Proposed Build to Rent Development at Former Blakes Site Residential Energy Statement

Cairn Homes Properties Ltd

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Residential Energy Statement

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1. Introduction

This Energy Statement prepared by Ethos Engineering is to form part of the planning submission documentation to An Bord Pleanala for the proposed Blake's Stillorgan residential development.

Located at the address The Hill, Stillorgan, Co. Dublin, the development is subject to the planning requirements applicable to the Dun Laoghaire Rathdown County Development Plan 2016-2022 and draft DLR development plan 2022-2028.

This report aims to satisfy the legislative planning requirements by addressing how the overall energy strategy of the proposed development has been approached in a holistic manner, striving to meet the highest standards of sustainable building design such as passive solar design, high efficiency systems and use of renewable energy technologies. This report also addresses how the proposed development will comply with NZEB (Part L 2021 Dwellings). The principles underpinning Part L compliance are energy demand reduction through passive measures and increased supply from renewable and efficient sources. The proposed design will follow this principle. Assessments carried out in this report are based on latest floor plans and elevations received from the architect.

1.1. Site and Building Summary

The development will consist of the construction of a mixed use scheme of 377 no. "Built to Rent" BTR apartments, Community Sports Hall (933 sq. m), along with 5 no. restaurant/cafés (c. 841.2 sq.m), creche (c. 215 sq. m), office hub (195.3 sq. m) and ancillary residents' support facilities/services (1,016 sq. m) laid out in 6 no. blocks ranging in height from 3-9 storeys (over basement) comprising 21 no. studio apartments, 189 no. 1 bedroom apartments, 159 no. 2 bedroom apartments & 8 no. 3 bedroom apartments, and public realm upgrades on a site of c. 1.41 hectares.

Figure 1: Blake's Stillorgan Site location and floor plan layout (outlined in red)

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2. Legislative/Planning Requirements

2.1. Part L

Technical Guidance Document Part L 2021 – Conservation of Fuel and Energy – Dwellings (public consultation edition)' (referred to in this document as "Part L or NZEB") stipulates requirements on, minimum fabric and air permeability requirements, maximum primary energy use and carbon dioxide (CO_2) emissions as calculated using the DEAP (Domestic Energy Assessment Procedure) methodology. This is a national standard and compliance is compulsory for all new dwellings. Three design aspects demonstrate compliance:

1. The limitation of primary energy use and CO_2 emissions
2. Building fabric
3. The use of renewable energy sources

2.1.1. Limitation of Primary Energy Use and CO_2 Emissions

In order to demonstrate that an acceptable primary energy consumption rate has been achieved, the calculated Energy Performance Coefficient (EPC) will be no greater than the Maximum Energy Performance Coefficient (MEPC). The MPEPC is 0.30.

To demonstrate that an acceptable CO_2 emission rate has been achieved, the calculated Carbon Performance Coefficient (CPC) of the dwellings being assessed will be no greater than the Maximum Carbon Performance Coefficient (MPCPC). The MPCPC is 0.35.

2.1.2. Building fabric

In order to limit the heat loss through the building fabric the thermal insulation for each of the plane elements of a new dwelling must meet or better the area weighted average elemental U-Values (Um) as specified by Part L, listed in Table 1 (column; Part L 2019).

Table 1: Fabric U Values Comparison Part L 2011 vs Part L 2021

Element	U-value (W/m².K)	U-value (W/m².K)
	Part L 2011	Part L 2021 (NZEB)
Pitched Roof (Insulated on slope or ceiling)	0.16	0.16
Flat Roof	0.20	0.20
Walls	0.21	0.18
Ground Floors	0.21	0.18
Exposed floors	0.21	0.18
External doors, windows and roof lights	1.60	1.40

2.1.3. Use of Renewable Energy Sources

In order to comply with NZEB, dwellings must conduct a comparative analysis for specified renewable technologies to demonstrate compliance with Regulation L3 (b).

Renewable Energy Ratio (RER) is the ratio of the primary energy from renewable energy sources to total primary energy as defined and calculated in DEAP. The following represents a very significant level of energy provision from renewable energy technologies in order to satisfy Regulation L3 (b).

Where the MPEPC of 0.3 and MPCPC of 0.35 are achieved, a RER of 0.20 represents a very significant level of energy provision from renewable energy technologies

2.2. Nearly Zero Energy Buildings (NZEB)

2.2.1. About NZEB Standard

The European Energy Performance of Buildings Directive Recast (EPBD) requires all new buildings to be Nearly Zero - Energy Buildings (NZEB) by 31st March 2020. This means that any building completed after these dates must achieve the standard irrespective of when they were started. This is quite different to the transitional arrangements for previous building regulations revisions.

'Nearly Zero - Energy Buildings' means a building that has a very high energy performance, Annex 1 of the Directive and in which "the nearly zero or very low amount of energy required should be covered to a very significant extent by energy from renewable sources, including energy from renewable sources produced on-site or nearby"

2.2.2. Implementation of NZEB in Ireland

Each member Government has discretion in how the standard is applied nationally. To comply with the NZEB requirement, the Irish Government has amended the 2011 Part L to include the following paragraphs:

'In order to achieve the acceptable primary energy consumption rate for a nearly zero energy dwelling, the calculated energy performance coefficient (EPC) of the dwelling being assessed should be no greater than the Maximum Permitted Energy Performance Coefficient (MPEPC). The MPEPC for a nearly zero energy dwelling is 0.30.

