Hardwicke Ltd

Frankfort Castle Residential

Energy Statement

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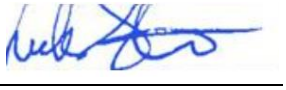
		Signature			

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Abbreviations

Abbreviation/Acronym	Description
AHU	Air Handling Unit
ASHP	Air Source Heat Pump
CHP	Combined Heat and Power
COP	Coefficient of Performance
CPC	Carbon Performance Coefficient
DEAP	Dwelling Energy Assessment Procedure (Ireland)
DHW	Domestic Hot Water
EPC	Energy Performance Coefficient
HVAC	Heating, Ventilation & Air Conditioning
MPCPC	Maximum Permissible Carbon Performance Coefficient
MPEPC	Maximum Permissible Energy Performance Coefficient
NZEB	Nearly Zero Energy Building
PEF	Primary Energy Factor
PV	Photo-Voltaic
SEAI	Sustainable Energy Authority of Ireland
TPER	Total Primary Energy Requirement
WSHP	Water Source Heat Pump

Executive Summary

This document provides an overview of the energy strategy for Frankfort Castle residential development. The main aim is to outperform the sustainability and energy targets and overheating risk assessment set by the Irish Building Regulations, Part L – Conservation of Fuel and Energy 2019, as defined further within this report.

To achieve suitable performance in relation to the energy consumption of the development, the energy demand must first be reduced where possible.

The proposed glazing has a positive effect on solar gain, reducing annual heat energy usage. Suitable performance criteria have been specified for the building fabric, reducing heat loss. All light fittings are specified as being low-energy lights, reducing electrical power consumption.

Primary energy sources were evaluated to identify the most suitable scheme solution for the development, which would also meet Part L 2019 requirements. The results of the evaluation were that an air to air supply & exhaust heat pump scheme was the most suited, where the air to air heat pump would provide for space and water heating.

The development includes new dwellings (block A, B and C) and an existing dwelling having a major renovation upgrade (block D) featuring 4 new apartments and an amenity space.

New dwellings, blocks A, B and C

A DEAP carbon emission assessment was carried out for several typical apartments, which were deemed to appropriately represent all other apartments within the development. The scope of the assessment includes the evaluation of the maximum energy and carbon emission allowed by the current regulation (EPC and CPC factors) and the minimum renewable energy supply (RER factor), all assessments based on the DEAP calculation.

The results of the assessment (included in detail in section 5) showed compliance with the requirements of Part L 2019 as follows:

- An average EPC equal to 0.27, with all individual EPC figures below the limiting MPEPC of 0.300 allowed by Part L 2019
- The average CPC equals 0.28, with all individual CPC figures below the limiting MPCPC of 0.35 allowed by Part L 2019

A DEAP overheating assessment was carried out for several typical apartments, which were deemed to appropriately represent all other apartments within the development. The results of the DEAP overheating assessment showed compliance in each case, where the average temperature was below the high-risk threshold in compliance with the limit set by Part L 2019.

Existing dwelling block D

A major renovation will be carried out in this building with the following upgrades in line with the requirements suggested by part L 2019 section Existing Dwellings, these upgrades are as follows:

- Increase of the fabric insulation of roof
- Increase of the fabric air tightness
- Introduction of Air-to-air heat pump system for 4no. new apartments in the block.
- Installation of a new heating generator with new controls and insulated distribution pipework, requirements identified in Part L 2019 Table 7 - Cost Optimal Works activated by Major Renovation

1 Introduction

The aim of this report is to validate the energy efficient and sustainable design of the proposed development. This will be demonstrated by identifying measures taken during the design stage of the development to minimise energy usage and by justifying the renewable energy source technologies proposed for this development.

Part L of the Irish Building Regulations 2019 outlines energy performance criteria which must be achieved, making it a legislative requirement to meet a minimum energy performance level. This report will demonstrate compliance with Part L (2019) as a base requirement for planning and is to form part of the planning submission to An Bord Pleanála for the proposed development: Frankfort Castle, Dundrum, Co. Dublin.

The energy performance of the development is also of importance to the developer due to the economic effect of energy efficient and sustainable design as well as the perceived quality such features have on the development, where customers have greater expectations in terms of environmental impact. It is the aim of the development to outperform legislation where feasible.

The report will be structured regarding the principles underpinning Part L compliance, energy demand reduction through passive measures and increased supply from renewable and efficient sources. Energy efficient and sustainable design measures will be quantified using the DEAP assessment tool results for this development.

All assessments carried out in this report are based on latest floor plans and elevations received from the architect on 15/03/2021.

2 Proposed Development

The proposed development is located at Frankfort Castle, Dundrum, Co. Dublin. The planning application is seeking permission for a residential development consisting of 70 two-bedroom apartments and 45 one-bedroom apartments. The apartments are distributed among three large new apartment buildings and one existing. The three large apartment buildings labelled Block A, B, and C surround a centrally located protected structure (Block D, Frankfort Castle). Block D includes new apartments on the 1st and 2nd floors. The Western side of the development beside Block B is adjacent to the Luas train line. Block A is 4 storeys, Block B is 5 storeys, block C is 3 storeys, block D is 2 storeys.

Figure 1: Site Plan of Proposed Development.

3 New dwellings. Blocks A, B, and C

The scope of this section covers all new dwellings block A, B and C. The next chapter covers the existing block D and the new dwellings in there.

3.1 Energy Reduction

Within this section of the report, the development in question is assessed, and compliance is shown, in relation to the energy reduction requirements of Part L 2019. The scope of this section is all new dwellings block A, B, and C.

The assessment has been carried out using the current compliance software from the Sustainable Energy Authority of Ireland (SEAI, DEAP software version V4.2).

3.1.1 Passive Solar

Glazing plays an important role in terms of light and heat energy usage. Generally, an increase in glazing reduces the need for artificial lighting. Particularly in dwellings where natural light alone is often sufficient throughout the day. The amount of glazing used is also a primary factor affecting the amount of solar gain a building will experience. Solar gain can be used to reduce space heating loads, as the heat gain from glazing can contribute significantly towards the space heating requirements of a building.

