Project:

Large-scale Residential Development at Ross Road, Killarney, Co. Kerry

Report Title

Climate Action and Energy Statement

Document Reference

24041-OSL-00-RP-C-0008

OSL·BUTLER
CONSULTING ENGINEERS

Civil, Structural & Project Engineering Services
Unit 38 Eastgate Drive, Little Island, Cork T45 YO49

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P03	S2 – For Information	01/08/25	Issued for Planning	BJM	DB	DB

CONTENTS

1.0 INTRODUCTION

OSL Butler Consulting Engineers (OSL) has prepared this Climate Action & Energy Statement on behalf of Homeland Projects Ltd., for a proposed Large-Scale Residential Development at Ross Road, Killarney, County Kerry on a circa 3.8-hectare site.

The site is located to the southwest of Killarney Town Centre, centred at grid reference E: 496243, N: 589941 (ITM) as highlighted in Figure 1 below.

Figure 1: Site Location (Site boundary shown indicatively)

The sustainability and energy strategy for the proposed development will employ an approach that will demonstrate how each dwelling & apartment area can achieve NZEB compliance based on Technical Guidance Part L (2022) of the Building Regulations. Technical Guidance Part L (2022) sets out the definition of a Near Zero Energy Building (NZEB) as follows:

"Nearly Zero Energy Building means a building that has a very high energy performance, as determined in accordance with Annex I to Directive 2010/31/EU of the European Parliament and the Council of 19 May 2010 on the energy performance of buildings (recast)(O.J. No. L 153, 18.6.2010, page 13). 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."

The creche building will be designed to comply with "Technical Guidance Part L (2022), Buildings other than Dwellings" which will include to limit the calculated primary energy consumption and related Carbon Dioxide emissions to Nearly Zero Energy Building level insofar as is reasonable possible, when both energy consumption and Carbon Dioxide emissions are calculated using Non-domestic Energy Assessment Procedure(NEAP) published by Sustainable Energy Authority of Ireland.

This strategy will use efficient passive and active measures coupled with the appropriate renewable technology to deliver a robust, cost effective, efficient and healthy environment within the development site. The development provides an opportunity to create environmentally sound and energy efficient dwellings and apartments, by using an integrated approach to design, planning, construction and operation.

Sustainable and energy efficient developments promotes resource conservation of our limited natural resources. The design strategies employed will include;

- a whole life cycle approach to management and planning of the development,
- energy efficiency with specific focus on reducing the carbon footprint and delivering the NZEB criteria,
- improving the environmental quality of the building spaces,
- material selection and use,
- waste management,
- water management and conservation and
- enhancing the ecological value of the site.

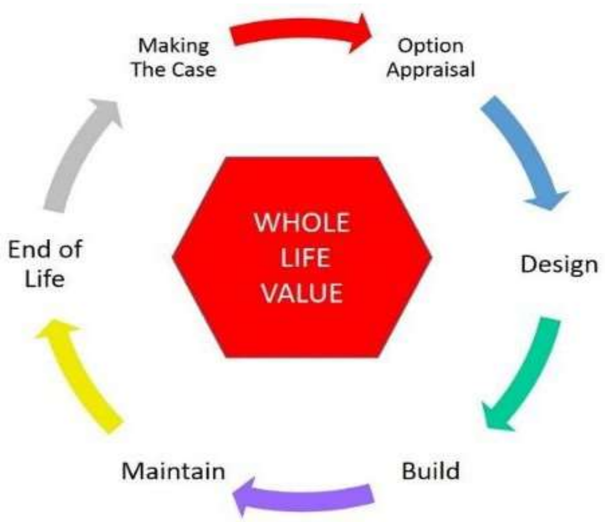

Figure 2: Whole Life Cycle Approach

The following are significant drivers for the sustainable and energy efficient design of the proposed development;

- The increasing cost required to provide services such as energy and water.
- Stricter energy targets set under the Building Regulations now and into the future i.e. the NZEB criteria.
- The desire to provide energy efficient building development to demonstrate energy awareness and efficiency of use.
- Requirements for building lifecycle considerations for all new residential developments.
- Kerry County Council Climate Action Plan 2024-2029 to reduce carbon emissions over the life of the Plan.
- Kerry County Council Development Plan 2022-2028 objectives regarding Climate Change and Energy Efficiency.
- The Government's plan to continue to decarbonize the built environment through the enactment of the Climate Action and Low Carbon Development Amendment) Act 2021.

2.0 ENERGY STRATEGY APPROACH

In developing the energy strategy for the proposed development at Ross Road, Killarney, County Kerry, the incorporation of energy efficient strategies into the project deliverables will encourage the commitment to sustainable design at a very early stage with all concerned to ensure a ‘best in class’ development for the site.

The approach will seek to ensure that the buildings will meet the principles of the Government’s ‘National Climate Change Policy’, Kerry County Council Development Plan 2022-2028 objectives with regard to Climate Change and Energy Efficiency, Kerry County Council’s Local Authority Climate Action Plan 2024-2029 and the NZEB criteria as set out in the Technical Guidance Part L (2022) Regulations and will maximize the reduction in Carbon Dioxide (CO2) emissions thus demonstrating the commitment to Climate Change.

Figure 3: Example of BER Certificate

The approach to the Energy Strategy for the proposed development will be to firstly maximise the passive benefits of the buildings fabric, orientation, etc. followed by the inclusion of highly efficient M&E systems to achieve a design that will meet the Renewable Energy Ratio (RER) target of 20% outlined in the Technical Guidance Part L (2022) Regulations.