To demonstrate that an acceptable CO2 emission rate has been achieved for a nearly zero energy dwelling, the calculated carbon performance coefficient (CPC) of the dwelling being assessed should be no greater than the Maximum Permitted Carbon Performance Coefficient (MPCPC). The MPCPC for a nearly zero energy dwelling is 0.35.'

2.3. Dun Laoghaire Rathdown Development Plan 2016-2022

As part of the Dun Laoghaire Rathdown development plan the development is subject to the outlined requirements. The energy strategy will consider the following planning Policies and objectives.

2.3.1. Energy Efficient Building Design

Two European Directives 2010/31/EU 'Energy Performance of Buildings Directive' and 2012/27/EU 'Energy Efficiency Directive' will inform National energy policy for the immediate future.

Energy Performance of Buildings Directive promotes "the improvement of the energy performance of building taking into account outdoor climatic and local conditions, as well as indoor climate requirements and cost-effectiveness."

The Directive also outlines policy for increasing the number of 'near Zero Energy Buildings' (nZEB) within each Member State. A 'near zero energy building' is defined as:

''Nearly Zero-Energy Building (NZEB): means a building that has a very high energy performance, as determined in accordance with Annex I of the EU Energy Performance of Buildings Directive Recast (EPBD Recast) 2010/31/EU of 19th May 2010. The nearly zero or very low amount of energy required should be covered to a very significant extent by energy from renewable sources, including energy from renewable sources produced onsite or nearby"

Constructing less carbon-intensive forms of development will build resilience to Climate Change. This also negates concerns related to security of fossil fuel supply and the rising costs as a result of the limited future availability of fossil fuel. Much of the existing built fabric, which will last until 2050 or beyond, has already been constructed and the residual available land zoned for development is a finite resource. In order to meet National energy targets and increase the aggregate energy level, all new development should conform to the highest standard possible.

The primary focus with regard to the efficient use of energy and natural resources is to design buildings that create a thermally-efficient building envelope. Such buildings will make optimum use of free heat gains in order to minimise the requirement of space heating and, in turn, will retain this heat gain through a high standard of insulation and heat recovery systems. Where required, the use of on-site 'micro renewables' or district heating systems can offer significant opportunities.

2.3.2. Policy CC7 - Energy Performance in New Buildings

It is the **policy** of Dun Laoghaire Rathdown Council:

- That all new buildings will be required to meet the passive house standard or equivalent, where reasonably practicable. By equivalent, it is meant that approaches to demonstrate efficacy are supported by robust evidence i.e. (monitoring studies), with particular regard to indoor air quality, energy performance, comfort, and the prevention of surface/interstitial condensation.

It is an **objective** of Dun Laoghaire Rathdown Council:

- To take a pro-active approach to raising the energy efficiency standards throughout the County.
- To take a consistent approach to improving energy standards at the earliest design stages.
- To encouraging more sustainable development, the efficient use of energy and the use of renewables in new buildings.
- To promote development in new buildings to reach near Zero Energy Build and/or Passive House standard.

2.3.3. Policy CC8 – Sustainability in Adaptable Design

It is the **policy** of Dun Laoghaire Rathdown Council:

- To promote sustainable approaches to the improvement of standards for habitable accommodation, by allowing dwellings to be flexible, accessible and adaptable in their spatial layout and design.

It is an **objective** of Dun Laoghaire Rathdown Council:

- To ensure that the design of individual buildings facilitate a good quality of life for residents and secures long-term sustainability of the overall development. The design of new residential developments should consider not just the immediate needs of the prospective occupants but also their possible changing needs over the life of the building.

2.3.4. Policy CC11 – Renewable Energy and Energy Networks

It is the **policy** of Dun Laoghaire Rathdown Council:

- To support National and International initiatives to encourage the development and use of renewable energy sources.

It is an **objective** of Dun Laoghaire Rathdown Council:

- To encourage the use of renewable energy resources including photovoltaic, biomass, offshore wind, domestic wind, hydro and tidal where appropriate.
- To support the use of district heating systems, geothermal, air-to-water heat pumps and solar water heating panels.

- To encourage the development of district energy and community co-op projects as a way of contributing to meeting the National 2020 renewable energy targets and encouraging local employment.

2.4. Dun Laoghaire Rathdown draft Development Plan 2022-2028

As part of the Dun Laoghaire Rathdown draft development plan the development is also subject to the outlined requirements. The energy strategy will consider the following draft planning Policies and objectives.

2.4.1. Policy CA7 – Construction Materials

It is the **policy** of Dun Laoghaire Rathdown Council:

To support the use of structural materials in the construction industry that have low to zero embodied energy and CO2 emissions

It is an **objective** of Dun Laoghaire Rathdown Council:

To follow the National Climate Action Plan 2019 which addresses the need to "work with industry stakeholders to increase the use of low carbon materials, taking into account international best practice".