However, it is also important to consider the role solar gain can play in overheating, as well as the extent of heat loss occurring in areas with a large amount of glazing. It is therefore good practice to maximise the use of natural daylight to enhance visual comfort, while also ensuring that thermal performance is not compromised. Due to the orientation of this site and its existing buildings, the developments main proposed façades with glazing are East-West for block B and North-South for blocks A and C. Passive solar methods have been used to achieve significant solar gain using the South, East and West façade, for example the use of balconies shading the windows below. This has reduced the overheating risk of the dwellings.

To ensure no overheating occurs, an appropriate g-value will be provided in the following Building Fabric section, specifying the amount of solar energy transmittance via the glazing. An appropriate U-value is also provided to ensure heat loss via the glazing is kept to an appropriate level.

The development has aimed to provide regularly occupied spaces, including bedrooms, living rooms and kitchens with natural daylight to reduce the energy need for artificial light. Natural lighting has less of an impact on occasionally occupied spaces, such as stores, bathrooms and en-suites. These areas have therefore not been targeted for natural lighting.

3.1.2 Building Fabric

Limitation of heat loss through the fabric of the building is a significant aspect of Part L regulations. Heat loss through the building fabric is minimised by increasing the thermal insulation to a level which is deemed to be acceptable. U-

value is the criteria used to measure such heat loss, where U-value is a measurement of the conductivity of building fabric elements.

The maximum acceptable U-values allowed by the current regulation Part L 2019 for the building's fabric elements are outlined in Table 1 (Blocks A, B, and C) and Table 2 (Block D).

The Proposed values are also given, all of which are equal to or lower than the limiting value, demonstrating compliance under this section of Part L. The proposed values are obtained through the DEAP assessment carried for this development. Results of this assessment are presented in section 3.4 of this report:

Table 1. Fabric Element U-Values [Adapted from Part L 2019].

Fabric Element	Part L 2019 U-Values	Proposed U-Values	G-Value (Glazing)
Roofs	0.16 W/m^{2}K	0.15 W/m^{2}K	
Walls	0.18 W/m^{2}K	0.18 W/m^{2}K	
Ground / Exposed Floors	0.18 W/m^{2}K	0.15 W/m^{2}K	
External Doors	1.40 W/m^{2}K	1.0 W/m^{2}K	
External Glazing	1.40 W/m^{2}K	1.0 or 1.4 W/m^{2}K	0.65

3.1.3 Thermal Bridging

A thermal bridge also known as a cold bridge is an area of a building construction which has a significantly higher heat transfer than the surrounding materials. This is typically where there is either a break in the insulation, less insulation or the insulation is penetrated by an element with a higher thermal conductivity, e.g. around windows, doors and other wall openings, at junctions between elements and other locations.

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

Heat loss due to thermal bridging is expressed as a multiplier of the total exposed surface area in DEAP calculations. The default value of this multiplier is 0.15 W/m^{2}K in DEAP; and the proposed design target for this is 0.05 W/m^{2}K.

3.1.4 Building Envelope Air Permeability

Air permeability should be limited in new buildings to reduce uncontrolled ventilation and associated heat losses. This can be facilitated by adopting standard details to form the appropriate air barrier elements (e.g. plaster, vapour control layer, breather membrane) and a regular on-site inspection regime will have to be

in place throughout the construction period to ensure that the air barrier is maintained.

Part L (2019) requires an air permeability level of no greater than 5m³/m²/hr @ 50Pa for a new dwelling; the design intent for the proposed dwellings will be to have an air permeability target of 3m³/m²/hr @ 50Pa.

It is advised that a minimum of two tests will be carried out for all typical apartment types. Each unique apartment type must be tested independently. The air permeability test will be carried out by an independent third party (National Standards Authority of Ireland or equivalent certification body).

3.1.5 Light Fittings

It is proposed that all light fittings are to be specified as being low-energy lights, reducing the energy requirement of artificial lighting. LED are the proposed fitting type throughout the apartments to achieve energy performance and to achieve alignment with CIBSE Lighting guidance.

3.1.6 Insulation of Pipes, Ducts and Vessels

All hot water storage vessels and pipes will be fully insulated. Hot water storage vessels shall have a minimum of 50mm factory installed insulation. All water pipes shall be insulated throughout the building. This will improve energy performance and help protect against legionella and freezing.

3.1.7 Heating Controls

Heating systems should be effectively controlled to ensure the efficient use of energy. It is intended that the system will minimise energy requirements by meeting user requirements closely while not exceeding them.

Heating and hot water level of controls will comply with the minimum control requirements stated in Part L 2019. A summary of this level of control is described as follows:

Automatic control of space heating based on room temperature:

- Automatic control of heat input to stored hot water based on stored water temperature
- Separate and independent automatic time control of space heating and hot water
- Shut down of heat pump or boiler when there is no demand for either space or water heating from that source
- Additional thermostat included in living room space which can over-ride the heat pump integrated thermostat to offer more user control.

3.2 Renewable Energy Sources

Within this section of the report, various energy source technologies are examined. The feasibility and suitability of each option is evaluated, based on the location of the site, the nature of the development, economic criteria, functionality, efficiency, and the sustainability of the system in question.

There is a requirement for the development that a proportion of energy sources used are renewable technologies. The minimum requirements, as set out by the 2019 amendment of Part L are that the minimum Renewable Energy Ratio is equal or above 0.2.

A RER of 0.2 represents 20 % of the primary energy of the building is served from renewable energy technologies to the total primary energy of the building, as defined and calculated in DEAP.

To satisfy that a dwelling achieves Part L compliance, it must also be demonstrated that an acceptable carbon performance coefficient (CPC) and energy performance coefficient (EPC) have been met. The calculated CPC of the dwelling being assessed should be no greater than the Maximum Permitted Carbon Performance Coefficient (MPCPC) of 0.35 and the EPC should be no greater than the Maximum Permitted Energy Performance Coefficient (MPEPC) of 0.30.

