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ENERGY REPORT
FOR THE
RESIDENTIAL DEVELOPMENT
AT
ST EDMUNDS,
ST LOMANS ROAD, PALMERSTOWN, DUBLIN 20

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1.0 INTRODUCTION

MANDE Consulting Ltd. (MANDE) prepared this Preliminary Energy Report, on behalf of "Moykerr Limited", for a proposed SHD residential development on a site located at St Edmunds, St Lomans Road, Palmerstown, Dublin 20.

The purpose of the report is to provide a building energy statement outlining the energy performance of the proposed development, identifying the services and renewable design strategy for the proposed development to demonstrate compliance with the building regulations.

2.0 DESCRIPTION OF THE DEVELOPMENT

The development is an amendment to the development currently being undertaken on site, previously granted SHD proposal ABP 305857-19. It consists of the construction 4 no apartment blocks ranging height from 2-9 storeys comprising 313 no. residential units, a creche and amenity space. This will provide an increase of 61 no. additional apartments. All the residential units will have associated private open space/ balconies/ terraces facing north/ south/ east/ west. The development will include 214 no. car parking spaces, 5 motorcycle parking spaces and 378 no. bike parking spaces. The site is accessed through the existing vehicular access to the west, off the unnamed road to the west. There will be a number of pedestrian entrances along St. Loman's Road, the Fonthill Road (R113) and the unnamed road to the west. The upgrading and re-landscaping of 4,400sq.m of land to the east of the site in the ownership of South Dublin County Council. In addition to all of the new facilities all other site services and works to enable the development of the site will also be provided including site, bin stores, ESB substations, associated roadworks and services connections, a large quantity of public and communal open space, boundary treatment works and landscaping. A full development description is included in the statutory notices.

2.1 ENERGY STRATEGY

This report outlines the energy performance of the proposed new development and compare with the standards prescribed in the building regulations TGD Part L 2021. Based on the results of the provisional BER assessments it has been determined that the residential units shall achieve a minimum BER rating of A2 or A3.

The built environment has been designed in order to maximise the quality of life within the development, with the health and wellbeing of the occupants in mind. Generous open spaces surrounding the housing units have been defined and orientated for this purpose.

Passive surveillance has been incorporated into the design. This reduces the risk of crime to all residents within the scheme, littering, and loitering of green spaces. The garden design of each unit in the scheme is integral to the health and wellbeing approach of the development and have been maximized in specific units where possible.

The proposed dwellings have been designed to meet the requirements set out in the set out in the Sustainable Residential Development in Urban Areas Guidelines for Planning Authorities (2009); Urban Development and Building Heights Guidelines for Planning Authorities' (2018)" and the "Sustainable Urban Housing: Design Standards for New Apartments, Guidelines for Planning Authorities' (2018)".

The development will be provided with a minimum of two new Nr ESB substations on the site, externally located as outlined on the architects site plans.

The dwellings shall include several energy conservation measures to achieve a high energy rating for each property:

- High-performance thermal envelope with low U-values for the fabric
- Airtight construction
- Ventilation system
- Heat Pump (HP) Technology or Highly efficient Gas boiler & Photo-Voltaic (PV) Panels
- Energy efficient lighting to be used throughout.

The sustainable design of the proposed development ensures that each unit in the development performs efficiently and complies with the TGD Part L NZEB criteria.

3.0 LEGISLATIVE BACKGROUND

The Planning and Development Act 2000 (as amended) sets out clear requirements for the monitoring and review of local authority housing strategies. Section 95 subsection (1)(b) requires that a planning authority's development plan should include objectives to ensure that the housing strategy is implemented.

"To support the development of quality residential schemes with a range of housing options having regard to the standards, principles and any specific planning policy requirements (SPPRs) set out in the Sustainable Residential Development in Urban Areas Guidelines for Planning Authorities (2009); Urban Development and Building Heights Guidelines for Planning Authorities' (2018) and the 'Sustainable Urban Housing: Design Standards for New Apartments, Guidelines for Planning Authorities' (2018)."