2.4.2. Policy CA13 – Solar Energy Infrastructure

It is the **policy** of Dun Laoghaire Rathdown Council:

To encourage and support the development of solar energy infrastructure, including photo voltaic (PV) and solar thermal and seasonal storage facilities infrastructure in appropriate locations

To support Ireland's renewable energy commitments by facilitating utility scale PV installations for the production of electricity.

It is an **objective** of Dun Laoghaire Rathdown Council:

To support the growth in solar photovoltaics and solar thermal use in the County.

3. Part L Compliance

The proposed development will meet or exceed where feasible the requirements of Part L. Apartments have been assessed using the Sustainable Energy Authority of Ireland (SEAI) DEAP 4.1 (beta) software which demonstrates Part L compliance. Software inputs and outputs are summarised in section 5 of this report.

3.1. Building Fabric

In order to limit the heat loss through the building fabric of the proposed apartments the thermal insulation for each of the plane elements of the development will meet or better the area weighted average elemental U-Values (Um) as specified by Part L. Table 1 lists the Part L area weighted average elemental U-Values and the targeted U-Values of the proposed design.

Table 2: Fabric U Values

Element	U value (W/m^2.K)	
	Part L 2021 (NZEB)	Targeted
Pitched Roof	0.16	0.16
Flat Roof	0.20	0.10
Walls	0.18	0.18
Ground Floors	0.18	0.15
Exposed floors	0.18	0.15
External doors, windows and roof lights	1.40	1.20
Glazing gv (EN410)		*0.4-0.6

* Subject to overheating assessment (on receipt of frozen elevations showing window openings and strategy for purge ventilation)

3.2. Thermal Bridging

To avoid excessive heat losses and local condensation problems, consideration will be given to ensure continuity of insulation and to limit local thermal bridging, e.g. around windows, doors and other wall openings, at junctions between elements and other locations.

Acceptable Construction Details will be adopted for all key junctions where appropriate (i.e. typical/standard junctions). For all bespoke key junctions certified details which have been certified by a third party certification body (such as Agrément or equivalent) will be used or calculated by an NSAI registered thermal modeller.

Heat loss associated with thermal bridges is taken into account in the DEAP methodology and can heavily impact the calculated energy use and CO_2 emissions. In general this is done by including an allowance for additional heat loss due to thermal bridging, expressed as a multiplier (Ψ, psi) applied to the total exposed surface area or by the calculation of the transmission heat loss coefficient H_{TB}. A default Y-value of 0.15 is applied in DEAP; the proposed design is targeting a Ψ value of at least 0.08 or equivalent H_{TB} value.

3.3. Building Envelope Air Permeability

In addition to fabric heat loss/gain, considerable care will be taken during the design and construction to limit the air permeability (Infiltration). High levels of infiltration can contribute to uncontrolled ventilation.

Part L requires an air permeability level no greater than 5m^3/m^2/hr @ 50Pa for a new dwelling; which represents a reasonable upper limit of air tightness. The design intent for the proposed apartments and houses will be to target an air permeability of 3m^3/m^2/hr @ 50Pa.

Air permeability testing will be carried out by a person certified by an independent third party (National Standards Authority of Ireland or equivalent certification body) in accordance with I.S. EN 13829: 2000 "Thermal performance of buildings: determination of air permeability of buildings: fan pressurisation method". All apartments will be tested in this way.

3.4. Building Services

3.4.1. Heating Appliance Efficiency

Regulation L3 (d) requires that space heating and water heating systems in dwellings are energy efficient, with efficient heat sources and effective controls. More specifically, Regulation L3 (e) provides that oil and gas fired boilers must achieve a minimum seasonal efficiency of 90%.

The proposed design for the apartments are to generate heat for space heating and domestic hot water (DHW) by using a centralised, group heating system with heat pump technology, delivering heat via heat interface units (HIUs). Heating will be provided to the space by appropriately sized radiators which meet SR50 calculations.

3.4.2. Space Heating and Hot Water Supply System Control

Space and water heating systems should be effectively controlled so as to ensure the efficient use of energy by limiting the provision of heat to that required to satisfy the user requirements.

The design intent is to provide the following minimum level of control;

- Automatic control of space heating on the basis of room temperature
- Automatic control of heat input to stored hot water on the basis of stored water temperature
- Separate and independent automatic time control of space heating and hot water
- Shut down of boiler or other heat source when there is no demand for either space or water heating from that source

We propose to use a control system with full time and temperature control in each occupied room

3.4.3. Insulation of Hot Water Storage Vessels, Pipes and Ducts

All hot water storage vessels, pipes and ducts (where applicable) will be insulated to prevent heat loss. Adequate insulation of hot water storage vessels will be achieved by the use of a storage vessel with factory applied insulation tested to BS 1566, part 1:2002 Appendix B. Water pipes and storage vessels in unheated areas will be insulated for the purpose of protecting against freezing. Technical Guidance Document G and Risk report BR 262, Thermal insulation avoiding risks, published by the BRE will be followed.

3.4.4. Low Flow Sanitary Ware

DEAP 4.2 for assessing the building energy rating now gives credit for water efficient showers, taps, wash hand basins and baths.