Potential energy sources were analysed based on the requirements of Part L and their applicability to this development. The systems assessed include:

- Wind Power
- Photovoltaics
- Solar Water Heating
- Air Source Heat Pumps
- Combined Heat and Power (CHP)
- Independent Exhaust Air Heat Pumps
- Biomass Fuel Heating
- Heat Recovery Ventilation

3.2.1 Wind Power

Wind power could be generated by either micro wind turbines attached to the roof of each building, or standalone mast-mounted wind turbines. Due to the nature and location of the site, neither of these wind power options would be feasible. The massing of each building has been designed with close consideration towards the surrounding buildings, this would be upset by the inclusion of wind turbines.

Figure 2. Wind Turbine Example

3.2.2 Photovoltaic

Photo-voltaic (PV) panels convert the sun's energy to electricity using semiconductor technology.

PV panels are a renewable energy option which could operate alongside a boiler system for instance. However, the surface of PV panels required for each apartment to comply with Part L 2009 is around 5 to 6 m2 per apartment.

Figure 2. Photovoltaic panels example.

Achieving the space requirement for PV panels makes such a solution less desirable in comparison to utilising a heat pump system. The heat pump option does not require PV Panels to cover the renewable supply minimum requirement required by Part L 2019.

3.2.3 Solar Water Heating

Solar panels may be used to provide the domestic hot water for the buildings. A potential for high maintenance frequency is a factor in not considering solar water heating a viable option. In the context of utilising combined heat and power plant or heat pumps, solar water heating is counter-productive and not considered a viable technology.

Figure 3: Solar Water Heating Panels example.

3.2.4 Centralised Air Source Heat Pump

The air-source heat pump units under consideration generate warm water to supply space heating to each apartment, via a central system. The units should be located with access to outside air, such as a roof plantroom. The heating demand of the apartment complex would be met using a series of centralised heat pumps. As a result, for the ASHP portion of the heating demand to be considered

renewable, the COP would need to exceed 2.19 (the Climaveneta heat pumps used are assumed to have a seasonal system COP of 2.77).

A disadvantage of this system being installed in this development is the decentralised nature of the development, where the apartments are separated across three different buildings. Flat roof space is also limited, therefore making the location of such units challenging without having a substantial visual impact. If a centralised air source heat pump scheme was pursued coordination with the existing architectural layout would be required.

Figure 4: Outdoor Condenser Unit example.

In this scheme a heat interface unit would be required within each apartment to provide space heating and allow for the metering of each individual client's usage.

3.2.5 Biomass Fuel Heating

A combination of gas-fired and biomass fired boilers is an option for the central heating plant in this project. Gas fired plant would be used as a back-up to the wood pellet fired plant.

Wood pellets or chips would need to be stored next to the boiler room in the building. The location of the boiler room and storage space must be carefully considered as this will have a bearing on the method of delivery.

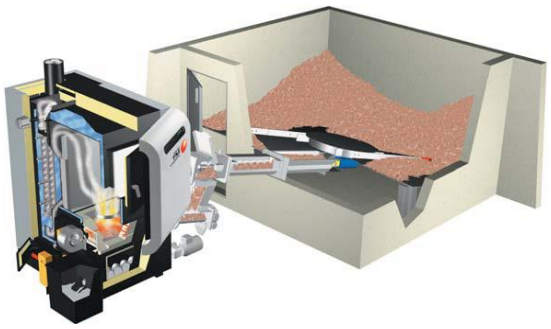


Figure 5: Biomass Fuel System example.

Additional plant space would be required in the basement area to locate the boiler room and storage area.

However, the delivery of biomass would be hindered by the low clearance height entering the basement. Frequent deliveries would also be required considering the scale of the development, where storage space is limited. Consideration should also be given to the flue exhaust, as particulate emissions can have a negative impact on air quality. Due to these logistical factors, this option is not being considered further, as it is not considered feasible.

3.2.6 Combined Heat and Power (CHP)

Combined Heat & Power is a technology that utilises the heat produced in electricity generation rather than releasing it wastefully into the atmosphere.

For a CHP system to be viable, the year-round base heat load on the plant would need to be roughly 1.6 times that of the electrical load delivered by the CHP plant. In this development, the limiting factor will be to find a use for the heat output, especially in the summer months (this may limit performance of solar water heating systems if installed).

The following illustration shows a typical gas-fired CHP system, supplemented by a gas boiler.

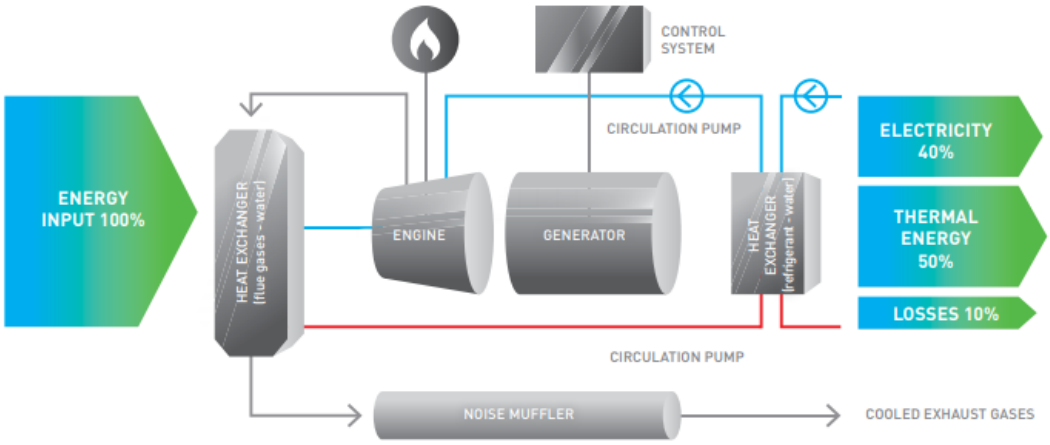


Figure 6: Diagrammatic example of a typical CHP System. Note that outputs are only illustrative on do not represent the would-be installed system.

