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TABLE OF CONTENTS

1 EXECUTIVE SUMMARY

This energy statement outlines the proposed energy conservation strategy for the proposed student residential development at the strategic housing development at this 0.3968 ha site known as a portion of the Brewery Block, bounded by Newmarket, St Luke's Avenue, Brabazon Place/Brabazon Row and Ardee Street, Dublin 8.

This report demonstrates how the energy performance and the sustainability of construction of the proposed development meets or exceeds legislative/planning requirements.

The energy strategy has been approached in a holistic manner using the energy hierarchy "Be Lean, Be Clean, Be Green" in order to comply with Part L 2017 requirements for energy performance and greenhouse gas emissions.

The energy statement focuses on energy conservation and energy efficiency, in order to maximise the overall energy performance of the proposed development.

Sustainable design features of the development include enhanced building fabric performance, high efficiency HVAC systems and high efficacy lighting with occupancy and daylight control where applicable.

The proposed energy strategy as detailed in this report will be compliant with the requirements of Part L 2017 and will achieve a BER certification of 'A3' or greater.

2 INTRODUCTION

The development will consist of the construction of a part-two to part-eight storey mixed-use development in three blocks, comprising a co-working shared space with associated café; and 368 No. student accommodation bed spaces with associated facilities.

The development also proposes upgrade works to existing structures to be retained, signage; cycle parking; a service lay-by; hard and soft landscaping and external amenity spaces including courtyards) and a roof garden at fifth floor level of Block A facing; balconies on Block B and Block C; plant; and all associated works above and below ground.

The proposed design will achieve or exceed the requirements of the national building regulations for energy performance and carbon dioxide (CO2) emissions set out in 'Technical Guidance Document Part L - Conservation of Fuel and Energy 2017 - Buildings other than Dwellings'.

Additionally, a provisional Building Energy Rating (BER) will also be produced in line with the EU Directive on Energy Performance in Buildings (EPBD). While the project is not targeting any specific BER certification, an 'A3' BER or higher is likely, due to the NZEB performance required under Part L 2017.

Located in the Dublin 8, the development is subject to the planning requirements set out in the DCC Development Plan 2016-2022.

In order to meet the legislative and planning requirements the overall energy strategy of the proposed design has been approached in a holistic manner using the adopted energy hierarchy "Be Lean, Be Clean, Be Green". Energy performance has been assessed in accordance with the Non-Domestic Energy Assessment Procedure (NEAP) methodology to demonstrate the systematic improvement in energy performance.

Assessments carried out in this report are based on latest floor plans and elevations received from the architect and all design parameter figures and assumptions stated are based on the current preliminary design received from the design team; these are subject to change during detailed design.

The proposed development will meet the highest standards of sustainable design and construction in line with all applicable regulations and planning requirements. Where feasible the development will aspire to exceed these requirements.

In line with the Dublin City Development Plan 2016-2022 the following sustainability considerations will be inherently addressed during design and construction to ensure the overall development;

- Makes most efficient use of land and existing buildings
- Reduces carbon dioxide and other emissions that contribute to climate change
- Is designed for flexible use throughout its lifetime
- Minimises energy use, including by passive solar design, natural ventilation, and vegetation (green roofs etc.) on buildings
- Minimises energy use, including passive solar design and natural ventilation
- Supplies energy efficiently and incorporates decentralised energy systems such as District Heating and uses renewable energy where feasible
- Manages flood risk, including application of sustainable drainage systems (SuDS) and flood resilient design for infrastructure and property
- Reduces air and water pollution
- Is comfortable and secure for its users
- Conserves and enhances the natural environment, particularly in relation to biodiversity, and enables ready access to open spaces
- Avoids the creation of adverse local climatic conditions
- Promotes sustainable waste behaviour
- Reduces adverse noise impacts internally and externally

3 LEGISLATIVE/PLANNING REQUIREMENTS

The proposed development is subject to compliance with;

- Nation legislation to meet the requirements of the EU Directive on Energy Performance in Buildings (EPBD) – Part L
- Local planning requirements as determined by Dublin City Council
- Dublin City Development Plan 2016-2022

3.1 EU LEGISLATIVE INITIATIVES

The Directive on Energy Performance in Buildings (EPBD), adopted in 2002, primarily affects energy use and efficiency in the building sector in the EU. Ireland transposed the EPBD through the Energy Performance of Buildings Regulations 2003 (S.I. 666 of 2006) which provided for the Building Energy Rating (BER) system to be administered and enforced by the Sustainable Energy Authority of Ireland (SEAI).