The passive elements of the design will be maximised as follows;

- Through Specifying building fabric insulation u-values better than the Part L/ NZEB specification (See Table 1 below).
- By using dynamic thermal modelling to optimize the façade performance using differing glazing u-values, light transmittance and solar gain ('g' values).
- Targeting natural daylight factors that meet CIBSE recommendations. Good natural daylight creates a positive living environment and contributes to the well-being of the occupants. The provision of high-performance glazing for the apartments that meet with the NZEB and BER requirements, will maximise the use of natural daylight and will enhance the visual comfort for the occupants. The high-performance glazing will also ensure that the thermal performance of the buildings is not compromised, while allowing the building occupants to enjoy the benefit of the glazed views.
- Using computer modelling techniques to review Façade options in conjunction with the Design Team to maximise the daylight factors, ventilation and solar gain benefits specific to the Mountain Road LRD site. The efficient use of natural light will help to offset the use of artificial light.
- Ensuring particular detailing of linear thermal bridging.

Table 1: Part L/NZEB u-values

Item	Part L (2022) Dwellings	NZEB Reference Values	Proposed Outline Specification (Range)
Roof	0.16 W/m²K	0.15 W/m²K	≤ 0.13 W/m²K
Walls	0.18 W/m²K	0.18 W/m²K	≤ 0.14 W/m²K
Floor	0.18 W/m²K	0.15 W/m²K	≤ 0.12 W/m²K
Windows	1.4 W/m²K	1.4 W/m²K	≤ 1.20 W/m²K
Air Permeability	5m³/m².h @50Pa	5m³/m².h @50Pa	≤2.5m³/m².h @50Pa

The active elements of the design will be maximised as follows;

- Through choice of Heat Source, please refer to Table 2 below. The heating source will be based on providing an 'Own door' approach with the proposed solution coming from one of the following:
  - Air Source Heat Pumps combined with radiators/MVHR solution
  - Exhaust Air Heat Pumps
  - Electric Radiators with Hot Water Heat pump with PV panels and MVHR solution.
- The commercial unit HVAC strategy will be based on heat pump technology.
- Specifying the use of high efficiency light fittings, LED lights, etc. for use in dimming, presence/ absence detection, occupancy and daylight controls in Landlord areas.
- Specifying lighting designs that deliver > 90 lumen/ circuit watt.
- Specifying high efficiency Heating systems.
- Minimise the specific fan power where applicable.
- Use of M&E systems and plant that are high efficiency and registered on the SEAI Triple E register of products.

Table 2: Heat Source and Renewable Energy Solution

Item	Type	Energy Source	Source (from either)
1	Houses and Apartments	Individual	Exhaust Air Heat Pump
			Air Source Heat Pump/MVHR
			Electric Heating Solution with PV Panels and/or Heat Pumps/MVHR

The renewable technology employed will again be based on the most optimum technology from an operational and maintenance viewpoint and the ability of the technology to meet the BER target projected (See Table 2).

The approach will be to address the electrical energy usage in the first instance as this has the highest primary energy factor. Technologies such as Solar PV, Exhaust Air Heat Pumps will be considered to meet the renewable source produced on-site or nearby, as per the NZEB definition.

Additional items for consideration in terms of delivering the Energy and Sustainability Strategy:

- Development of a flexible design to enhance each buildings longevity.
- Computer analysis of the natural ventilation strategy will be carried out for the impact of climate change using approved CIBSE 2020/2050 weather files. This will ensure that there will be no need to alter the ventilation strategy of the buildings where a natural ventilation strategy is employed.
- During design and construction phases, environmental assessment methodology will be used to ensure that the buildings are developed holistically.
- An integrated Water Management and Conservation approach that incorporates the use of low water consumption equipment to ensure the minimal use of potable water, efficient sanitary appliances (low water WC cisterns, push spray taps).
- Extend the sustainable approach from the Building to the Site throughout the construction and handover process.
- All public and amenity lighting will use low energy LED light fittings and be installed in line with Cork County Council specifications.
- Provision of electric car (EV) charging facilities in line with Part L 2022 and Cork County Council requirements in accordance with Objective 8.4
- Whole life cycle approach to the selection of materials and equipment used in the buildings with specific regard to the impact on the carbon footprint by specifying materials and equipment with a low to zero embodied carbon footprint.
- Reduce Reuse and Recycle throughout the design, construction and operational phases of the development to ensure that the project maximises the recycling and reuse of materials while reducing the quantum of waste diverted to landfill.
- During the design and construction stages of the project environmental assessment methodologies will be used to assist in the development of a life cycle approach, in which approach the principles of IS0 15686 – Building and Constructed Assets – Service Life Planning – Life Cycle Costing (LCC) will be used (see Figure 2). The life cycle analysis will assess the long- term operation of the development of a 60-year timeframe and will consider all aspects of the development from maintenance costs to running costs to replacement costs and noting that certain M&E elements especially those with moving parts will have a typical life cycle of 10 - 15 years and this will be accounted for in the LCC analysis.

The additional investment required to deliver an energy efficient and climate change adaptive design in line with the Kerry County Council Development Plan will add long term value for the building owners and users. These benefits will require less energy, less services and therefore less resources to operate than is required for existing developments and will make the apartments more energy and environmentally efficient and will ensure that they are more sustainable apartments into the future.

3.0 PRELIMINARY DEAP ASSESSMENT

The preliminary DEAP assessment carried out on a semi-detached house shows an indicative EPC and CPC compliant building in accordance with Part L of the Building Regulations 2022. Based on this analysis and design criteria proposed, all the apartments(ground/roof/etc.) should achieve a minimum BER rating of A2.