As this is a residential scheme with multiple electrical meters the electrical energy produced by the CHP cannot be sold back to individual tenants. This means that electrical usage will have to be charged to the tenants via a service charge. Each apartment in the development will have a heat interface unit; this will provide both heating and domestic hot water (DHW) to the tenants.
The advantage of the heat interface unit is that it allows for metering of heat energy used by the tenants and then tenants can be billed on this basis. Another advantage of heat interface unit is that it allows for the instant production DHW in the dwelling and negates the need for individual water cylinders.

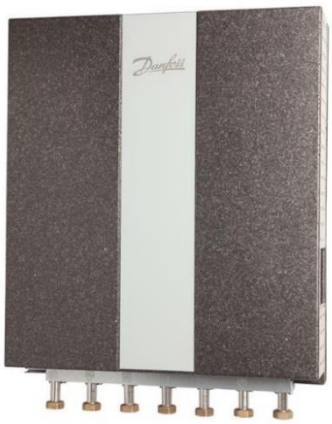


Figure 7: Heat Interface Unit.

Available plant space for a CHP, accompanying boilers, associated pumps and other ancillary equipment will be required in the basement.

Each CHP and boiler have an associated flue which must clear the highest point of the development by 2 metres. This poses a challenge as the plant area available in the basement is not located directly below any of the buildings.

In overall, these are factors that make this option less preferable than the individual heat pump option.

3.2.7 Exhaust Air Heat Pump Per Apartment

Exhaust air heat pump technology is based upon recovering heat energy from the wet rooms of the apartment, kitchens and bathrooms, then using this energy in a refrigeration cycle to heat water for domestic hot water and space heating requirements.

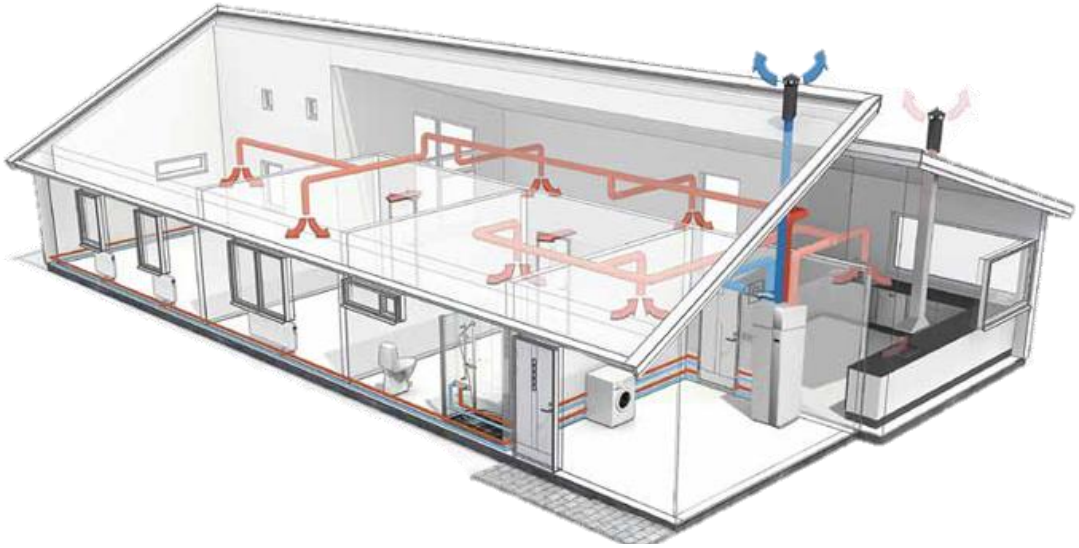


Figure 8: Exhaust Air Heat Pump System. Source: Nilan.

In this development exhaust air heat pumps could be provided for each apartment. This option offers the following advantages:

- This option is advantageous if the apartments were to be sold individually in the future. The de-centralisation of plant equipment means that the complex management company can hand over the maintenance of the equipment if they wish to do so.
- Due to the high heating efficiency of the heat pumps this option does not require additional PV panels to achieve compliance with the minimum renewable's requirement (renewable ratio) of Part L.
- As defined by the function of the system, the ventilation provided to heat the space via the heat pump also provides the fresh-air requirements.

Disadvantages of this option include its high capital cost and the requirement for a designated equipment space within the apartment.

3.2.8 Mechanical Whole House (Apartment) Balanced Heat Recovery Ventilation

To lower energy usage within buildings they have become increasingly airtight. This increased airtightness, while providing lower energy levels can lead to other problems due to stale air not being exhausted from the dwelling which would otherwise be replaced with outside air.

MVHR (Mechanical Ventilation with Heat Recovery) provides outdoor filtered air into a dwelling whilst retaining most of the energy that has already been used in heating the building. It works on the principle of extracting air from the wet rooms (WCs, kitchens, etc) and supplying air into the occupied rooms (living area, bedrooms, etc).

Figure 9. Whole apartment balanced heat recovery using air to air heat pump unit. Source: Nilan.

The apartment must still be heated and powered, and a heat pump is the solution proposed for this purpose – this is the recommended solution for this scenario.

Each apartment shall be supplied with an air to air supply & exhaust heat pump unit.

The unit shall provide space heating with a supply of hot air routed internally via ductwork.

The air is preheated via heat recovery equipment and further heated in the heat pump unit. The unit also supplies hot water heating.

Figure 10. Supply & Exhaust air-to-air heat pump with heat recovery. Source: Nilan.

The heat pump unit is very efficient due to the heat recovery equipment and heat pump operation.

The use of this unit avoids the necessity for the installation of other renewable energy (i.e. PV Panels or Solar panels) to comply with Part L requirements.