The Recast EPBD, adopted in May 2010, states that reduction of energy consumption and the use of energy from renewable sources in the buildings sector constitute important measures needed to reduce the EU's energy dependency and greenhouse-gas emissions. The directive aims to have the energy performance of buildings calculated on the basis of a cost-optimal methodology. Member states may set minimum requirements for the energy performance of buildings.

The recast EPBD requires Ireland to ensure, among other obligations, that:

- Building energy ratings are included in all advertisements for the sale or lease of buildings;
- Display Energy Certificates (DECs) are displayed in public and privately-owned buildings frequently visited by the public;
- Heating and air-conditioning systems are inspected;
- Consumers are advised on the optimal use of appliances, their operation and replacement;
- Energy Performance Certificates and inspection reports are of a good quality, prepared by suitable qualified persons acting in an independent manner, and are underpinned by a robust regime of verification; and
- A national plan is developed to increase the number of low or nearly zero energy buildings (NZEB), with the public sector leading by example.

The directive was transposed by the European Union (Energy Performance of Buildings) Regulations 2012 (S.I. 243 2012).

Part 2 of the EPBD deals with Alternative Energy Systems and applies to the design of any large new building, where a planning application is made, or a planning notice is published, on or after 1st of January 2007. This calls for a report into the economic feasibility of installing alternative energy systems to be carried out during the design of the building. Systems considered as alternative energy systems are as follows:

- Decentralised energy supply systems based on energy from renewables
- Cogeneration i.e. Combined heat and power systems
- District or block heating or cooling, if available, particularly where it is based entirely or partially on energy from renewable sources
- Heat pumps

The EPBD requires all new buildings to be Nearly Zero Energy Buildings (NZEB) by 31st December 2020 and all buildings acquired by public bodies by 31st December 2018; defining NZEB as:

"A building that has a very high energy performance, as determined in accordance with Annex 1. 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,"

3.2 PART L 2017 (NZEB)

Technical Guidance Document Part L – Conservation of Fuel and Energy 2017 - Buildings other than Dwellings' (referred to in this document as 'Part L 2017') stipulates requirements on, minimum fabric and air permeability requirements, maximum energy use and carbon dioxide (CO2) emissions and renewable energy requirements as calculated using the NEAP (Non-Domestic Energy Assessment Procedure) methodology.

Part L 2017 defines how buildings in Ireland will meet "Nearly Zero Energy Building" (NZEB) performance as required by the Energy Performance of Buildings Directive (EPBD). NZEB is not separate to the building regulations, it is merely a term used to define the targeted performance of new building regulations; i.e. buildings compliant with the requirements of Part L 2017 will be "NZEB".

Part L 2017 is the nation legislation to meet the requirements of the EPBD and compliance is compulsory for all new buildings other than dwellings from 31st December 2020. Part L 2008 ceases to have effect from 31st December 2018.

Under Part L 2017, an NZEB Reference building has been specified which defines the 'Maximum Permitted Energy Performance Coefficient' (MPEPC) and 'Maximum Permitted Carbon Performance Coefficient' (MPCPC).

Additionally, Part L 2017 introduces the requirement to meet a significant portion of the buildings primary energy use from renewables; the "Renewable Energy Ratio" (RER).