Hot water usage in DEAP can be reduced by 5% if the dwelling is designed to achieve a water use target of not more than 125 litres per person per day (this includes all water use, hot and cold). This will benefit part L/BER calculations. From a singular DEAP entry however, the presence of baths and the flow rate for showers have the largest impact to the DEAP calculations in terms of water use.

The 125 per person per day target can be achieved by using water efficient sanitary fittings and fixed low-flow restrictors which can be availed of through manufacturer's product information to determine the consumption of each appliance. The Architect will need to confirm the following can be met.

Table 3: Sanitary Ware - Water Efficiency Targets

Sanitary Fitting	Target Capacity/Flow Rate	Unit of Measure
WC's (Dual Flush)	6	Full Flush - Volume (litres)
	4	Part Flush - Volume (litres)
Taps (excluding Kitchen/utility taps)	≤3.75	Flow Rate (Litres/min) @ 3 Bar
Taps (Kitchen/Utility Sink taps)	≤ 5	Flow Rate (Litres/min) @ 3 Bar
Bath	180	Capacity to Overflow (Litres)
Dishwasher	≤1	Litres/Place Setting
Washing Machine	≤ 6	Litres/Kg dry Load
Shower	≤ 6	Flow Rate (Litres/min) @ 3 Bar

3.4.5. Lighting Design

Based on DEAP 4.2 there is a more focused emphasis on lighting in which credit will be given for an appropriate for an appropriate LED lighting design in relation to the dwelling. In the case of a deprived or over-elaborated lighting design spec, there will be a penalty for the building energy rating. A full lighting design analysis using appropriate software i.e. Dialux or Relux can help create a balanced lighting design.

3.4.6. User Information

After the completion of the proposed Development the end user(s) will be provided with sufficient information about the building, its installed services and their maintenance requirements so that the Apartments can be operated in line with their optimum operation for energy efficiency.

3.5. Use of Renewable Energy Sources

The following low & zero carbon technologies were reviewed in terms of their applicability for this development;

- Micro Wind
- Wind Power
- Photovoltaic Cells (PV)
- Solar Thermal Collectors
- Biomass Heating
- Ground Source Heat Pumps (GSHPs)
- Air Source Heat Pumps (ASHPs)
- Exhaust Air Heat Pumps (EAHPs)
- Combined Heat & Power (CHP)

Technology	Feasibility			Comments
	High	Medium	Low	
Micro Wind 			√	**Technology Description:** Micro wind turbines can be fitted to the roof of a building but would contribute a negligible amount of energy to the development. **Applicability to this Development:** Due to the suburban nature of the development site, this renewable has not been deemed viable. Vertical axis wind turbines may be more suited to this building, but there would still be the obvious aesthetic and potential noise issues.
Wind Power 			√	**Technology Description:** Mast-mounted wind turbines can be located in an open area away from obstructions such as buildings and tall trees. **Applicability to this Development:** Due to the suburban location of the site and its location close to other residential buildings it is deemed that a large wind turbine installation is not feasible.
Solar Photovoltaic (roof mounted) 	√			**Technology Description:** Photovoltaic (PV) Cell technology involves the conversion of the sun's energy into electricity. PV panels can be discrete roof-mounted units or embedded in conventional windows, skylights, atrium glazing, façade cladding etc. **Applicability to this Development:** Residential developments can be suitable locations for the installation of PV depending on orientation roof pitch and over-shading while also being virtually maintenance free. PV should be included for this development and assessed further at detailed design.

Technology	Feasibility			Comments
	High	Medium	Low	
Solar hot water systems 			√	**Technology Description:** Active solar hot water technology uses the sun's thermal radiation energy to heat fluid through a collector in an active process. **Applicability to this Development:** Due to the maintenance factor surrounding solar panels a solar hot water system is not considered feasible at this site.
Biomass Heating 			√	**Technology Description:** Biomass boilers work on the principle that the combustion of wood chip or pellets can create heat for space heating and hot water loads. **Applicability to this Development:** This technology requires substantial space allowance in a boiler room, access for delivery trucks, a thermal accumulator tank and considerable space for fuel storage of wood chips or pellets. The system also requires regular maintenance to remove ash etc. The use of biomass calls for a continuous local supply of suitable fuel to be truly sustainable. Concerns exist over the level of NOx and particulate emissions from biomass boiler installations, particularly in urban areas.
Ground source heat pump (GSHP)			√	**Technology Description:** GSHP technologies exploit seasonal temperature differences between ground and air temperatures to provide heating in the winter and cooling in the summer. GSHP systems use some electricity to run the heat pump, but as most of the energy is taken from the ground, they produce less greenhouse gas than conventional heating systems. Ground source heat systems deliver low temperature heat and high temperature cooling, suitable for underfloor heating or chilled beams. **Applicability to this Development:** Site restrictions would require the use of vertical boreholes as opposed to horizontal ground loops. GSHP technology would need further