A space of 900 mm x 610 mm room with 2065 mm clearance is typically required for one heat pump in each apartment.

This is the option recommended for this development. DEAP compliance results included in section 3.4 of this report and in the introduction of this report are carried out including the implementation of this system

3.3 Overheating study

A DEAP overheating assessment was carried out for several typical apartments, which were deemed to appropriately represent all other apartments within the development. The typical apartment layouts selected and analysed for compliance are included in Appendix 1 and were selected due to their architectural layouts, glazing percentages, and relative increased risk of overheating due to orientation.

The results of the DEAP overheating assessment showed compliance in each case, where the average temperature was below the high-risk threshold in compliance with the limit set by Part L 2019.

Windows to open 50%

The previous assessment conducted using the current DEAP methodology software (version 4.2) shows compliance having windows able to open up to 50% of the void of the window.

All windows in occupied spaces of the new dwellings should be able to open to this level to avoid a high risk of overheating in summer.

3.4 DEAP Calculation Summary – Blocks A, B, C

The conditions previously outlined in this section 3 have been used to carry out DEAP assessments to ensure that all apartments comply with EPC and CPC limitations and ultimately Part L (2019).

The assessment is carried out for an air supply & exhaust heat pump with heat recovery described in section 3.2.8. For this investigation, an air-to-air Nilan Compact-P heat pump system was utilised.

The DEAP calculations have been carried out for several different typical apartments, which were deemed to be worst case scenarios, using SEAI DEAP version 4.2 software to demonstrate compliance with TGD Part L (2019).

The typical apartment layouts selected and analysed for compliance are included in Appendix 1.

3.4.1 DEAP Inputs

The DEAP assessment was carried out based on the proposed values, which are applicable to all typical apartments, listed in Table 2

Table 2. DEAP Assessment Input Values.

Input Parameter	Input Value
Structural Air Permeability	2m³/m²/hr at 50Pa
Ventilation Method	Balanced whole-house mechanical ventilation with heat recovery.
Specific Fan Power	0.88 W/l/s (Note 1)
External Glazing g-value	0.65
Roof U-Value	0.15 W/m^{2}K
Walls U-Value	0.15 W/m^{2}K
Ground / Exposed Floors U-Value	0.15 W/m^{2}K
External Doors U-Value	1.0 W/m^{2}K
External Glazing U-Value	1.0 W/m^{2}K
Thermal Bridging	0.05 W/m^{2}K
Distribution Loss Factor	1.17
Lighting	100% LED (~5 per room)
Thermal Massing Category	Medium

Note 1 - SFP Value has not been included in calculation. Fan energy is included in efficiency value applicable for the heat pump unit.

3.4.2 DEAP Outputs – Blocks A, B, C

The results of the DEAP assessment are provided in Table 3 below, where they can be seen to verify compliance to Part L (2019) in all cases. This verifies that the outlined arrangement for servicing the building is compliant with Part L and is therefore a suitable scheme to use for the development.

Table 3. DEAP Blocks A, B, C Assessment Output Values.

Apartment	EPC	CPC	RER	Size of apt (m^2)	Compliance
Limit	*< 0.300*	*< 0.350*	*>0.2*		
1A	0.27	0.27	0.27	59	✓
1B	0.27	0.27	0.27	48	✓
1C	0.26	0.25	0.28	50	✓
2A	0.28	0.27	0.29	75	✓
2B	0.29	0.28	0.29	78	✓
2C	0.28	0.27	0.3	87	✓
2D	0.29	0.28	0.29	74	✓
2E	0.26	0.25	0.27	80	✓
2F	0.29	0.28	0.29	85	✓
2G	0.295	0.29	0.27	103	✓
2H	0.26	0.25	0.27	81	✓
2J	0.26	0.25	0.27	80	✓
2K	0.294	0.29	0.27	85	✓
2L	0.28	0.27	0.3	84	✓
2M	0.25	0.24	0.29	95	✓
2N	0.28	0.28	0.26	84	✓
2P	0.27	0.26	0.29	103	✓
2Q	0.29	0.28	0.29	86	✓

4 Existing Building – New Dwellings. Block D

The scope of this section covers block D.

Block D is an existing building provided with new apartments on the 1st and 2nd floors.

It is an existing dwelling fully renovated. Therefore, the renovation will comply with the requirements of a Major Renovation as defined by Part L 2019. This entails achieving a *cost-optimal energy demand level* of less than **125 kWh/m²/yr** for each individual apartment.

As outlined in the sections below, the renovation will include several thermal upgrades in compliance with this regulation.

4.1 Efficient envelope

The following upgrade works will be carried out in this building to decrease the heating loads of the building to cost optimal level, in line with the recommendations of Part L 2019.

The following works are as follows:

- Upgrade insulation of walls
- Upgrade insulation of roof

This scope follows the recommendation of scope of Table 7 Cost optimal works activated by Major renovation, Part L 2019.

The minimum efficiency parameters associated to these works is presented in Table 4 below.

Table 4. Block D Fabric Specifications for Alignment with DEAP.

Input Parameter	Average Value	G Value
Roof U-Value	0.16 W/m²K	
Cavity Walls U-Value	0.55 W/m²K	
No cavity walls U-Value	0.35 W/m²K	
Glazing	1.4 W/m²K	0.65
Air tightness	5 m3/h/m²	

4.2 Efficient heating and controls

The apartments located on L00 and L01 will be serviced with the same strategy as those in Blocks A, B, and C, using a Nilan air-to-air heat pump with energy efficient heat recovery to create an ‘all-air’ heating system. This system will also provide domestic hot water within the apartments. There should be an individual

thermostat located in the living room which can override the integrated heat pump thermostat, for user control.

A new separate central heating generator serving dedicated radiators will heat the amenity spaces and serve domestic hot water to toilets and kitchen.

The heating system and its controls will include the minimum characteristics as defined by Part L 2019 section 2.2.3.