3.1 BUILDING REGULATIONS – PART D

The practical implementation of the Design and Material principles has informed the design of the building envelope, internal layouts and detailing has informed the materiality of the proposed development.

The proposed dwellings and buildings are designed in accordance with the Building Regulations, in particular Part D 'Materials and Workmanship', which includes all elements of the construction. The Design Principles and Specification are applied to the housing units and the communal / amenity parts of the development.

3.2 BUILDING REGULATIONS – PART L

The Building regulations "TGD-L" sets out the design requirements for Nearly Zero Energy Buildings (NZEB). In accordance with the requirements of The European Energy Performance of Buildings Directive Recast (EPBD) all new buildings must achieve the Nearly Zero Energy Building (NZEB) standard.

Technical Guidance Document Part L – Conservation of Fuel and Energy – Dwellings sets out the requirements for the minimum fabric and air permeability requirements, maximum primary energy use and carbon dioxide (CO_2) emissions as well as the minimum amount of energy derived from renewable sources, as calculated using the Domestic Energy Assessment Procedure (DEAP) methodology. The compliance with the requirements of this document is compulsory for all new dwellings.

Three design aspects demonstrate compliance:
1. The quality of building fabric
2. The limitation of primary energy use and CO_2 emissions
3. The use of energy from renewable sources

The table below outline the minimum fabric U value for each element for the construction of the dwellings as outlined in the Building Regulations TGD-L:

Maximum Building Fabric U-values

Building Fabric Element	TGD-L / NZEB U-value (W/m^2K)
- Pitched Roof	0.16
- Flat Roof	0.20
- External Walls	0.18
- Ground Floor / Exposed Floor	0.18
- External doors, Windows, Rooflights	1.40
Air Permeability (Air Tightness)	5.0 $m^3/h\ m^2$ @ 50Pa

The table below outline the minimum energy values for the dwelling and apartments as outlined in the Building regulations TGD-L:

Energy / Carbon Performance Targets

Element	TGD-L / NZEB
Maximum Permitted Energy Performance Coefficient (MPEPC)	0.300
Maximum Permitted Carbon Performance Coefficient (MPCPC)	0.350

Renewables	TGD-L / NZEB
Minimum Amount of Energy from Renewable Sources	20%

In addition, TGD-L set out the minimum requirements in relation to:

- Heating Appliance Efficiency
- Space Heating and Hot Water Supply System Control
- Insulation of Hot Water Storage Vessels, Pipes and Ducts
- Mechanical Ventilation systems

3.3 SOUTH DUBLIN COUNTY COUNCIL – DEVELOPMENT PLAN 2016 - 2022

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

Climate Change

It is the **policy** of South Dublin County Council:

CORE STRATEGY (CS) Policy 8: It is the policy of the Council to support the implementation of the National Climate Change Strategy and the National Climate Change Adaption Framework Building Resilience to Climate Change 2012 through the County Development Plan and through the preparation of a Climate Change Adaptation Plan in conjunction with all relevant stakeholders.

Housing

It is the **policy** of South Dublin County Council:

HOUSING (H) Policy 11 - It is the policy of the Council to promote a high quality of design and layout in new residential development and to ensure a high quality living environment for residents, in terms of the standard of individual dwelling units and the overall layout and appearance of the development.

HOUSING (H) Policy 14 - It is the policy of the Council to ensure that all new housing provides a high standard of accommodation that is flexible and adaptable, to meet the long term needs of a variety of household types and sizes.

It is an **objective** of South Dublin County Council:

H11 Objective 1: To promote a high quality of design and layout in new residential development and to ensure a high quality living environment for residents, in terms of the standard of individual dwelling units and the overall layout and appearance of the development in accordance with the standards set out in Chapter 11 Implementation.

H11 Objective 2: To promote new residential developments taking account of energy efficiency, prioritising passive house construction standards, as well as renewable energy opportunities, including solar energy where appropriate, in accordance with Part L of the Building Regulations.