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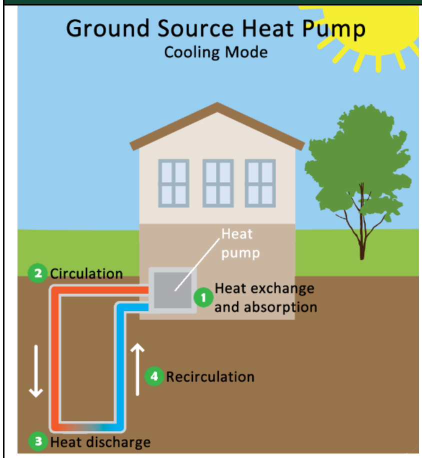
Technology	Feasibility			Comments
	High	Medium	Low	
				investigation during detailed design and will depend on a favourable ground Thermal Response Test. Additionally capital costs are high and ideally, there should be a good balance between heating and cooling loads to allow for high COPs and reasonable capital payback. While a well-designed GSHP system operating under favourable conditions can achieve good efficiencies, the capital cost difference may still outweigh potential energy savings. As there is no cooling load, this investment is not deemed viable
Air source heat pump (ASHP) 	√			**Technology Description:** ASHP technologies exploit seasonal temperature differences between external air and refrigerant temperatures to provide heating in the winter and cooling in the summer. ASHP systems use more electricity to run the heat pump when compared to GSHP, but as most of the energy is taken from the air, they produce less greenhouse gas than conventional heating systems over the heating season. Their COP can reduce to below 2.0 when outside air temperatures are ≤0°C and they can require additional energy for a defrost cycle. **Applicability to this Development:** Heat pumps are generally safer than the combustible based heating systems and have a relatively low carbon footprint. Heat pumps can deliver heat at low outside temperatures which can be considered suited to the Irish climate. For this reason ASHP has been deemed suitable for the proposed development for the provision of space heating and/or DHW demand.

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Technology	Feasibility			Comments
	High	Medium	Low	
Exhaust Air source heat pump (EAHP) 	√			**Technology Description:** The exhaust air heat pump uses otherwise wasted heat in the warm air areas of your home (bathrooms, kitchen, utility..) and transfers that heat to hot water using the same principles as air source and ground source heat pumps. An Exhaust Air Heat Pump (EAHP) extracts heat from the exhaust air and transfers the heat to domestic hot water and/or hydronic heating system (underfloor heating, radiators).This type of heat pump requires a certain air exchange rate to maintain its output power. Since the inside air is approximately 20-22 degrees Celsius all year round, the maximum output power of the heat pump is not varying with the seasons and outdoor temperature **Applicability to this Development:** Exhaust Air Heat Pumps are best suited to apartments which will have low fabric heat losses. The latest units with inverter controlled compressor also have a ducted outside air supply which means the unit can draw on outside air when extract rates are low but without the need for an external condenser unit.
Combined Heat and Power (CHP) 	√			**Technology Description:** Combined heat and power (CHP), also known as co-generation, is the simultaneous generation of both useable heat and electrical power from the same source. A CHP unit comprises of an engine (referred to as the prime mover) in which fuel is combusted. The mechanical power produced by the engine is used to generate electricity using an integral electrical generator. The heat emitted from the engine (waste heat) is used to provide space heating and domestic hot water **Applicability to this Development:** CHP systems can be used in applications where there is a significant year-round demand for heating in addition to the electricity generated. CHP has been deemed suitable for the proposed development for the provision of space heating and/or DHW demand due to annual hours of operation considering the nature of the development.

4. Passive Design

A focus for this project is to operate the building with low energy consumption. The building will be designed to minimise/avoid the requirements for mechanical ventilation and/or air conditioning. This will be done with the use of passive systems to control the internal environment, where possible.

This will be further developed with the client, architect, structural engineer and cost consultant as the scheme develops. The passive systems will aim to reduce external noise and pollution, reduce heat loss (in winter), reduce solar gains (in summer), and maximum daylight while maintaining comfort conditions.

4.1. Natural Ventilation

Natural ventilation will be incorporated wherever possible via either single sided or cross ventilation. Where natural ventilation cannot provide the comfort and air quality needs of the occupants or the space and mechanical ventilation cannot be avoided, these systems will incorporate energy efficient solutions to maximise the efficiency of the systems through the use of heat recovery and the efficient controls. This will be fully assessed during detailed design in accordance with procedures in CIBSE TM59 – 'Design methodology for the assessment of overheating risk in homes'.

For dwellings that incorporate mechanical solutions as in paragraph 4.2 below, it should be noted that these systems will not be sufficient to prevent summertime overheating alone. CIBSE TM59 states that 'homes that are predominantly naturally ventilated, including homes that have mechanical ventilation with heat recovery (MVHR), with good opportunities for natural ventilation in the summer should assess overheating using the adaptive method'. This will involve detailed consideration of openable windows and doors and testing the design for a number of typical worst case apartments using dynamic simulation software.

