thermal for domestic hot water and/or space heating as per CAP11 part b + e.
- Mechanical ventilation with heat recovery as per CAP11 parts b + e.
- Continuous mechanical extract ventilation as per CAP11 part b.
- Natural ventilation with intermittent extract as per CAP11 parts b, d + e.

The energy balance for this mixed-use scheme means that a decentralised heat pump scheme with supplementary photovoltaic would be the most practical option for meeting the renewable energy requirements.

4.2. TGD PART L SPECIFICATION

The Part L and BER specification was detailed and developed in the Energy Analysis Report for both the domestic units and non-domestic landlord area. An except is outlined below in table 1. (following page)

Table 1: TDG Part L Specification

Requirements	Domestic		Non-Domestic	
	Proposed Development	Part L 2022 Reference	Proposed Development	Part L 2022 Reference
Building Envelope U-values (W/m²K)				
Flat Roof	0.15	0.20	0.15	0.20
Above-Grade Wall	0.15	0.18	0.15	0.21
Ground-Contact Floor	0.15	0.18	0.15	0.21
Exposed Floor (where applicable)	0.15	0.18	0.15	0.21
Window/Curtainwall (glazing + frame)	1.2	1.4	1.4	1.6
Rooflight (glazing + frame)	-	1.4	-	1.6
External Door	1.2	1.4	1.4	1.6
Air Leakage				
Air-Leakage Rate (m^3/hr. m^2 @ 50 Pa)	3	5	3	5
Thermal Bridging				
Y Value Target (ACDs)	**ACDs 2022 Part L**			
Electrical				
Lamp Type	LED	-	LED	-
Mechanical				
Space Heating System	EAHP	-	Elec Radiators	-
Space Cooling System	NA	-	NA	-
Domestic Hot Water System	From space heating source	-	-	-
Renewables				
Solar PV	No requirement	-	Solar PV to meet Part L compliance	-
Part L NZEB Compliance/Building Energy Rating				
EPC	Compliant	-	Compliant	-
CPC	Compliant	-	Compliant	-
RER	Compliant (met by EAHP)	-	Compliant	-
Part L Compliance	Yes	-	Yes	-
BER	A2	-	A3	-

5. SUSTAINABILITY DESIGN MEASURES

The proposed development will meet the standards of sustainable design and construction in line with all applicable regulations and planning requirements. In line with the Final Development Plan 2023-2029 the following sustainability considerations (related to energy) will be incorporated into the design and construction. This will aim to ensure the overall development:

- Reduces carbon dioxide and other emissions that contribute to climate change
- Minimises energy use,
- Supplies energy efficiently and integrates renewable energy
- Minimises indoor water use through water efficient sanitary fixtures and fittings
- Reduces air and water pollution
- Is comfortable and secure for its users
- Promotes sustainable waste behaviour
- Reduces adverse noise impacts internally and externally

6. PROPOSED PERFORMANCE

DEAP calculation for the domestic units based on the latest architectural, mechanical and electrical information for the residential units will be carried out at the next stage of the design.

NEAP calculation for the non-domestic areas based on the latest architectural, mechanical and electrical information for the landlord areas will be carried out at the next stage of the design.

The headings are specified as follows:

- EPC: Energy Performance Coefficient
- CPC: Carbon Performance Coefficient
- RER: Renewable Energy Ratio
- BER: Building Energy Rating

Domestic Apartment Units

Unit Type	Floor	Need to Comply with Part L 2022 (NZEB)			Need to Comply with Part L (Y/N)	BER to Achieve
		EPC	CPC	RER		
1 Bedroom Residential Unit	Ground Floor Unit	Y	Y	Y	Y	A2
	Middle Floor Unit	Y	Y	Y	Y	A2
	Top Floor Unit	Y	Y	Y	Y	A2
2 Bedroom Residential Unit	Ground Floor Unit	Y	Y	Y	Y	A2
	Middle Floor Unit	Y	Y	Y	Y	A2
	Top Floor Unit	Y	Y	Y	Y	A2
3 Bedroom Residential Unit	Ground Floor Unit	Y	Y	Y	Y	A2
	Middle Floor Unit	Y	Y	Y	Y	A2
	Top Floor Unit	Y	Y	Y	Y	A2

Non-domestic Landlord Area

Assessed Area	Need to Comply with Part L 2022 (NZEB)			Need to Comply with Part L (Y/N)
	EPC	CPC	RER	
Landlord Area	Y	Y	Y	Y

The proposed Mayeston Residential development will achieve TGD Part L 2022 compliance and A2 BER for residential units and achieved TGD Part L 2022 compliance for the landlord area. DEAP and NEAP calculations will be carried out at the next stage of the design.