3.3 DUBLIN CITY DEVELOPMENT PLAN 2016-2022

The development is subject to the Dublin City Development Plan 2016-2022. The following council policies have been considered as part of the proposed Energy strategy:

Student Accommodation

It is the **policy** of Dublin City Council:

▪ QH31: To support the provision of high-quality, professionally managed and purpose built third-level student accommodation on campuses or in appropriate locations close to the main campus, in the inner city or adjacent to high-quality public transport corridors and cycle routes, in a manner which respects the residential amenity and character of the surrounding area, in order to support the knowledge economy. Proposals for student accommodation shall comply with the 'Guidelines for Student Accommodation' contained in the development standards.

Climate Change
It is the **policy** of Dublin City Council:

- CC1: To prioritise measures to address climate change by way of both effective mitigation and adaptation responses in accordance with available guidance and best practice.
- CC2: To mitigate the impacts of climate change through the implementation of policies that reduce energy consumption, reduce energy loss/wastage, and support the supply of energy from renewable sources.

It is an objective of Dublin City Council:

- CCO1: To implement the 'National Climate Change Adaptation Framework' (2012) by adopting a Climate Change Action Plan for Dublin City which will assist towards meeting National and EU targets. This will be adopted by end of 2018.
- CCO2: To support the implementation of the forthcoming 'Climate Change Strategy for Dublin and Climate Change Action Plan for Dublin City.
- CCO3: To support the implementation of the national level 'Strategy for Renewable Energy 2012-2020' and the related National Renewable Energy Action Plan (NREAP) and National Energy Efficiency Action Plan (NEEAP)
- CCO4: To support the implementation of the 'Dublin City Sustainable Energy Action Plan 2010-2020' and any replacement plan made during the term of this Development Plan.

Sustainable Energy / Renewable Energy
It is the policy of Dublin City Council:

- CCO5: To support and collaborate on initiatives aimed at achieving more sustainable energy use, particularly in relation to the residential, commercial and transport sectors.
- CCO6: To promote the concept of carbon-neutral sustainable communities throughout the city and to seek to initiate and support carbon neutral demonstration projects in conjunction with local communities.
- CCO7: To actively promote and facilitate the growth of the new emerging green industries to contribute both to the reduction of the city's energy consumption levels and to the role of the city as a leader in environmental sustainability.
- CCO8: In conjunction with Codema, to complete a comprehensive spatial energy demand analysis to help align the future energy demands of the city with sustainable energy solutions
- CCO9: To encourage the production of energy from renewable sources, such as from Bioenergy, Solar Energy, Hydro Energy, Wave/Tidal Energy, Geothermal, Wind Energy, Combined Heat and Power (CHP), Heat Energy Distribution such as District Heating/Cooling Systems, and any other renewable energy sources, subject to normal planning considerations, including in particular, the potential impact on areas of environmental sensitivity including Natura 2000 sites
- CCO10: To support renewable energy pilot projects which aim to incorporate renewable energy into schemes where feasible
- CCO11: To support and seek that the review of the National Building Regulations be expedited with a view to ensuring that they meet or exceed the passive house standard or equivalent, with particular regard to energy performance and other sustainability considerations, to alleviate poverty and reduce carbon reduction targets.

Sustainable Building Design/Quality
It is the **policy** of Dublin City Council:

- QH12: To promote more sustainable development through energy end-use efficiency, increasing the use of renewable energy, and improved energy performance of all new development throughout the city by requiring planning applications to be supported by information indicating how the proposal has been designed in accordance with the development standards set out in the development plan.
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Energy Efficiency and the Built Environment
It is the policy of Dublin City Council:

- CC3: To promote energy efficiency, energy conservation, and the increased use of renewable energy in existing and new developments.
  CC4: To encourage building layout and design which maximises daylight, natural ventilation, active transport and public transport use.
- It is an objective of Dublin City Council:
- CCO12: To ensure high standards of energy efficiency in existing and new developments in line with good architectural conservation practice and to promote energy efficiency and conservation in the design and development of all new buildings in the city, encouraging improved environmental performance of building stock.
- CCO13: To support and encourage pilot schemes which promote innovative ways to incorporate energy efficiency into new developments.