A summary of the minimum heating requirements for the heat generator system for the amenity spaces (separate to the Heat pump system) is presented as follows:

Table 5. Block D additional system information - heat generation.

Input Parameter	Input Value
Natural Gas Heating boiler	Min 90% (DEAP HARP database)
Controls	Automatic control of space heating based on room temperature; - automatic control of heat input to stored hot water on the basis of stored water temperature; separate and independent automatic time control of space heating and hot water; shut down of boiler or other heat source when there is no demand for either space or water heating from that source 9
Radiators	With local thermostatic valves
Insulation	Insulation of hot water storage and pipework

4.2.1 Efficient Ventilation

The apartments will utilise the same heat pump system as blocks A, B, C to provide heating and fresh air. There shall also be the option for natural ventilation via openable windows. In the amenity spaces, efficient natural ventilation is deemed appropriate.

Natural ventilation openings of windows will comply with the requirements of the approved TGD Document F 2019 Table 3 having general and purge ventilation openings.

4.2.2 DEAP Outputs – Block D

The results of the DEAP assessment for block D are provided in Table 5 below, where they can be seen to verify compliance to Part L (2019) Cost Optimal requirement (125 kWh/m^2/yr) in all cases. This verifies that the outlined arrangement for servicing the building is compliant with Part L and is therefore a suitable scheme to use for the development.

Table 6. DEAP Assessment Output Values for Cost Optimal Analysis for Block D.

Apartment	Cost Optimal Level	Size of apt (m^2)	Compliance
Limit	*< 125 ($kWh/m^2/yr$)*		
1D	85	62	✓
1E	69	63	✓
1F	47	54	✓
2R	62	98	✓

5 Recommendations and Conclusion

To comply with Part L (2019) regulations, as part of the Irish building regulations, it is proposed that:

New blocks A, B and C

- Passive design is used to minimise energy requirements.
- Building construction details are followed, as per this report; including building fabric requirements outlined. Maintain 2 $m^3/m^2/hr$ air tightness for all apartments.
- All lighting used is low-energy lighting – LED spec.
- A supply & exhaust air-to-air heat pump system with heat recovery is used for space and water heating, which will recover heat energy from the extract air. Further thermostat/temperature control to be provided to living space in addition to integrated system version.

Major renovation in blocks D

- Passive design. Upgrade of insulation of roof and walls.
- A supply & exhaust air-to-air heat pump system with heat recovery is used for the apartment spaces and water heating, which will recover heat energy from the extract air. Further thermostat/temperature control to be provided to living space in addition to integrated system version.
- Installation of a new heating system (natural gas boiler) to service amenity spaces.
- Natural ventilation of amenity spaces. Minimum opening requirements as required by TGD Part F 2019 Table 3 for general and purge ventilation

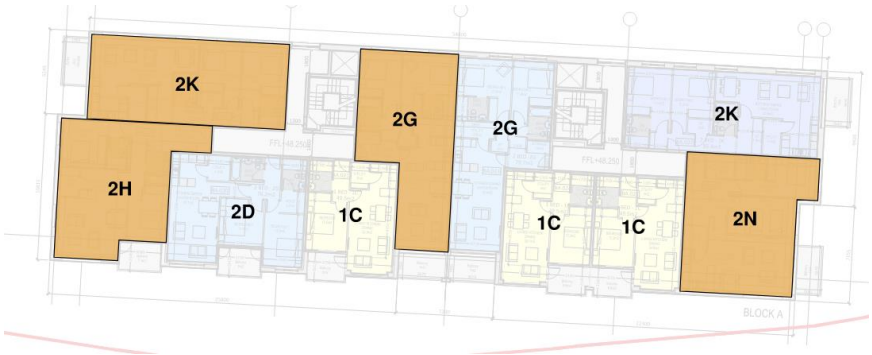
This report confirms that if these proposals are met for Blocks A, B, C and D, that the proposed development will comply with Part L regulations for all apartments.

Appendix A – DEAP Assessment Typical Apartment Plans

The following section identifies the representative apartments of the development where a DEAP assessment has been carried out (key apartments highlighted in orange):