H14 Objective 1: To ensure that all residential units and residential buildings are designed in accordance with the relevant quantitative standards, qualitative standards and recommendations contained in Sustainable Urban Housing: Design Standards for New Apartments (2015), the Guidelines for Planning Authorities on Sustainable Residential Development in Urban Areas (2009), the companion Urban Design Manual and have regard to the standards and targets contained in Quality Housing for Sustainable Communities (2007), particularly the standards and recommendations that relate to internal amenity/layout, overall unit size, internal room sizes, room dimensions, aspect, sound insulation, communal facilities, storage, sustainability and energy efficiency.

H14 Objective 2: To support adaptable housing layouts that can accommodate the changing needs of occupants, through extension or remodelling.

Energy

It is the **policy** of South Dublin County Council:

Energy E Policy 1. It is the policy of the Council to respond to the European and National Energy Programme through the County Development Plan – with policies and objectives that promote energy conservation, increased efficiency and the growth of locally based renewable energy alternatives, in an environmentally acceptable and sustainable manner.

Energy E Policy 2. It is the policy of the Council to implement the recommendations of the South Dublin Spatial Energy Demand Analysis (SEDA) in conjunction with all relevant stakeholders, promoting energy efficiency and renewable energy measures across the County.

Energy E Policy 2. It is the policy of the Council to promote high levels of energy conservation, energy efficiency and the use of renewable energy sources in existing buildings.

ENERGY (E) Policy 4. It is the policy of the Council to ensure that new development is designed to take account of the impacts of climate change, and that energy efficiency and renewable energy measures are considered in accordance with national building regulations, policy and guidelines.

ENERGY (E) Policy 7 Solar. It is the policy of the Council to promote the development of solar energy infrastructure in the County, in particular for on-site energy use, including solar PV, solar thermal and seasonal storage technologies. Such projects will be considered subject to environmental safeguards and the protection of natural or built heritage features, biodiversity and views and prospects.

It is an **objective** of South Dublin County Council:

E2 Objective 2: To seek to reduce reliance on fossil fuels in the County by reducing the energy demand of existing buildings, in particular residential dwellings

E2 Objective 3: To promote the generation and supply of low carbon and renewable energy alternatives, having regard to the opportunities offered by the settlement hierarchy of the County and the built environment.

E2 Objective 7: To require, where feasibly practical and viable, the provision of PV solar panels in new housing and apartment builds, for electricity generation/storage and/or water heating, so as to reduce the long term energy/heating costs of residents living in such dwellings, to minimise carbon emissions and to reduce Ireland's dependency on imported energy derived from fossil fuels.

E3 Objective 1: To ensure that medium to large scale residential and commercial developments are designed to take account of the impacts of climate change, including the installation of rainwater harvesting systems and that energy efficiency and renewable energy measures are incorporated in accordance with national building regulations, policy and guidelines

E4 Objective 2: To support the passive house standard or equivalent for all new build in the County.

E7 Objective 1: To encourage and support the development of solar energy infrastructure for on-site energy use, including solar PV, solar thermal and seasonal storage technologies. E7

E7 Objective 2: To encourage and support the development of solar energy infrastructure for local distribution, including solar PV, solar thermal and seasonal storage technologies.