4.2. Balanced Whole House Mechanical Ventilation with Heat Recovery

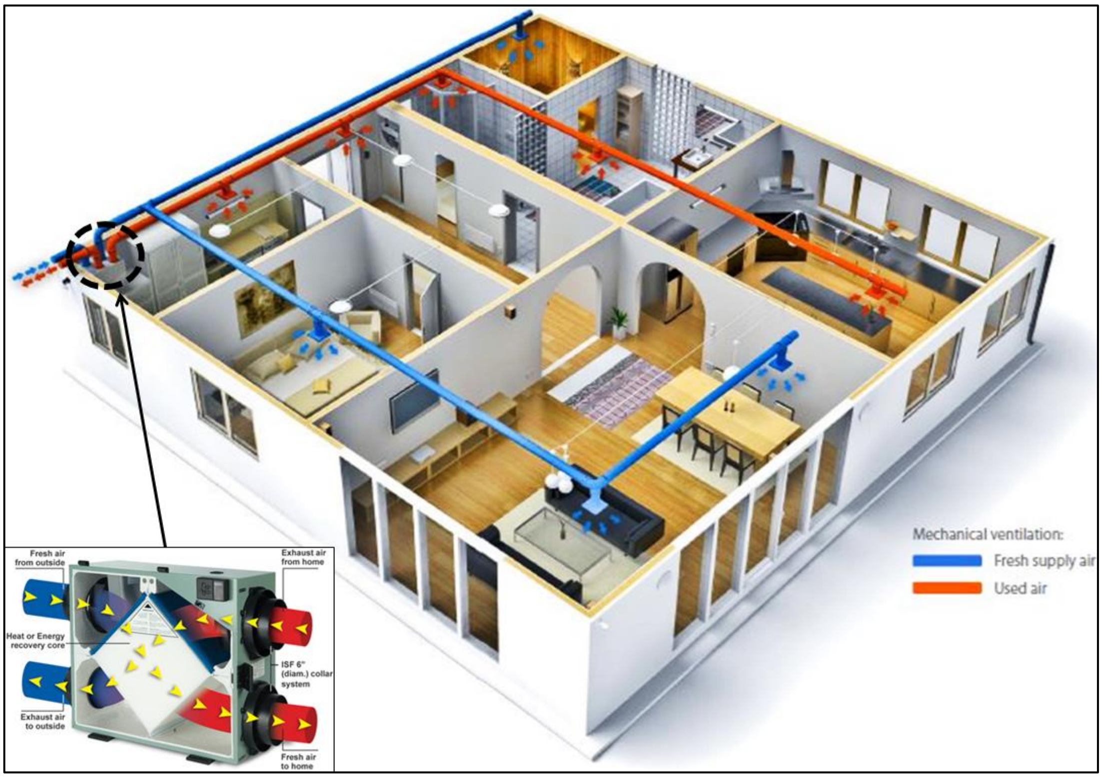

Figure 3: Balanced Whole house Mechanical Ventilation with heat recovery

The proposed system for apartments will use mechanical ventilation with heat recovery (MVHR), which is a whole-house ventilation system that generally supplies fresh air to dry rooms and extracts stale air from wet rooms.

Both air flows are to be ducted and driven by two fans, one on the supply side and one on the extract side. This will provide whole building ventilation as the mechanical extract fan will remove odours and excessive humidity to maintain a good air quality. A key component of the system is that a heat recovery unit is utilised to transfer heat from the warm exhaust air to the fresh air, achieving heat recovery.

The ventilation system should be listed on SAP appendix Q which ensures a suitable method of testing procedure for Irish use.

4.3. Passive Solar

Daylight in buildings creates a positive environment by providing connectivity with the outside world and assisting in the wellbeing of the building inhabitants. Daylight also represents an energy source; it reduces the need for artificial lighting, particularly in dwellings where natural light alone is often sufficient throughout the day. The design intent is to maximise the use of natural daylight to enhance visual comfort and not compromise thermal performance. The proposed development will have glazing specified that will minimise thermal conduction (u-value) while allowing for sufficient daylight levels and the maximisation of solar gain. Maximising solar gain within the limitations of thermal comfort will allow for a portion of the space heating load to be met passively during the day.

4.4. Water Conservation

During the detailed design stage for the proposed development the consumption of potable water in sanitary applications will be strongly considered and where possible low water use fittings and dual flush WCs will be specified.

A rainwater harvesting system will also be considered for this project and during the detailed design stage; calculations will be carried out to evaluate the suitability of this type of system. Reclaimed rainwater can be used for a range of applications such as toilet flushing, washing machines and irrigation. There are three main types of rainwater recovery systems: indirectly pumped, directly pumped, and gravity fed. The benefits of rain water harvesting is twofold as not only does it help to reduce the use of treated mains water for non-potable use, it can also help reduce water run –off and risk of flooding.