A1.1 Block A

Block A - Ground Floor



Block A - First & Second Floor

Block A - Third (Top) Floor

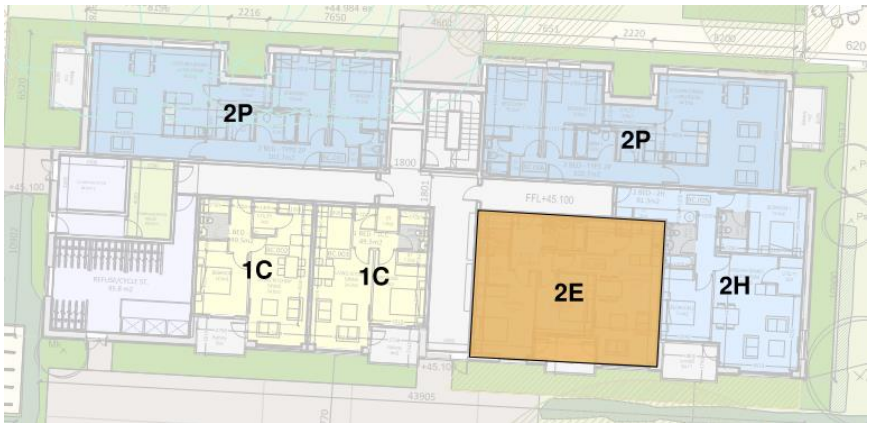
A1.2 Block B

Block B - Ground Floor

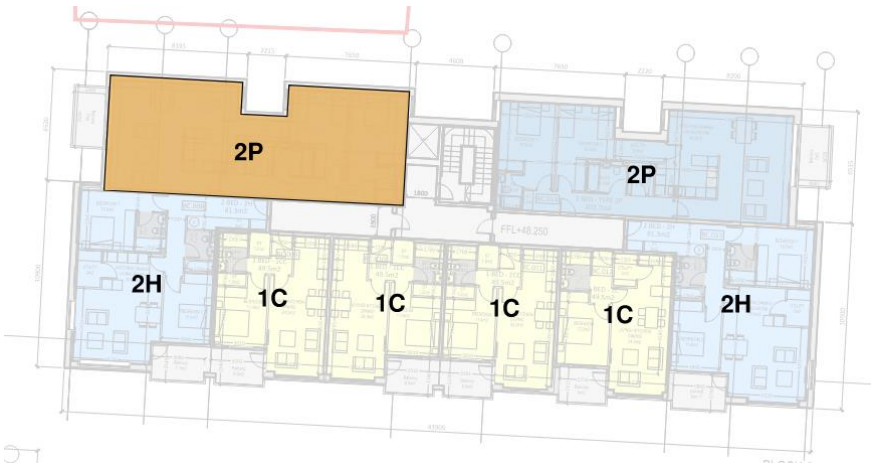
Block B - First, Second, and Third Floor