4.0 SUITABILITY OF ENERGY TECHNOLOGIES

TRADITIONAL HEATING TECHNOLOGIES		
Traditionally the following technologies were used to provide space heating and hot water for residential developments:		
<u>Direct Electric Heating</u> Direct acting electric heaters, with or without storage element, is used to provide space heating. Domestic hot water is generated in a hot water cylinder fitted with an electric immersion heater. While the capital cost of this solution is low, it cannot satisfy the requirements of the current Building Regulations – Part L. However, this solution may still be viable in certain applications (e.g. in a small, well insulated, mid-floor apartment), if supplemented with a suitable Renewable Technology as listed in the next section.	✘	Not deemed suitable as it would require a large amount of energy to be generated from renewable sources to offset poor primary energy efficiency of direct electric heating.
<u>Hydronic Heating using Boilers</u> Hydronic heating utilises water as the medium for transporting the heat energy from the heat source (boiler) to heat emitters (radiators). The boiler is fired with the fuel available on site, i.e. natural gas, LPG, heating oil, coal, wood. While this solution used to be the most widespread through the industry, it has its limitations in meeting the requirements of the current Building Regulations – Part L. Generally, it must be supplemented with one or more of the Renewable Technologies listed in the next section.	✘	Not deemed suitable as it would require a large amount of energy to be generated from renewable sources to offset relatively poor primary energy efficiency of individual gas fired boilers.
<u>Warm Air Heating</u> Combined heating and mechanical ventilation system using air as the medium for transporting heat. Rarely used in Ireland and more suitable for houses than apartments.	✘	Not deemed suitable for apartments.
<u>Communal Heating</u> A variation of the hydronic heating with the individual boiler in each replaced with a centrally located boiler(s) serving all dwellings. A Heat Interface Unit (HIU) installed in each dwelling provides control and metering of heat energy used in the dwelling. Communal heating benefits from improved efficiency of the central boilers over individual, often oversized boilers. It also creates an opportunity to introduce Renewable Energy Technologies that would not be viable at small scale, e.g. Biomass or CHP (Refer to the next Section).	✘	Not deemed suitable for a project of this scale.

RENEWABLE ENERGY TECHNOLOGIES

The use of renewable energy technologies is promoted and required by the Building Regulations Part L since 2005, gradually increasing with each revision of the Regulations, i.e. 2011, 2019 and 2021. The most current TGD-L for nearly Zero Energy Buildings (nZEB) require that at least 20% of building energy is derived from renewable sources.

There is a number of low & zero carbon technologies available that may be suitable for a development of this type.

Wind Power (micro turbines) Micro wind turbines are normally fitted to the roof of the building. They convert energy of wind into electricity. Typically, they provide small amounts of electrical energy.	✘	Not deemed suitable for a suburban location due to aesthetical and noise implications.
Wind Turbines A mast mounted wind turbine can generate significant amounts of electrical energy. However due to the physical size and clearances required from buildings or trees, they are suitable for sites with large open areas.	✘	Not deemed suitable for a suburban location due to size, aesthetical and noise implications.
Solar Photovoltaic Solar Photovoltaic (PV) collectors convert the energy of the sun into electricity that can be used within the dwelling reducing the amount of electricity imported from the grid. PV collectors can be installed on the roof or integrated with external walls. While only up to 20% of the sun irradiation available is recovered, this energy form (electricity) comes with the flexibility of being suitable for many uses.	✓	Suitable. It is proposed to use Solar PV collectors on the roof for this project subject to further assessment at the detailed design stage.
Solar Thermal Solar Thermal collectors convert the energy of the sun into heat energy used to generate domestic hot water or/and contribute to the central heating. Typically, the collectors are installed on the roof, however certain types can be integrated with external walls without compromising on the solar energy yield. While the solar energy recovery rate of 70-80% is superior to that of PVs, the heat energy can only be used to heat water. Also, solar thermal systems require a certain level of maintenance in order to operate efficiently.	✘	Not deemed suitable due to complexity of the system and the required maintenance implications.
Biomass Fired Heating Biomass Fired Heating uses CO_2 neutral fuels (wood chips, wood pellets, straw) to generate heat energy for heating and domestic hot water. This technology requires a significant amount of space to accommodate boilers, fuel storage and transportation, fuel deliveries by trucks. It also required regular ash removal and a stepped-up maintenance regime. Generally suitable for large communal / district heating schemes only, where a frequent maintenance can be justified. To be fully sustainable, the fuel needs to be sourced locally. Also, while the CO_2 generated may be environmentally neutral, there are other emissions (NOx, smoke) that may not be suitable for urban sites.	✘	Not deemed suitable due to added complexity of the system, additional maintenance required. Also, implications in relation to the fuel deliveries and local emissions of CO_2, NO_x and particulates.