The preliminary DEAP assessment, 24041-OSL-00-RP-C-0009, has been included in Appenidx A of this report.

Appendix A – Preliminary DEAP Assessment

Project:

Large-scale Residential Development at Ross Road, Killarney, Co. Kerry

Report Title

Preliminary Design BER / NZEB Building Compliance Report

Document Reference

24041-OSL-00-RP-C-0009

OSL·BUTLER CONSULTING ENGINEERS

Civil, Structural & Project Engineering Services
Unit 38 Eastgate Drive, Little Island, Cork T45 YO49

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1.0 INTRODUCTION

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The site is located to the southwest of Killarney Town Centre, centred at grid reference E: 496243, N: 589941 (ITM) as highlighted in Figure 1 below.

Figure 1: Site Location (Site boundary shown indicatively)

To summarise, the proposed development will consist of a largescale residential development (LRD), comprising of 134no. residential dwellings as follows: 65no. houses consisting of 10no. 4-bed dwellings and 55no 3-bed dwellings; 51no. townhouses consisting of 32no. 3-bed units and 19no. 2-bed units; and 18no. apartments consisting of 12no. 2-bed units and 6no. 1-bed units. The proposed development also includes crèche (585sqm) with capacity to accommodate 102no. children, and all ancillary site development works including 2no. vehicular and pedestrian accesses onto the Ross Road.

This report outlines a design stage preliminary Part L compliance assessment for the houses/apartments in the Mountain Road LRD project. The proposed buildings are designed to exceed the provisions of the Building Regulations Part L (2022) and will offer a sustainable and adaptable design to meet future provisions to these standards. The strategy approach to the design of the facilities is firstly to maximise the passive measures of the buildings (insulation, solar gains, daylight, etc.) and then apply the most efficient active measures (Heat Pumps, LED lighting, etc).

Figure 2: Building Design Standards Part L (2022)

2.0 DESIGN PARAMETERS: KEY ELEMENTS

The following key elements will be included in the design parameters.

Maximise the **passive elements** of the design in the first instance by:

- Specifying building fabric insulation u-values better than the Part L 2022 Regulations.
- Targeting the air permeability to be ≤ 3m3/m2/hr @ 50Pa
- Using the DEAP Software to optimise the façade using differing glazing u-values, light transmittance and solar gain (‘g’ values).
- Ensuring particular detailing of linear thermal bridging.

Maximising the **active elements** of the design by:

- Specifying lighting designs that deliver > 90 lumen/ circuit watt
- Specifying lighting systems with occupancy and daylight controls in Landlord areas.
- Specifying high efficiency Heating systems
- Minimise the specific fan power where applicable.

By addressing the passive and active elements of the building design as outlined above, the strategy will achieve a design that exceeds the Renewable Energy Ratio target of 20% as outlined in the Part L Regulations 2022 on the basis that the building has a Maximum Permitted Energy Performance Coefficient ≤ 0.3 with a corresponding Maximum Permitted Carbon Performance Coefficient ≤ 0.35 for the apartments.

The renewable technology employed will target the highest primary energy factor and technologies such as Solar PV, Exhaust Air Heat Pumps, etc. will be assessed to meet the renewable source produced on-site or nearby as per the NZEB definition.

3.0 RENEWABLE OPTIONS CONSIDERED

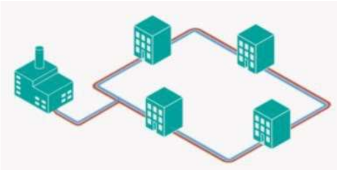
The following renewable energy sources have been considered as outlined in the Energy Performance Directive for alternate energy systems for the development. The most feasible technologies currently that will achieve the criteria for NZEB is the use of PV Solar Panels, Exhaust Air Heat Pumps, Air Source Heat Pumps on their own or in combination, based on the final developed design:

Table 1: Feasibility of Renewable Technologies Considered

Technology	Feasibility			Comments
	High	Medium	Low	
Ground Source Heat Pumps (GSHP) Closed Loop 	x			GSHP technology uses seasonal differences between ground and air temperatures to provide heating in winter and cooling in summer. GSHP provide low temperature heating and high temperature cooling suitable for underfloor heating or chilled beams. Site restrictions would be a consideration with vertical boreholes been most practical but also more capital intensive. Impact on the Primary Energy factor can be significant with Heat Pumps but additional capital and area required is a constraint.
Air Source Heat Pump (ASHP) 	x			ASHP technology uses seasonal differences between external air temperatures and refrigerant temperatures to provide heating in winter and cooling in summer. As most of the energy is taken from the air they produce less greenhouse gas than a conventional heating system over the heating season. Most efficient when used as a pre-heat mechanism as the COP remains high and therefore has a major impact on the RER % and NZEB criteria.
Exhaust Air Heat Pump (EAHP) 	x			Hot water for space and hot water heating is generated via. an exhaust air heat pump. Part L compliance is met through generating space heating and hot water from heat recovered from hot air within the apartment. Ventilation is provided by exhaust air working on differential pressure. Very efficient when the COP of the unit is high and therefore has a major impact on the RER % and NZEB criteria. Can be used to heat hot water only. This is a fully decentralized system.