5. DEAP Calculation Summary

DEAP calculations have been carried out using SEAI DEAP 4.2 software in order to demonstrate compliance with Part L 2021 on a sample of 2-bed apartment. The DEAP calculations are based on the following provisional inputs:

5.1. SEAI DEAP 4.2 Input – Apartment

- Fabric U Values
  - Wall U value = 0.18 W/m^{2}K
  - Floor = 0.15 W/m^{2}K
  - Flat Roof = 0.10 W/m^{2}K
  - Doors = 1.40 W/m^{2}K
  - Glazing/Balcony door = 1.20 W/m^{2}K (whole window unit inclusive of frame)
  - Glazing gv (EN410) = 0.4-0.6 (subject to overheating study)
    - Frame Factor = 0.7 (i.e. 30% frame)
- Air permeability = 3 m^3/m^2/hr at 50 Pa
- Thermal bridging = 0.08 W/m^2.K

- Ventilation = MVHR
- Specific Fan Power = 0.46 W/l/s (Sap appendix Q - 2012)
- Heat Exchanger Efficiency = 92% (Sap appendix Q - 2012)
- Lighting = 100% Low energy
- Heating system = Community Heating
- Distribution system loss and gains;
  - Heating system category: Group heating schemes
  - Heating system: Group heating boilers
  - Heating System Controls: Full time and temperature zone control
- Charging on heat consumed = Yes
- Distribution loss factor = 1.05
- Heating system: Air-Water heat pump (electric)
  - Heat Pump efficiency = 400%
  - Heat Emitter Type: Fan coil/low temperature radiators only
- Sub-category: Boiler
  - Heating fuel = Mains gas
  - Boiler efficiency = 91%
- Space heating system also supplies DHW = Yes
- Heat Interface Unit Loss Factor = 0.364 kWh/day
- Heat Interface Unit Water Storage Volume = 3.4L
- Renewable Sources = 1no. PV Panel

5.2. SEAI DEAP 4.2 Output – Apartment

Table 4 summaries the results of the preliminary DEAP calculations carried out for a sample 2-bed apartment using the energy strategy detailed in this report. Appendix 1 contains the DEAP output which demonstrates Part L 2021 (NZEB) compliance.

Table 4: DEAP Output Summary - Apartment

Apartment		Energy Rating	EPC	CPC	RER
Top Floor	2-Bed apartment	A3	0.293	0.253	0.323

5.3. Conclusions

5.3.1. Part L 2021 (NZEB) - Apartment compliance:

This report confirms that the proposed Blake's Stillorgan apartments will comply with Part L 2021 regulations (NZEB). The report highlights that Part L will be achieved if applied as the report suggests. The strategies adopted for the Blake's Stillorgan apartments are outlined here:

- U-values for floor and roof will exceed the building regulation backstops
- Using Glazing U-Value target outlined in this report
- Better performance air permeability than the backstop, adding to building air tightness and ventilation effectiveness
- Balanced whole house mechanical ventilation with heat recovery
- High performance thermal bridging
- Air source heat pump (ASHP) to provide space Heating (via radiators) and domestic hot water
- Renewable Sources – 1 no. PV Panel per 50% of apartments as required

Appendix 1: DEAP Part L Compliance Report

Part L Report
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Part L Specification

BER IS NOT PUBLISHED

Property Details

Dwelling Type	Top-floor apartment	**Type of BER rating**	New Dwelling - Provisional
Address line 1	Blakes Stillorgan - 2-bed - Block 05 - Top	**Year of Construction**	2020
Address line 2		**Date of Assessment**	29/01/2021
Address line 3	new	**Date of Plans**	12/05/2019
County	Dublin 2	**Planning Reference**	DSDZ3864/14
Eircode		**Building Regulations**	2019 TGD L
BER Number		**MPRN No.**	0
Purpose of Rating	Sale	**Is MPRN shared with another dwelling?**	N/A
Assessor Name	Jamie Molony	**Assessor Number**	106070
Comment		**BER number assigned to shared dwelling**	N/A

Dimension Details

	Area [m²]	Height [m]	Volume [m³]
Ground Floor	77.00	2.85	219.45
First Floor	0.00	0.00	0.00
Second Floor	0.00	0.00	0.00
Third and other floors	0.00	0.00	0.00
Room in roof	0.00	0.00	0.00
Total Floor Area	77.00		219.45

Living Area [m²]	38.27	**Living area percentage [%]**	49.70
No of Storeys	1		

Ventilation Details

	Number		
Chimneys	0	**Has permeability test been carried out?**	Yes
Open Flues	0	**Structure type**	N/A
Fans & Vents	1	**Is there a suspended wooden ground floor?**	No
Number of flueless combustion room heaters	0	**Percentage windows/doors draught stripped [%]**	N/A
Is there a draught lobby on main entrance?	Yes	**Number of sides sheltered**	2
Ventilation method	Balanced whole-house mechanical ventilation with heat recovery	**Mechanical Ventilation Manufacturer**	vent Axia
Specific fan power [W/(L/s)]	0.460	**Mechanical Ventilation Model Name**	Sentinel Kinetic Advance S
Heat exchanger efficiency [%]	92.00	**How many wetrooms (incl. kitchen)?**	2 rigid

Building Elements - Floor Details

Type	Description	Underfloor heating	U-Value [W/m²K]	Area [m²]
Non-Heat Loss Floor	Ground Floor	N/A	0	77

Building Elements - Roof Details

Type	Description	U-Value [W/m²K]	Area [m²]
Flat Roof	Main Roof	0.1	77

Building Elements - Wall Details

Type	Description	U-Value [W/m²K]	Area [m²]
300mm Cavity	Brick Cavity Wall	0.18	48.33
Semi Exposed 100mm Block Wall adjacent unheated circulation space	Wall to unheated Corridor	0.19	23.69

