



## **Energy Efficiency Design Statement**

Proposed Residential Development Site at Knockrabo Phase 2,  
Mount Anville Road, Goatstown, Dublin

October 2024

**Waterman Moylan Consulting Engineers Limited**

Block S Eastpoint Business Park, Alfie Byrne Road, Dublin D03 H3F4  
[www.waterman-moylan.ie](http://www.waterman-moylan.ie)

**Client Name:** Knockrabo Investments DAC  
**Document Reference:** 20-086r.007  
**Project Number:** 20-086

## Quality Assurance – Approval Status

This document has been prepared and checked in accordance with Waterman Group's IMS (BS EN ISO 9001: 2015, BS EN ISO 14001: 2015)

<b>Issue</b>	<b>Date</b>	<b>Prepared by</b>	<b>Checked by</b>	<b>Approved by</b>
1	24-05-24	N. Coughlan	A. Brophy	
2	28-08-24	N. Coughlan	A. Brophy	N. Coughlan
3	22-10-24	N. Coughlan	A. Brophy	N. Coughlan

### Comments

---

## Disclaimer

This report has been prepared by Waterman Moylan, with all reasonable skill, care and diligence within the terms of the Contract with the Client, incorporation of our General Terms and Condition of Business and taking account of the resources devoted to us by agreement with the Client.

We disclaim any responsibility to the Client and others in respect of any matters outside the scope of the above.

This report is confidential to the Client and we accept no responsibility of whatsoever nature to third parties to whom this report, or any part thereof, is made known. Any such party relies on the report at its own risk.

# Content

<b>1. Introduction</b>	<b>1</b>
<b>2. Building Regulations Part L 2022 Dwellings</b>	<b>2</b>
2.1 Regulation 8 Part (a)	2
2.2 Regulation 8 Part (b)	2
2.3 Regulation 8 Part (c)	2
2.4 Regulation 8 Parts (d & e)	3
2.5 Regulation 8 Parts (f)	3
2.6 Requirements for Common Areas	3
2.7 L2A & S.I No 393 of 2021 Regulation 5 Part (f) – Electric Vehicle Charging	4
<b>3. Building Fabric</b>	<b>5</b>
3.1 Elemental U-Values	5
3.2 Air Permeability	5
3.3 Thermal Bridging	6
<b>4. Heat Sources &amp; Renewable Energy Options &amp; Proposals</b>	<b>7</b>
4.1 Houses & Duplex Units Option 1 - Gas Fired Boilers with Solar PV	7
4.2 Houses & Duplex Units Option 2 - Air Source Heat Pumps	7
4.3 Additional Solar PV	8
4.4 Apartments Option 1 –Exhaust Air Heat Pumps	8
4.5 Apartments Option 2 – Electric Heaters, Hot Water Heat Pumps, Heat Recovery Ventilation & PV Panels	8
4.6 Apartments Option 3 - District Heating	9
4.7 Apartment Corridors/Landlord Areas	9
<b>5. Proposed Solutions</b>	<b>10</b>
5.1 Energy in Use Measures	10

## 1. Introduction

Waterman Moylan Engineering Consultants have been appointed by Knockrabo Investments DAC to prepare this Energy Efficiency Design Statement as part of the planning documentation for a proposed residential development on lands at Knockrabo, Mount Anvile Road, Goatstown, Co. Dublin.

The development with total of c.17,312.2 sq.m. gross internal area (GIA) will consist of the construction of 158 No. residential units (12 No. houses and 146 No. apartments (35 No. 1 beds, 81 No. 2 beds, 3 No. 3 beds and 27 No. 3 bed duplex units), a childcare facility (c.400 sq.m. GIA) and Community / Leisure Uses (c. 223 sq.m. GIA), as follows:

This report identifies the energy standards with which the proposed development will have to comply and also sets out the overall strategy that will be adopted to achieve these energy efficiency targets.

The dwellings will be required to minimise overall energy use and to incorporate an adequate proportion of renewable energy in accordance with Building Regulations Part L 2022, Conservation of Energy & Fuel (hereinafter referred to as "*Part L 2022 Dwellings*").

## 2. Building Regulations Part L 2022 Dwellings

Compliance with Building Regulations *Part L 2022 Dwellings* is broken down into six distinct categories, known as Regulation 8; parts (a) to (f).