Table 1: Feasibility of Renewable Technologies Considered (continued)

Technology	Feasibility			Comments
	High	Medium	Low	
Combined Heat & Power (CHP) 	x			Combined heat and power (CHP) refers to the local simultaneous generation of electricity and heat. CHP works best in areas that have a constant "round the clock" demands for heat. CHP systems typically run on oil or gas with biomass also used. Key to a CHP installation is to ensure that the demand load for heating and electricity usage are utilized, i.e. to size the unit correctly on a base load basis. Can assist in meeting the RER requirement under NZEB but energy load dependent.
Wind Power 			x	Micro wind turbines can be fitted to roofs but do not supply much energy. Full scale turbines need open space and are capital intensive but deliver large energy savings. There is considerable health and safety issues associated with wind turbines. Good impact from a Primary Energy perspective.
Solar Photovoltaic 	x			Solar PV collectors absorb the sun's energy and converts it into electricity. PV Panels can be discrete roof-mounted units or embedded in conventional facades, etc. The ideal location for locating the PV system is facing a southerly direction. Good impact from a Primary Energy perspective and RER% under NZEB.
Solar Thermal 			x	Solar collectors absorb the sun's energy and provide energy for space heating and hot water generation. The ideal location for locating the solar system is southerly direction. Solar systems are usually designed to meet only a portion of the heating load. Available roof area is better utilised with PV Panels as has higher Primary Energy impact.
Biomass Heating 			x	Biomass boilers combust wood chips or pellets and is considered carbon neutral. The technology requires significant plant space and ongoing maintenance.

Table 1: Feasibility of Renewable Technologies Considered (continued)				
Technology	**Feasibility**			**Comments**
	High	**Medium**	**Low**	
District Heating 			x	A centralized district heating system is one where a common energy centre is used to provide heating/cooling to multiple blocks. Such a scheme works best when an input source of heat in the locality can be utilized, such as waste heat from a data centre of waste incinerator facility. Sharing the cost of the capital equipment and increasing diversity of use are the main advantages behind this option. However, energy losses below and above ground, inflexibility surrounding billing options for tenants, inflexibility surrounding separate ownership of building within the one scheme and plant space requirements must be considered. Considering the above, the development will not be *"District Heat Enabled"*.

4.0 EMBODIED ENERGY IMPACTS

Embodied energy is the concept that the materials and processes involved in construction a building consume vast amount of energy and therefore emit carbon, which is also known as "Embodied Carbon". To date, embodied energy/ carbon is not currently regulated in Ireland and focus has always been towards "Operational Energy" through the use of compliance with the Part L Building Regulations.

However, the following points related to Embodied Carbon have been considered;

- Reduce the weight of equipment.
- Specify products that can be demounted and reused.
- Specify products with long lifespans.
- Mitigate refrigerant impact through low refrigerant Global Warming Potential (GWP) and leakage rates.
- Plant should be easily accessible for inspection, maintenance and replacement.
- Design with adaptation in mind.
- Less is more, design out MEP.
- Source local materials where possible.
- Source materials with an Environmental Product Declaration (EPD) where possible

5.0 DEVELOPMENT SPECIFIC NZEB DETAILS

OSL Butler Consulting Engineers has carried out an NZEB analysis on a typical Housing type building proposed for the development at Ross Road, Killarney, County Kerry to demonstrate that the NZEB strategy approach outlined by the Design Team will deliver compliant apartments in line with the provisions of the Building Regulations Part L (2022).

This report provides a preliminary design stage energy assessment, using the DEAP 4.2 Software tool as issued by the Sustainable Authority of Ireland (SEAI). The Dwelling Energy Assessment Procedure (DEAP) is a software tool and manual which calculates energy consumption and carbon dioxide emissions. It considers space heating, ventilation, water heating, and lighting in a dwelling.

The Dwelling Energy Assessment Procedure (DEAP) is the methodology for demonstrating compliance with specific aspects of Part L of the Building Regulations. DEAP is also used to generate the Building Energy Rating (BER) and advisory report for new and existing domestic buildings. DEAP calculates the energy consumption and CO2 emissions associated with a standardised use of a building. The energy consumption is expressed in terms of kilowatt hours per square meter floor area per year (kWh/m2/yr) and the CO2 emissions expressed in terms of kilograms of CO2 per square meter floor per year (kg CO2/m2/yr).

The DEAP Procedure has been illustrated/outlined in Figure 3 below.