RENEWABLE ENERGY TECHNOLOGIES – CONTINUED		
Combined Heat & Power Combined Heat & Power (CHP) is a system that utilises an internal combustion engine to mechanically drive an electric generator and produce electricity. At the same time the waste heat emitted from the engine is utilised for space or hot water heating purposes, resulting in an improved overall energy efficiency over a traditional electricity generation in power plants. Generally suitable for communal / district heating schemes only.	✘	Not deemed suitable for a project of this scale.
Geothermal / Ground Source Heat Pump Ground Source Heat Pump (GSHP) utilise the natural heat of the ground. A refrigeration cycle is used to draw energy from the low-temperature medium (ground) and heat the higher-temperature medium (heating water). The amount of energy transferred is much higher than the amount of energy required to power the system. There are two general types of GSHP systems: with horizontal or with vertical collector. Horizontal collector comprises a large amount of piping installed below the ground, i.e. it may suitable for large open areas. Vertical collector comprises of piping coil in a deep borehole, i.e. it is more suitable where space comes at a premium.	✘	Not deemed suitable due to added complexity of the system and additional cost.
Air Source Heat Pump Air Source Heat Pump (ASHP) utilise the natural heat of the ambient air. A refrigeration cycle is used to draw energy from the low-temperature medium (air) and heat the higher-temperature medium (heating water). The amount of energy transferred is much higher than the amount of energy required to power the system. The energy efficiency of an ASHP is generally lower than that of a GSHP especially during the coldest weather, and it may require supplementation with electric heater at peak heat demand times, however such occurrences are not very often in the relatively mild climate in Ireland. The capital investment for an ASHP is lower than for a GSHP as the expensive ground collector required for the latter is not present.	✓	Suitable. It is proposed to use ASHP unit in individual heating systems subject to further assessment at the detailed design stage.
Exhaust Air Heat Pump Exhaust Air Heat Pump (EAHP) is a certain type of an ASHP which draws energy from the air being extracted from the dwelling through the ventilation system. As the temperature of this air is constant throughout the year, the output and energy efficiency of an EAHP also stays constant, i.e. it is not affected by low ambient air temperatures. Another advantage of an EAHP is that it can help in ventilating the dwelling with its constantly running fan. The downside of EAHPs is the limited output that is related to the ventilation requirements of the dwelling – EAHPs are deemed suitable for relatively small and well insulated houses or apartments.	✓	Suitable. It is proposed to use EAHP unit in individual heating systems subject to further assessment at the detailed design stage.

RENEWABLE ENERGY TECHNOLOGIES – CONTINUED		
<u>Electric Heaters & Exhaust Air Heat Pump for Hot Water plus heat recovery ventilation and solar PVs</u> Exhaust Air Heat Pump (EAHP) is a certain type of an ASHP which draws energy from the air being extracted from the dwelling through the ventilation system. This system consists electrical panel radiant heating for space heating and EAHP for hot water heating, with heat recovery ventilation and solar PV panels on the roof. This solution is deemed suitable for relatively small and well insulated houses or apartments.	✓	Suitable. It is proposed to use this system for the individual heating systems subject to further assessment at the detailed design stage.

5.0 BUILDING DESIGN

High-performance building fabric elements are being considered and selected to minimise heat loss from the internal spaces.

In addition to the reduction in energy consumption and associated carbon emissions for space heating and ventilation through a high performance fabric, high efficiency heating systems are being proposed for use throughout the development, minimising heat losses through the buildings fabric as well as a lower then required air permeability rate, helps to ensure lower energy consumption rates and associated carbon emissions are achieved throughout the year thus reduces the overall cost of heating for the end user.

The buildings will be designed and constructed in accordance with the building regulations and best practices and can be summarised as follows:

Fabric Insulation Values

The following target U-values have been adopted for the project:

Fabric	Target U Value	Building Regulations (U value)
External walls	0.18W/m^{2}K	(TGD-L max. = 0.18W/m^{2}K)
Flat roof	0.16W/m^{2}K	(TGD-L max. = 0.16W/m^{2}K)
Floor	0.18W/m^{2}K	(TGD-L max. = 0.18W/m^{2}K)
External doors and windows	1.40W/m^{2}K	(TGD-L max. = 1.40W/m^{2}K)

Air permeability

The target air permeability of 5.0m^3/h/m^2 is consistent with the maximum air permeability allowed under TGD-L. This level or air permeability should be achievable by adherence to the BR Part L Acceptable Construction Details and monitoring during the construction.