4 PART L 2017 (NZEB) METHODOLOGY

4.1 OUTLINE

The hierarchy of design considerations for reducing energy use and increasing efficiency in buildings should be as follows:

1	Building envelope design	Maximise energy conservation through optimal u-values, avoidance of thermal bridging, analysis of thermal capacity, and improved air tightness levels
2	Mechanical, electrical and plumbing strategy	Optimise MEP strategy to provide efficient energy transfer, distribution and control
3	Low to zero carbon technologies	Employ practical energy systems to supplement energy demand

The energy performance objectives for this development will be achieved primarily through a combination of fabric first ‘’passive measures’’, for example, high insulation and air tightness standards. The MEP systems will then be designed to ensure maximum efficiency, consistent with the lowest possible capital, operating and maintenance costs.

4.2 ROUTE TO EXCEEDING MINIMUM STANDARD

We have outlined below the minimum building fabric and building services performance standards as set out in TGD Part L (2017) of Building Regulations. Based on our analysis of the proposed scheme against the base case in Part L, we also outline good and best practice performance targets and suitable MEP solutions, to keep energy use and resultant carbon emissions as low as possible.

Minimum and proposed standards for NZEB/Part L 2017*				
Element	**Units**	**NZEB Backstop values**	**Good practice**	**Best practice**
Building Envelope				
Fabric U-Values:				
External wall	W/m2K	0.21	0.16	0.15
Pitch roof	W/m2K	0.16	0.15	0.13
Flat roof	W/m2K	0.20	0.18	0.15
Ground floor/Exposed Floor	W/m2K	0.21	0.18	0.15
Windows	Thermal (W/m2K)	1.60	1.25	0.85
	Solar factor (Fraction)	-	0.40	0.30
	Light transmission (Fraction)	-	0.70	0.75
Air permeability	m3/hr/m2 @ 50 Pa	5.00	3.00	2.00
Thermal bridging at junctions	Meet or exceed standards set out in table C2 of TGD Part L 2017			
Mechanical, Electrical and Plumbing Systems				
Energy centre:	High-efficiency Air Source Heat Pumps with gas condensing boiler back-up			
Efficiency:	Heat pumps: 154% Eff.			
Distribution system:	A. Low temperature how water district heating system			
Ventilation strategy:	A. natural ventilation & demand-controlled heat recovery vent			
SFP:	<0.5 W/L/s			
Hot water system:	Instantaneous hot water from communal heating via heat interface unit			
Light power density:	<5W/m2			

Lighting controls:	Circulation areas	Auto on dimmed with daylight control
	Residential areas	dimmable with daylight control
Renewables technologies:		
	Heat Pumps	
	Photovoltaics	

*Guidelines for early design developments. The recommended fabric U-values for any project can only be confirmed after a detailed energy performance assessment for the whole building specification is completed.

4.3 NEAP

The primary energy consumption and carbon dioxide (CO_2) emissions of the proposed development, including the services design, will be calculated using the NEAP (Non-Domestic Energy Assessment Procedure) methodology. The NEAP methodology sets out the procedures to reflect specialist processes when calculating the 'Energy Performance Coefficient' (EPC), 'Carbon Performance Coefficient' (CPC) and 'Renewable Energy Ratio' (RER).

Under Part L 2017, an NZEB Reference building has been specified which defines the 'Maximum Permitted Energy Performance Coefficient' (MPEPC) and 'Maximum Permitted Carbon Performance Coefficient' (MPCPC). The Reference building is a high-performance building based on the same geometry as the actual design with 20% of its primary energy use met by renewables.

In order to demonstrate that an acceptable primary energy consumption rate has been achieved, the calculated EPC will be no greater than the MPEPC of 1.0. Similarly, to demonstrate that an acceptable CO_2 emission rate has been achieved, the calculated CPC will be no greater than the MPCPC of 1.15.

The RER requires that 20% of the building primary energy use is met via renewable energy technologies. However, for higher performing buildings that achieve EPCs and CPCs ≤ 0.9 and 1.04 respectively, the RER is reduced to 10%.

4.4 iSBEM

The Simplified Building Energy Model (SBEM) is a calculation engine designed for the purpose of indicating compliance with building regulations Part L in regards primary energy usage from buildings other than dwellings. SBEM has certain limitations and is explicitly for benchmarking purposes; not a design tool.