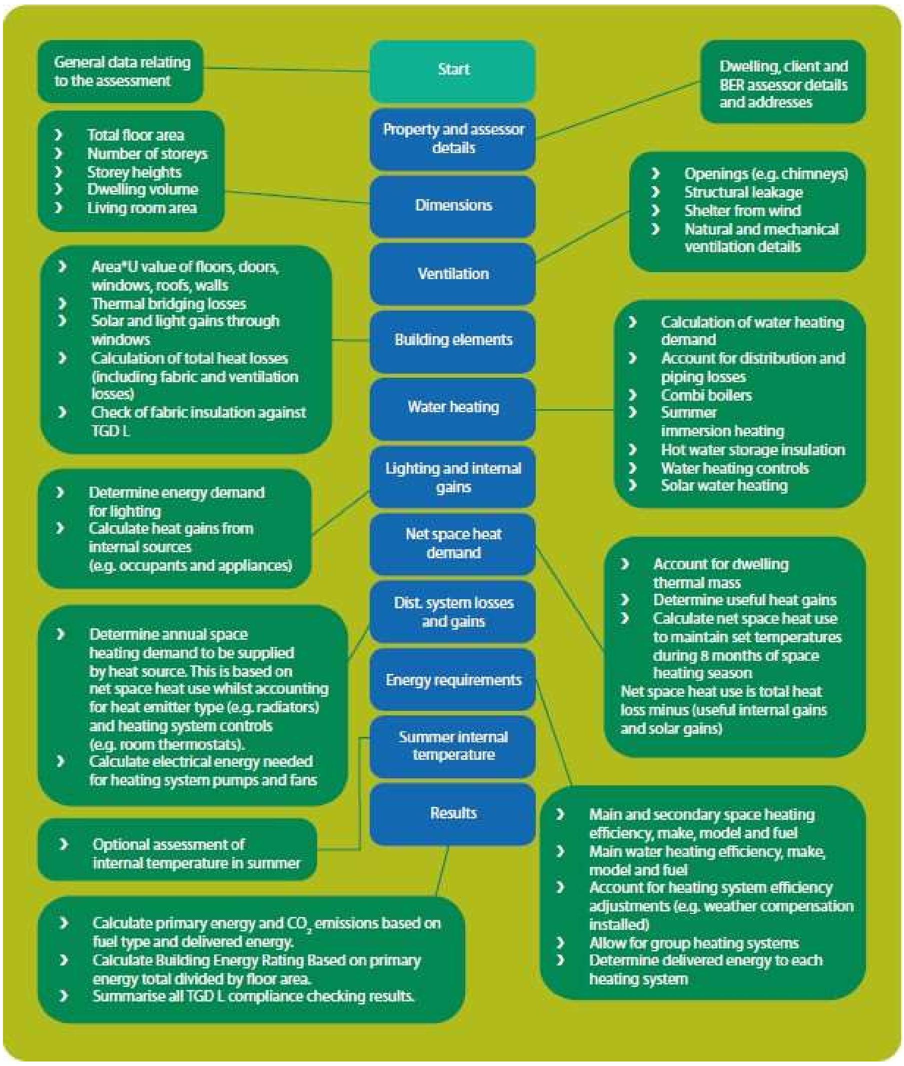


Figure 3: DEAP Procedure (source www.seai.ie)

5.1 BUILDINGS ASSESSED

The DEAP assessment was carried out on the following building types;

- Semi-detached dwelling house

5.2 ARCHITECTURAL ELEMENTS ASSESSED

The DEAP assessment was carried out on the following architectural elements;

- Architect's Drawings
- Façade details
- Mechanical and Electrical Outline Specifications

5.3 ASSUMED CONSTRUCTION DETAILS ASSESSED

The DEAP assessment was caried out with the following construction detail assumptions;

- External wall area weighted average U-value, ≤ 0.14 W/m^2.K
- Ground floor area weighted average U-value, ≤ 0.12 W/m2.K
- External roof area weighted average U-value, ≤ 0.13 W/m2.K
- Window area average U-value (incl. frame), ≤ 1.30 W/m2.K
- Door area average U-value, 1.6 W/m2.K
- Vertical glazing total solar transmittance (g-value), ≤ 0.6 (Typical value assumed)
- Glazing light transmittance, 70% (Typical value assumed – to be confirmed by architect and window manufacturer)
- Air permeability/Tightness, ≤3.0 (m3/ (m2.hr)) at 50 Pa
- Mechanical System Type
    - Radiators, DHW System (180 litre DHW storage built into exhaust Heat Pump),
    - Fuel Type Electricity
- Electrical System, Power factor correction ≥0.95
- Lighting System, Energy metering for lights
- Renewable Technologies Exhaust Heat Pump
    - Fuel Type Electricity
    - Heat Pump Heating Efficiency sCOP>3.5
    - Fraction of Heating Supplied by Heat Pump 100%
    - Fraction of DHW supplied by Heat Pump 85%

6.0 SEAI DWELLING DETAILS REPORT

3 Bedroom Semi-Detached: Assessment below based on existing dwellings constructed in Waterfall Heights, County Cork. This approach will be followed in the proposed development at Ross Road, Killarney, County Kerry.

Property details:

MPRN	0	**Shared MPRN**	No
BER Number	N/A	**BER number assigned to shared dwelling**	N/A
Address line 1	House Type A1		
Address line 2	Waterfall	**Type of Rating**	New Dwelling - Provisional
Address line 3	Phase 5	**Purpose of Rating**	Sale
County	Cork City	**Building Regulations**	2019 TGD L
Eircode		**Planning Reference**	19/38655
Dwelling Type	Semi-detached house	**Date of Plans**	12/09/2023
Year of construction	2023	**Assessor Name**	Cornelius Kiely
Dwelling Extension	No	**Assessor Number**	102990
Storeys	2	**Date of Assessment**	26/10/2023
		Assessor Comments	OLOS / OSL BUTLER
		Assessor Description	House Type A1, COPPENGER FIELDS, PHASE 5, CORK

Dimension details

	Area [m^2]	Height [m]	Volume [m^3]
Ground floor	68.07	2.46	167.46
First floor	68.07	2.82	191.96
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
Totals	136.14		359.42

Living Area	19.90 m^2
Living Area Percentage	14.62 %

Ventilation details

	Number	Air Change Rate [m3/h]
Chimneys	0	0.00
Open Flues	0	0.00
Fans & vents	1	10.00
Flueless combustion room heaters	0	0.00