Block B - Fourth (Top) Floor

A1.3 Block C



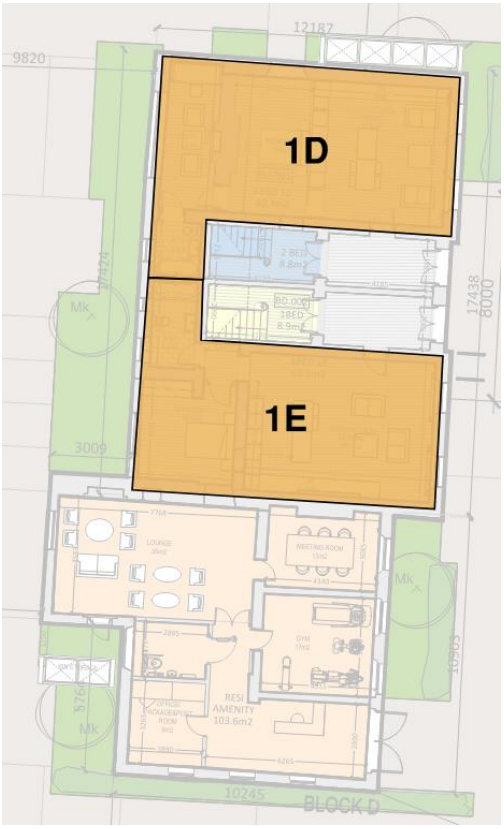
Block C - Ground Floor



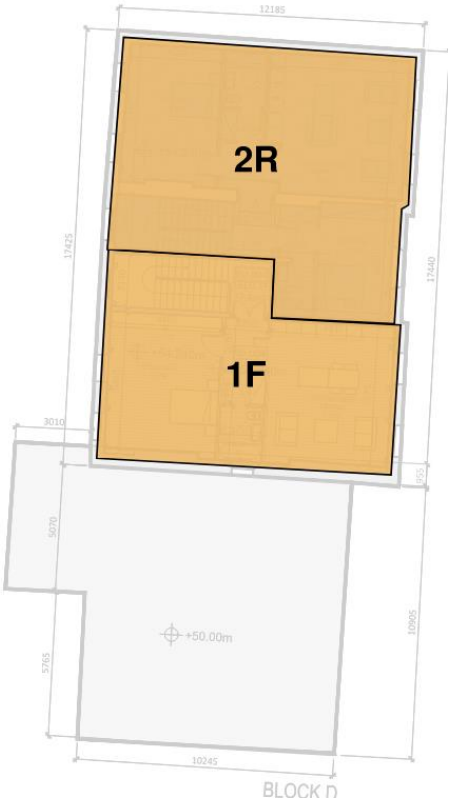
Block C - First & Second (Top) Floor

Block C - Second (Top) Floor

A1.4 Block D

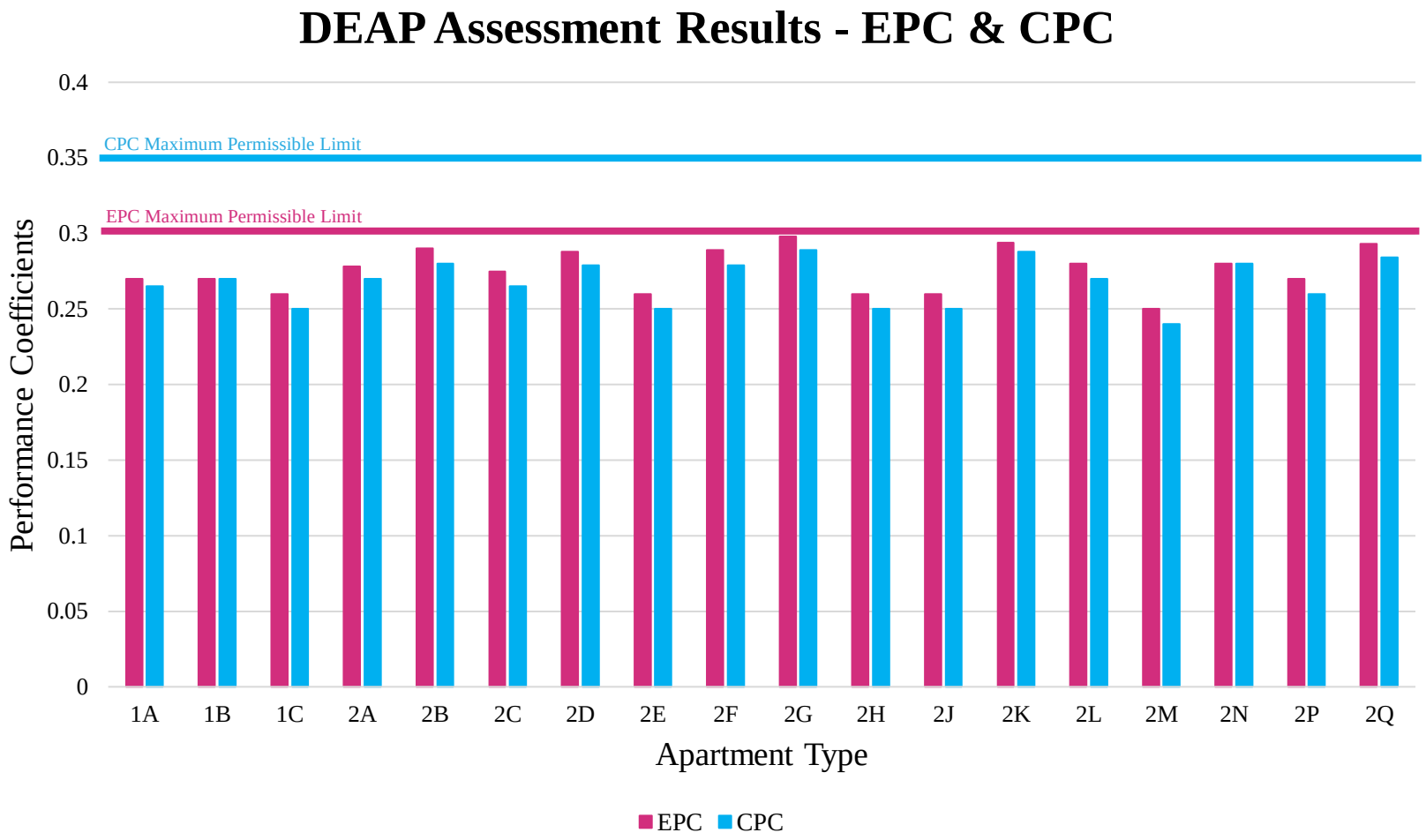


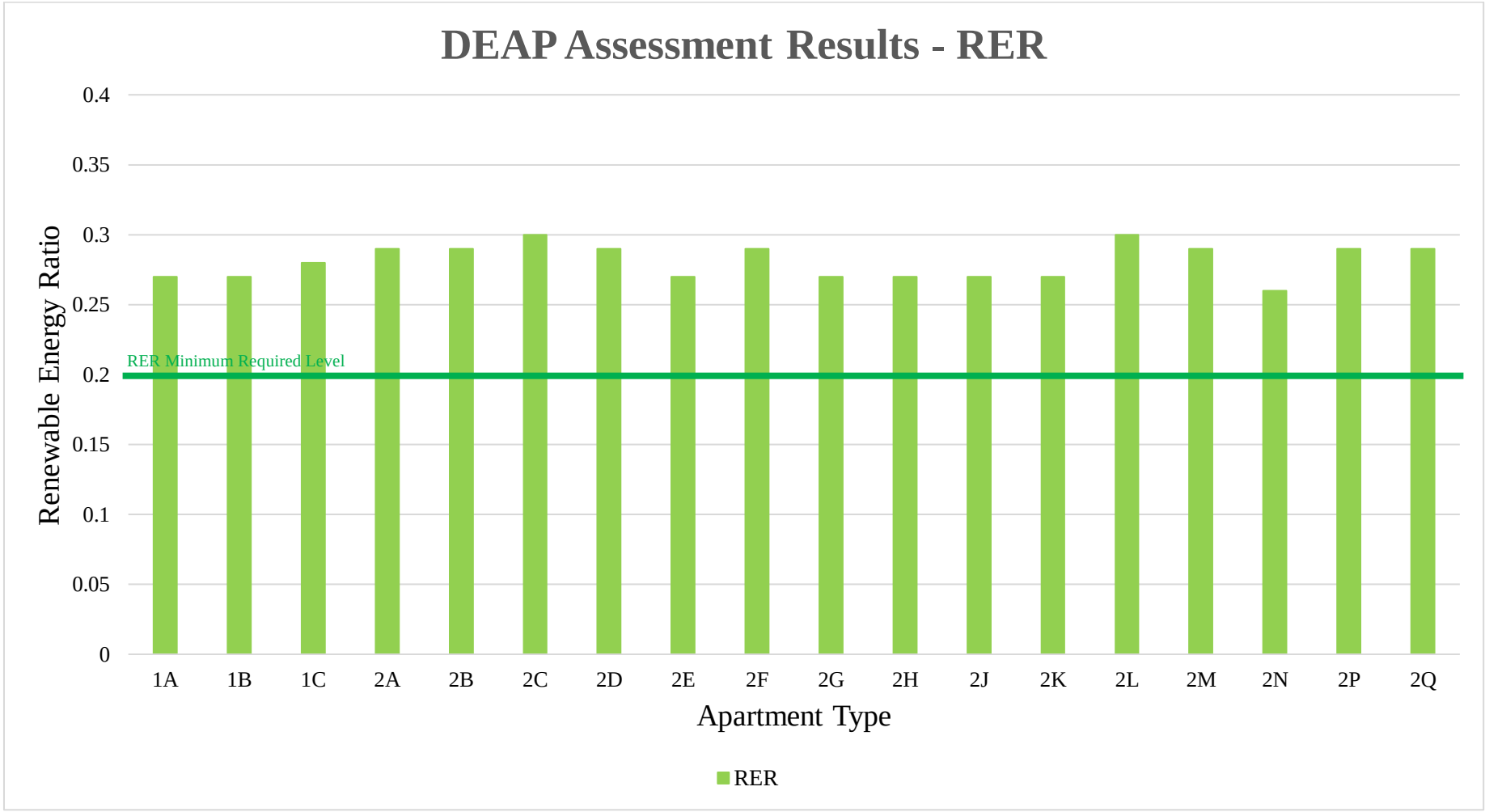
Block B - Ground Floor



Block B – First Floor

Appendix B – DEAP Assessment Results Graphed – Blocks A, B, C




DEAP Assessment Results - RER
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
Renewable Energy Ratio
RER Minimum Required Level
1A
1B
1C
2A
2B
2C
2D
2E
2F
2G
2H
2J
2K
2L
2M
2N
2P
2Q
Apartment Type
RER