Integrated Environmental Solutions (IES) Virtual Environment (VE) software provides an SBEM interface. IES VE version 6.1 has been used for the Part L and BER assessments conducted in this report. Detailed 3D model was constructed based on latest floor plans and elevations received from the architect and all building fabric and M&E inputs (detailed later in this report) are based on the current preliminary design received from the design team; these are subject to change during detailed design.

The proposed development will be assessed using the SBEM interface in the IES software which demonstrates Part L compliance in accordance with NEAP.

Currently the updated SBEM software (version 5.3.ar/IE1.0.) for demonstrating compliance with Part L 2017 has not been released. Thus, the energy strategy can only be definitively determined when approved building energy modelling software is made available; which has been indicated might be the end of 2018.

The ‘Interim Nearly Zero Energy Building Performance Specification’ for new buildings owned and occupied by Public Authorities was launched in January 2017. It is intended that this methodology will allow designers to adapt the existing SBEM software to assess compliance with Part L 2017. This has been used to assess the current proposed design.

5 ENERGY STRATEGY

5.1 LIMITING HEAT LOSS

Best practice fabric U-values and air tightness standards will be implemented in order 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.

5.2 PASSIVE SOLAR SHADING

Overheating mitigating measures will be implemented and the risk assessed according to CIBSE TM52, as outlined in TGD Part L.

Passive solar design to minimise unnecessary/unwanted solar gains is one of the most effective ways to reduce/negate cooling requirements. The building will be designed in line with section 1.3.5 of Part L 2017 “Limiting the effects of solar gain in summer” which requires that;

- Buildings should be designed and constructed so that: those occupied spaces that rely on natural ventilation do not risk unacceptable levels of thermal discomfort due to overheating caused by solar gain, and
- those spaces that incorporate mechanical ventilation or cooling do not require excessive plant capacity to maintain the desired space conditions.

For the purposes of Part L, reasonable provision for limiting solar gain through the building fabric would be demonstrated by showing that for each space in the building that is either occupied or mechanically cooled, the solar gains through the glazing aggregated over the period from April to September inclusive are no greater than would occur through one of the following glazing systems with a defined total solar energy transmittance (g-value) calculated according to I.S. EN 410: 2011.

- For side lit spaces, an east-facing façade with full width glazing to a height of 1.0m having a framing factor of 10% and a G-value of 0.68.
- For top lit spaces, a horizontal roof of the same total area that is 10% glazed (based on internal roof area) with roof lights having a 25%framing factor and a G-value of 0.68.

For side lit space in Dublin this methodology corresponds to a 213.45kW of solar gain per linear length of façade; aggregated over the period from April to September. This is subject to change following the official release of SBEM version 5.3.ar/IE1.0.

Meeting the solar gain criteria in Section 1.3.5 is not an assessment of the internal comfort condition of the building as many other factors have a bearing on comfort e.g. internal heat gains, occupancy level, thermal capacity and ventilation. For this reason, Section 1.3.6 of Part L 2017 “Limiting Overheating” recommends that the design should comply with the thermal comfort criteria set out in CIBSE TM52 to ensure overheating is avoided for normally occupied naturally ventilated spaces.

To achieve the criteria set out in sections 1.3.5 and 1.3.6 of Part L 2017 it is recommended that a glazing G-value of 40% is specified while glazing VLT (Visible Light Transmittance) should be kept above 60%. This is to ensure that the reduction in solar gain does not compromise daylight levels. Thus, electric lighting will be a supplementary lighting source, reducing both the electricity demand for lighting and the associated internal heat gain from lighting.

5.3 DIRECT AND PASSIVE SOLAR HEAT GAIN

Sunlight will be used where possible to reduce the need for heating on cold days, such as in winter when the sun cast is lower. This resource will be harnessed by allowing sunlight in the buildings to areas with high thermal mass such as exposed concrete.

5.4 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.