Manufacturer	ALDES EasyHOME HYGRO COMPACT
Model	EasyHOME HYGRO COMPACT

Has a permeability test been carried out	Yes
Infiltration rate due to structure [ac/h]	0.15
Intermediate infiltration rate	0.23
Number of sides sheltered	1
Adjusted infiltration rate [ac/h]	0.21
Effective air change rate [ac/h]	0.50
Ventilation heat loss [W/K]	59.30
Adjusted result of air permeability test [ac/h]	0.15
Specific fan power [W/(l/s)]	0.25
Heat exchanger efficiency [%]	0.00
Electricity for ventilation fans [Kwh/y]	109.62
Heat gains from ventilation fans [W]	0.00

Is there a draught lobby on main entrance?	No
Draught lobby air change [ac/h]	0.05
Openings infiltration [ac/h]	0.08
Structure type	N/A
Is there a suspended wooden ground floor?	No
Windows/doors/attic hatches draught stripped [%]	N/A
Ventilation method	Whole-house extract ventilation
How many wetrooms (inc. kitchen)? Is the vent. ducting flexible/rigid/both?	K + 4. 75mm Ducting
Is MVHR ducting uninsulated where outside of insulated envelope?	N/A

Adjusted heat exchanger efficiency	0.00

Building Elements - Floors

Type	Description	U/F Heating	Include in compliance	In Roof	Age Band	Exposed Perimeter [m]	Area [m²]	U-Value [W/m²K]	Heat Loss
Ground Floor - Solid	Ground Floor Area - 120mm Xtratherm Thin-R Floor Insulation (T.C. 0.022)	Yes	Yes	No	2010 onwards	N/A	68.07	0.14	9.53
Non-Heat Loss Floor	1st Floor Area	N/A	No	No	2010 onwards	N/A	68.07	0.00	0.0

Total area [m²] 136.14

Building Elements - Roofs

Type	Description	Include in compliance	Insulation Thickness	Age Band	Heat Area [m²]	U-Value [W/m²K]	Loss (AU)
Pitched Roof - Insulated on Ceiling	300mm Mineral Wool (T.C. 0.044)	Yes		2010 onwards	68.07	0.15	10.21

Total area [m²] 68.07

Building Elements - Walls

Type	Description	Wall is semi-exposed	Include in compliance check	Age Band	Area [m²]	U-Value [W/m²K]	Heat Loss (AU) [W/K]
Timber Frame	Front Elevation: 350mm Timber Frame	No	Yes	2010 onwards	24.76	0.18	4.46
Timber Frame	Rear Elevation: 350mm Timber Frame	No	Yes	2010 onwards	27.09	0.18	4.88
Timber Frame	Side Elevation: 350mm Timber Frame	No	Yes	2010 onwards	52.38	0.18	9.43
Timber Frame	Side Elevation: 350mm Timber Frame	No	Yes	2010 onwards	3.15	0.18	0.57
Total area [m²]							107.39

Building Elements - Doors

Count	Type	Description	Draught Stripped	Area [m²]	U-Value [W/m²K]	Heat Loss (AU) [W/K]
1	Munster Joinery UltraTech Door	Front Entrance Door	Yes	2.00	1.40	2.80
Total area	**[m²]**					2.00

Building Elements - Windows

Count Type	Glazing Type	Frame	Frame Factor	Solar Transm.	In Roof	Over shading	Orient.	Area [m²]	U-value [W/m²K]
1	Double-glazed, argon filled (low-	Wood/PVC	0.700	0.730	No	Average or Unknown	West	7.79	1.20
1	Double-glazed, argon filled (low-	Wood/PVC	0.700	0.730	No	Average or Unknown	East	4.99	1.20
1	Double-glazed, argon filled (low-	Wood/PVC	0.700	0.730	No	Heavy	North	2.32	1.20
1	Double-glazed, argon filled (low- E, en = 0.15, hard coat)	Wood/PVC	0.700	0.520	No	Average or Unknown	East	3.80	1.40
1	Double-glazed, argon filled (low-	Wood/PVC	0.700	0.520	No	Average or Unknown	West	1.33	1.40

Total area [m²] 20.23

Heat loss details

Total glazed area [m²]	20.23	**Glazing ratio**	0.06
Total glazed heat loss [W/K]	24.09	**Summer solar gain [W/m²**	796.67
Total effective collection area [m²]	6.14	**Total element area [m²]**	265.759
Total plane heat loss [W/K]	65.96	**Thermal bridging factor [W/m²K]**	0.1500
Fabric heat loss [W/K]	105.83	**Total heat loss [W/K]**	165.13
Per m2	1.21		

Lighting and Internal Gains

Lighting Design Calculation Method	Bulb type only	**Average Efficacy [lm/W]**	66.90
Fixed lighting provision [klmh/y]	4306.84	**Top up lighting requirement [klmh/y]**	0.00
Energy required for fixed lighting [kWh/y]	114.84	**Energy required for top up lighting [kWh/y]**	0.00
Energy required for portable lighting [kWh/y]	180.34		
Basic energy consumption for lighting [kWh/y]	1001.83	**Water heating (In watts [W])**	181.14
Annual energy used for lighting [kWh/y]	295.17	**Occupants (In watts [W])**	145.47
Internal gains from lighting during heating season [kWh/hs] (In watts [W])	225.81 (38.72)	**Mechanical ventilation (In watts [W])**	0.00
Lighting (In watts [W])	38.72	**Heat loss to the cold water network (In watts [W])**	-40.18
Appliance and cooking (In watts [W])	255.65	**Net internal gains (In watts [W])**	580.79

Lights

Count	Name	Description	Type	Efficiency	Power [W]
16	Default LED/CFL	LED / CFL	LED/CFL	66.90	