Building Elements - Door Details

Description	Number of Doors	U-Value [W/m²K]	Area [m²]
	1	1.36	1.850

Building Elements - Window Details

Glazing type	User defined u-value	U-Value [W/m²K]	Area [m²]
Double-glazed, argon filled (low-E, en = 0.15, hard coat)	Yes	1.300	20.340
Double-glazed, argon filled (low-E, en = 0.15, hard coat)	Yes	1.300	1.440

Other Details

Thermal bridging factor [W/m²k]	0.0900	**Thermal mass category of dwelling**	Medium-low

Heating System - Solar Water Heating

Solar Water Heating Present?	No	**Aperture area of solar collector [m²]**	N/A
Type, manufacturer, model	N/A		
Zero loss collector efficiency, n0	N/A	**Collector heat loss coefficient, a1 [W/m²>K]**	N/A
Annual Solar Radiation [kWh/m²] (Refer to Appendix H in DEAP)	N/A	**Overshading factor**	N/A
Dedicated storage volume [Litres]	N/A	**Combined Cylinder**	N/A
Solar fraction [%]	0.000		

Heating System - Hot Water System

Distribution Losses	245.19	**Combi boiler present?**	No
Supplementary electric water heating	N/A	**Water Storage Volume [L]**	3
Hot water storage manufacturer and model name		**Declared loss factor [kWh/d]**	N/A
Temperature factor unadjusted	1	**Temperature Factor Multiplier**	1
Primary Circuit loss type	Community heating		
Is hot water storage indoors or in group heating system?	Yes	**Insulation type**	Factory Insulated
Insulation thickness [mm]	20		

Heating System - Dist. system losses and gains

Temperature adjustment [°C]	0.000	**Control Category**		**Responsiveness category**	
Central heating pumps	0	**Oil Boiler Pump**	0	**Oil boiler pump inside dwelling**	No
Gas boiler flue fan	0	**Warm air heating or fan coil radiators present**	No		

Other Details

Thermal bridging factor [W/m²k]	0.0900	**Thermal mass category of dwelling**	Medium-low

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Heating System - Energy Requirements (Group)

Charging based on heat consumed?	Yes	**Distribution loss factor**	1.05	**Fraction of heat from waste heat/CHP**	0.75
% of heat from secondary heating		**Efficiency of secondary heating [%]**		**Secondary heating fuel type**	Mains Gas
Heating System 1 percentage of heat [%]	100	**Heating System 1 efficency [%]**	89.6	**Heating System 1 fuel type**	Mains Gas
Solar space heating percentage of heat [%]					
CHP electrical efficiency	0.291	**CHP thermal efficiency**	0.641	**CHP Fuel type**	Mains Gas

Summary for Part L Conformance (Applies to TGD L 2008/2011/2019 for new dwellings only)

BER Number		**Building Regulations**	**2019 TGD L**
BER Result	A3	**Energy Value kWh/m²/yr**	**53.26**
CO_2 emissions [kg/m²/yr]	9.37		
EPC	0.293	**EPC Pass/Fail**	**Pass**
CPC	0.253	**CPC Pass/Fail**	**Pass**

Part L Conformance - Fabric

Conformity with Maximum avg U-value requirements	**U-value [W/m²K]**	**Pass/Fail**	**Conformity with Maximum U-value requirements**	**U-Value [W/m²K]**	**Pass/Fail**
Pitched roof insulated on ceiling	0.00	Pass	**Roofs**	0.1	Pass
Pitched roof insulated on slope	0	Pass	**Walls**	0.18	Pass
Flat Roof	0.1	Pass	**Floors**	0	Pass
Floors with no underfloor heat	0.00	Pass	**External doors / windows / rooflights**	1.36	Pass
Floors with underfloor heat	0.00	Pass			
Walls	0.18	Pass			
Percentage of opening areas [%]	30.69				
Average U value of openings	1.30	Pass			
Permeability test carried out and meets guidelines in TGD L				0.15	Pass

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Part L Conformance - Renewables (applies to TGD L 2019)

	Source	Renewables Primary Energy	Total Primary Energy	RER
+ Delivered energy	PV/Wind	480.73	480.73	
+ Delivered energy	Other	0.00	0.00	
+ Delivered energy	Solar	0.00	0.00	
+ Delivered energy	Biomass	0.00	0.00	
+ Delivered energy	Biodiesel	0.00	0.00	
+ Delivered energy	Bioethanol	0.00	0.00	
+ Environmental energy	HP	0.00	0.00	
+ Saved energy	CHP	1414.77	1414.77	
+ District heating	District Heating	0.00	0.00	
+ Delivered energy	Grid	0.00	-2760.11	
+ Delivered energy	Thermal	0.00	6739.71	
SUBTOTAL		1895.50	5875.10	0.32 - Pass
Energy not used in Regulated Loads	PV/Wind/CHP	0.00	-2760.11	
TOTAL		1895.50	8635.21	0.22

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ISO 9001:2008 EQA QUALITY ASSURED COMPANY

ISO 14001:2004 EQA ENVIRONMENTAL APPROVED SYSTEM

OHSAS 18001:2007 EQA OCCUPATIONAL, HEALTH & SAFETY APPROVED SYSTEM