6.0 BUILDING SERVICES SYSTEMS DESIGN

Energy technologies for this development shall be selected on the following basis:

- Operation strategy: individual vs communal
- Compliance with the Building Regulations – Part L (NZEB)
- Life-cycle cost

The selection of technologies will be confirmed at the detailed design stage, however it is envisaged that a combination of technologies shall be required to achieve building regulation compliance on the apartment development as follows:

a) Apartment Development

Heating system

Individual Exhaust Air Heat Pump subject to detailed design.

The apartments shall be heated by means of either underfloor heating or low temperature radiators / fan coil units. In addition, electrical radiant panel heaters shall be considered during the detailed design.

Heating controls in the apartments consists of a heating zone with individual time and temperature controls.

Domestic hot water

Domestic hot water shall be generated in every apartment with individual time and temperature controls.

Renewable Technologies

In order to demonstrate the compliance with the Building Regulations Part L, each apartment is required to have a portion of its energy requirements provided from a source of renewable energy.

In addition to heat pumps, additional Solar PV panels on the roof of the apartment building could be provided to ensure building regulation compliance subject to detailed design.

Ventilation

The ventilation solutions considered for the development are as follows:

a) Natural Ventilation + Intermittent Extract Fans

b) Continuous (Centralised or Decentralised) Mechanical Extract Ventilation (MEV) or demand control ventilation (DCV), which operates by extracting warm, stale air from dwelling wet rooms either centrally or decentralised. Wall vents in the habitable rooms shall be provided and acoustically treated as required.

c) Balanced Whole House Mechanical Ventilation (with or without Heat Recovery) as a whole dwelling approach with ‘mechanical ventilation with heat recovery system (MVHR). The unit works by extracting warm, stale air from ‘wet rooms’ (kitchen, utility, bathroom, etc.), and extracting the embodied energy (heat) from this exhaust air and re-introducing this captured energy into the incoming fresh air.

Cooker extract hoods shall be installed in the Kitchens.

Consideration will be given to during the detail design for the provision of upgrading ventilation specification to include for acoustic grade wall vents or acoustic trickle vent in apartments facades where required in accordance with the Traffic Noise Impact Assessment Document reference 19/0209R01C as provided by CLV Consulting.

Water Conservation Measures

The requirements for low flow sanitary ware in each dwelling shall be considered during the detailed design stage. This is a water conservation initiative and reduces waste by restricting water flowrates to the shower heads within the dwelling.

The shower head fittings could be provided with a reduced flow to allow for the conservation of water use as well as reducing energy used to heat hot water. This is treated as a renewable under DEAP 4.

Lighting

Provision for natural daylight in modern buildings helps to create a better internal environment for occupants and helping to assist in the well-being of the inhabitants.

All light fittings are to be based on LED type (A+ Rated light bulb) located throughout each occupiable space, such as bedroom, lobby, living/dining etc. A significant reduction in electrical energy usage shall also be realised using high efficiency lights.

External Lighting shall be energy efficient and provided with LED type with photocell technology.

7.0 CONCLUSION

This Sustainable/Energy Report provides significant and relevant detail in relation to the energy efficiency for the proposed development and supports the standards, principles and any specific planning policy requirements (SPPRs) set out in the Sustainable Residential Development in Urban Areas Guidelines for Planning Authorities (2009); Urban Development and Building Heights Guidelines for Planning Authorities' (2018) and the "Sustainable Urban Housing: Design Standards for New Apartments, Guidelines for Planning Authorities' (2018)".

As demonstrated in this report, the proposed development shall be constructed to high building standards and shall provide a sustainable, energy efficient development for future occupants.