Water heating details

Are there distribution losses?	Yes
Are there storage losses?	Yes
Is there a solar water heating system?	No
Standard number of occupants	2.91
Number of mixer showers	2
Number of electric showers	0
Number of baths	1
Daily hot water use [Litres/d]	166.45
Hot water energy reqs. at taps [kWh/y]	2218.53
Distribution losses [kWh/y]	391.51
Water storage volume [Litres]	200.00
Is manufacturers declared loss factor available?	No
Declared loss factor [kWh/d]	0.00
Manufacturer and Model name	
Insulation type	Factory Insulated
Insulation thickness [mm]	50

Is supplementary electric water heating used in summer?	N/A
Is there a combi boiler?	No
Total hot water demand [kWh/y]	2610.04
Temperature factor unadjusted	1.08
Temperature Factor Multiplier	0.89
Hot water storage loss factor [kWh/l d]	0.02
Volume factor	0.84
Combi-boiler electricity consumption [kWh/y]	0.00
Adjusted storage loss [kWh/y]	898.68
Adjusted primary circuit loss [kWh/y]	0.00
Heat gains from water heating system [W]	181.14
Output from supplementary heater [kWh/y]	0.00

Type of mixer shower	Flow restriction	Flow rate [l/min]	HW usage [l/day]	WWHRS Manufacturer/Model	WWHRS efficiency	WWHRS Utilisation Factor	Energy Savings [kWh/yr]
Unvented hot water system	No	11.000		Any / Any			
Total :			93.03				0.00

Combi-boiler Type	None
Combi-boiler loss [kWh/y]	0.00
Keep Hot facility	None
Storage Loss	898.68
Storage Type	Heat pump with integral hot water storage / Integrated thermal store and gas-fired CPSU

Output from main water heater [kWh/y]	3508.72
Annual Heat gains from water heating system [kWh/y]	1586.79
WWHRS input to main system [kWh/y]	0.00
WWHRS input to supplementary system [kWh/y]	0.00

Primary Circuit loss type Boiler / heat pump and thermal store within a single casing (cylinder thermostat present)

Primary circuit loss [kWh/y]	0.00
Is hot water storage indoors or in group heating system	Yes
Heat Pump Type of DHW	Integral Hot Water Storage

Net space heat demand

Required temp. during heated hours	21.00	**Length of one unheated period [h]**	8
Required temperature rest of dwelling	18.00	**Unheated periods per week**	14
Living area percentage	14.62	**Heat use during heating season [kWh/y]**	4774.12
Required mean internal temperature [°C]	18.44	**Heat use for full year [kWh/y]**	5013.54
Thermal mass category of dwelling	Low		

	Utilisation factor	Intermittent heating
Internal heat capacity of dwelling [per m²]	0.07	0.07
Internal heat capacity [MJ/K]	9.53	9.53

Space heat demand details

Month	Mean Ext. Temp [°C]	Adj. Temp [°C]	Int.Heat Loss [W]	Heat [kWh]	UseGain/Loss Ratio	Utilisation Factor	Heat Use [W]	Useful Gains [W]	Solar Gain [W]
January	5.3	16.58	1862	915	0.37	0.92	1230	632	110
February	5.5	16.60	1834	753	0.44	0.89	1121	713	220
March	7.0	16.82	1621	615	0.59	0.83	827	794	378
April	8.3	17.00	1437	420	0.79	0.75	583	854	561
May	11.0	17.38	1054	202	1.24	0.60	271	783	724
June	13.5	17.74	700	75	1.88	0.45	104	596	731
July	15.5	18.02	416	22	3.02	0.31	29	387	676
August	15.2	17.98	459	31	2.60	0.35	41	418	613
September	13.3	17.71	728	112	1.44	0.55	155	573	468
October	10.4	17.30	1139	354	0.77	0.76	476	663	294
November	7.5	16.89	1550	660	0.47	0.88	917	633	140
December	6.0	16.67	1763	855	0.38	0.91	1149	613	92

Space Heating

Type	Space Heating Standard	Fuel	Design flow temp[°C]	Daily Operation [h]	SH Seasonal eff.	WH Seasonal eff.	Heats water	Source
Heat pumps	I.S. EN 14825	Electricity	45	24	515	284.21	Yes	Assessor

Model	HITACHI RAS-2WHVRP/RWD-2.0NRWE-200
Manufacturer	HITACHI

Back Up Space Heater Fuel	N/A	**Back Up Space Heater Efficiency [%]**	N/A
Back Up Water Heater Fuel	Electricity	**Back Up Water Heater Efficiency [%]**	100.00

Heating System Test data: I.S. EN 14825

Heat Pump Type Air to Water

Test Condition - Low (35°C)

	A (88%) -7°C	B (54%) 2°C	C (35%) 7°C	D (15%) 12°C	E* (100%) TOL
Source	A-7	A2	A7	A12	A-10
Sink	W34	W30	W27	W24	W35
Heating Capacity (kW)	3.54	2.35	3.00	3.05	4.00
Coefficient of Performance (kW/kW)	3.20	4.80	6.20	8.30	2.75

Test Condition - Medium (55°C) *

	A (88%) -7°C	B (54%) 2°C	C (35%) 7°C	D (15%) 12°C	E* (100%) TOL
Source	A-7	A2	A7	A12	A-10
Sink	W52	W42	W36	W30	W55
Heating Capacity (kW)	3.50	2.10	2.43	2.80	3.10
Coefficient of Performance (kW/kW)	2.13	3.35	5.15	6.80	1.90