5.5 SPACE HEATING

Space heating to all areas will be provided by a central heat pump system which will comprise a roof top air source heat pump(s) and low temperature wet distribution system with radiators throughout. Back-up high efficient condensing boilers will also be installed for peak demand periods.

5.6 NATURAL / MECHANICAL VENTILATION

Natural ventilation will be the primary mode of ventilation to the development. The building will be modelled using thermal modelling software to simulate real time dynamic weather patterns and the effect of internal and external heat gains.

Should the natural ventilation not meet the required volumes to control the heat gains to the space mechanical ventilation shall be adopted. Its intended that this will be limited to a small number of high density/high occupancy spaces such as the Gym. For enhanced efficiency heat recovery is normally adopted. During warmer months and depending on the temperature need within the space, the heat recovery function can be bypassed automatically.

5.7 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 also that only the specific area where lighting is needed.

5.8 DOMESTIC HOT WATER

The majority of domestic hot water will be generated by the air source heat pumps with supplementary heating from the gas condensing boilers. This is required as the distribution requirement for hot water is 60°C for legionella protection.

5.9 DEDICATED ENERGY MANAGEMENT SYSTEM (M&T SYSTEM)

Energy use across the development will be monitored with a dedicated energy management system. This system will enable staff to verify that performance standards are being achieved and to work towards continuous improvement in a systematic manner.

The energy management system will comprise a multi-point metering system and proprietary energy management software that will monitor and target energy consumption across all systems, as well as general water services. The following systems and sub-systems will be monitored:

1. Thermal Systems

    1.1 Low pressure hot water (LPHW) circuits for space heating
    1.2 VRV & heat pump systems
    1.3 Low pressure hot water for domestic hot water generation

2. Electrical systems

    2.1 Lighting circuits
    2.2 Small power
    2.3 Unregulated power supplies (plug loads)
    2.4 HVAC systems

3. Water systems (plumbing)

    3.1 Mains water
    3.2 Cold water
    3.3 Hot water use

5.10 BUILDING MANAGEMENT SYSTEM AND ENVIRONMENTAL CONTROL

The main BMS system for the development will be used to monitor and control all mechanical, electrical and plumbing systems, reporting any faults and alarms to the BMS supervisor / management company.

5.11 BUILDING MODELLING AND DYNAMIC SIMULATIONS

Detailed modelling and dynamic simulations will be carried out during the development in order to inform, optimise, and validate the proposed building designs.

Simulations will be used to perform a detailed analysis on the areas listed below, in order to determine the suitability and effectiveness of appropriate systems:

- Natural ventilation / overheating mitigation
- Natural daylight distribution
- Regulatory Compliance Assessments for Part L
- Building energy use
- MEP Plant and Equipment Selections

5.12 RENEWABLE ENERGY REQUIREMENTS

Air source heat pumps will be utilised to achieve the renewable energy targets. As the most efficient heating plant appliance, ASHPs will be prioritised to provide the bulk of the annual base heat load, for as long as it is efficient to do so, based on the external ‘source’ temperature. As efficiency or CoP (Coefficient of Performance) reduces with falling external ambient air temperature, then the condensing boilers would automatically be prioritised through the controls system.

5.13 BUILDING ENVELOPE AIR PERMEABILITY

In addition to fabric heat loss/gain, reasonable care will be taken during the design and construction to limit the air permeability (Infiltration) which can lead elevated heat loss through cold air exchange. High levels of infiltration can contribute to uncontrolled and unwanted ventilation, particularly noticeable in winter months. Part L 2017 requires an air permeability level no greater than 5m3/m2/hr @50Pa for new buildings. The design intent will be to achieve an air permeability of 3m3/m2/hr @50Pa which represents a reasonable upper limit of air tightness.

5.14 THERMAL BRIDGING

To avoid excessive heat losses and localised 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. Heat loss associated with conductive

thermal bridges is considered in calculating energy use and CO2 emissions using the NEAP methodology.

Acceptable construction details will be adopted (Appendix D of TGD - Part L 2017) for all key junctions where appropriate. All bespoke key junctions will be certified by a third-party certification body. T

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