Heating System Test data: I.S. EN 16147

Source of Data	Water heating energy efficiency [%]
Co-efficient of Performance [kW/kW]	0.00
Water heating energy efficiency [%]	132.00
Reference Hot water Temperature [°C]	54.00
Hot water Rated Heat output P_{rated} [kW]	4.00
Declared load profile	L
Standing heat loss of test storage tank [kWh/day]	1.75
Volume of DHW accounted for in test [litre]	263
Heat Pump Type	Air to Water

Dist. System Losses and Gains

Temperature adjustment [°C]	0
Heating system control category	3
Heating system responsiveness category	3
Mean internal temperature during heating hours [°C]	18.44
Additional heat emissions due to non ideal control and responsiveness [kWh/y]	590.69
Gross heat emission to heated space [kWh/y]	5364.81
Mean internal temperature [°C]	17.52

	Number present	Boiler controlled by thermostat	Inside dwelling	Electricity consumption [kWh/y]	Heat gain [W]
Central heating pumps	1	Yes	Yes	130	10
Oil boiler pumps	0	No	No	0	0
Gas boiler flue fan	0			0	
Warm air heating or fan coil radiators present	No			0	0
Totals				130	10

Note: Wet central heating systems are likely to have one or more central heating pumps.

Gains from fans and pumps associated with space heating system [kWh/y]	58
Is there underfloor heating on the ground floor?	Yes
Average utilisation factor, October to May	0.82
Useful net gain [kWh/y]	48
U-Value of ground floor [W/m²K]	0.14
Fraction of heating system output from ground floor	0.67
Net heat emission to heated space [kWh/y]	5317
Annual space heating requirement [kWh/y]	5377
Additional heat loss via envelope element [kWh/y]	59.55

Energy Requirements: Individual Heating Systems

Manufacturer name	HITACHI
Model name	HITACHI RAS-2WHVRP/RWD-2.0NRWE-200

Brand name			N/A
Model Qualifier			N/A
Indoor unit identifier			N/A
Outdoor unit identifier			N/A
Efficiency of main heating system [%]	515	**Fraction of heat from secondary system**	N/A
Efficiency adjustment factor	1.00	**Efficiency of secondary system [%]**	N/A
Adjusted efficiency of main heating system [%]	515.00	**Energy required for main heating system [kWh/y]**	1044.03
Product index number	N/A	**Energy required for secondary heating system [kWh/y]**	0
Manufacturer's reference number	N/A		
Appliance ID	N/A	**Low temperature test condition (35°C)**	N/A
Rated air flow rate [m³/h]	0	**Intermediate temperature test condition (45°C)**	N/A
Medium temperature test condition (55°C)			N/A
High temperature test condition (65°C)			N/A

Fraction of main space and water heat from CHP N/A

Heat demand from CHP 0.0

Efficiency of main water heating system 284.21

[%]

Manufacturer name HITACHI

Model name HITACHI RAS- 2WHVRP/RWD- 2.0NRWE-200

Heat Pump Type Air to Water

Water Heating Standard I.S. EN 16147

Efficiency adjustment factor 1.0000

Adj. efficiency of main water heating system [%] 284.21

Water Heating Efficiency [%] 132

Energy req. for main water heater [kWh/y] 2160.47

Energy req. for secondary water heater [kWh/y] 0.00

	Fuel Type	Primary energy conversion factor	CO_2 emission factor
Main space heating system	Electricity	1.75	0.224
Secondary space heating system	None	0.00	0.000
Main water heating system	Electricity	1.75	0.224
Supplementary water heating system	Electricity	0.00	0.000
Cooling System	None	0.00	0.000
Pumps, fans	Electricity	1.75	0.224
Energy for lighting	Electricity	1.75	0.224

CHP data

Heat output from CHP [kWh/y] 0.00

Electrical efficiency of CHP Heat efficiency of CHP

CHP Fuel type N/A

Energy delivered to CHP [kWh/y] 0

Electrical output from CHP [kWh/y] 0

Summer internal gains

Dwelling volume [m³]	359.420	**Total gains in summer [W]**	1377.46
Effective air change rate for summer period [ac/h]		**Temperature increment due to gains [°C]**	13.02
Ventilation heat loss coefficient [W/K]	0.00	**Summer mean external temperature [°C]**	15
Fabric heat loss coefficient [W/K]	105.83	**Heat capacity parameter**	0.07
Heat loss coefficient under summer conditions [W/K]	105.83	**Temperature increment related to thermal mass [°C]**	1.51
Total Solar Gain for Summer Period [W]	796.67	**Threshold internal temperature [°C]**	29.53
Internal gains [W]	580.79		

Results

	Delivered energy [kWh/y]	Primary energy [kWh/y]	CO_2 emissions [$kgCO_2$/y]
Main space heating system	1044	1827	234
Secondary space heating system	0	0	0
Main water heating system	1235	2160	277
Supplementary water heating system	0	0	0
Cooling	0	0	0
Pumps and fans	240	419	54
Energy for lighting	295	517	66
CHP input (individual heating systems only)	0	0	0
CHP electric output (individual heating systems only)	0	0	0
Renewable and energy saving technologies			
Energy produced and saved	0	0	0
Energy consumed by the technology	0	0	0
Total	2813	4923	630
Per m² floor area	20.66	36.16	4.63
Energy Rating	A2		

7.0 CONCLUSION

The preliminary DEAP assessment carried out on a semi-detached house shows an indicative EPC and CPC compliant building in accordance with Part L of the Building Regulations 2022.

Based on this analysis and design criteria proposed, all the apartments(ground/roof/etc.) should achieve a minimum BER rating of A2.