A summary of each of these parts as listed in Technical Guidance Document L 2022 is provided below together with a description of what is required to demonstrate compliance and suggested routes to meeting the required standards.

### 2.1 Regulation 8 Part (a)

The regulation requires that:

*Providing that the energy performance of the building is such as to limit the calculated primary energy consumption and related carbon dioxide (CO<sub>2</sub>) to that of a nearly zero energy building within the meaning of the Directive insofar as is reasonably practicable.*

Part (a) is the overarching compliance target which stipulates the required overall reduction in energy consumption and carbon emissions for new dwellings.

This requires that the energy consumption and carbon emissions of every dwelling is assessed using the DEAP software and that reductions of 70% in energy consumption and 65% in carbon emissions are achieved. The baseline against which this reduction is to be measured is considered to be a dwelling which is constructed to perfectly comply with the 2005 version of Building Regulations Part L.

The ratio of the energy consumed by the proposed dwelling to a similar dwelling constructed to 2005 energy efficiency standards is referred to as the “Energy Performance Co-efficient”

### 2.2 Regulation 8 Part (b)

The regulation requires that:

*Providing that, the nearly zero or very low amount of energy required is covered to a very significant extent by energy from renewable sources, including energy from renewable sources produced on-site or nearby;*

This requires that all new dwellings are provided with a renewable energy source. The regulations state that 20% of the total energy consumed within the dwelling must be provided from renewable thermal sources (solar thermal, biomass, heat pumps) or renewable electrical sources (Photovoltaic, Micro-wind).

In practical terms, for a multiple unit development, this requirement is usually met by incorporating PV panels at roof level, incorporating air source heat pump technology or by adding an element of biomass or micro-Combined Heat & Power (CHP ) to a district heating scheme.

Where CHP is included, the renewable energy is considered to be the waste heat which is generated as a by-product of the electricity produced. Specific calculation methods are set out within TGD *Part L 2022 Dwellings* which detail how compliance should be demonstrated.

### 2.3 Regulation 8 Part (c)

The regulation requires that:

*Limiting heat loss and, where appropriate, availing of heat gain through the fabric of the building;*

This requires that the fabric of the building is designed to minimise heat loss from the building and that the air permeability of the structure limits the unwanted passage of air into the building.

Typical compliant U-Values are as follows.

Pitched roof	0.16 W/m <sup>2</sup> K
Flat roof	0.20 W/m <sup>2</sup> K
Walls	0.18 W/m <sup>2</sup> K
Floor	0.18 W/m <sup>2</sup> K
Windows	1.4 W/m <sup>2</sup> K

The u-values of individual elements can be relaxed if required provided that compensatory measures are taken on other elements and that the overall area weighted u-value for the entire dwelling is the same as it would have been if all individual elements had complied.

The thermal bridging details of junctions in the envelope of the building (floor-wall; wall-window; wall-roof, etc) must also be designed and constructed in accordance with the guidance set out in Limiting Thermal Bridging and Air Infiltration – Acceptable Construction Details

Every dwelling must also be subjected to an air pressure test to determine the air tightness. All dwellings must achieve an air tightness of less than 5m<sup>3</sup>/m<sup>2</sup>/hour when tested at 50 Pascals. In multiple dwelling developments with repeating apartment types, testing can be conducted on a representative sample of units in accordance with Table 1.5.4.3 of TGD *Part L 2022 Dwellings*.

## 2.4 Regulation 8 Parts (d & e)

The regulation requires that:

*Providing and commissioning energy efficient space and water heating systems with efficient heat sources and effective controls;*

*Providing that all oil and gas fired boilers shall meet a minimum seasonal efficiency of 90%;*

These require that gas or oil-fired boilers are at least 90% efficient and that heating controls allow independent time control of the heating (2 zones for dwellings larger than 100m<sup>2</sup>) and hot water. Heating in each zone should also be controlled by room thermostats (in the case of heating) and cylinder stats (in the case of hot water).

## 2.5 Regulation 8 Parts (f)

The regulation requires that:

*Providing to the dwelling owner sufficient information about the building, the fixed building services and their maintenance requirements so that the building can be operated in such a manner as to use no more fuel and energy than is reasonable.*

This requires that information is provided to the dwelling owner which relates to the effective and efficient operation of the systems installed in that dwelling. Instructions on how to control the heating & hot water systems based on time and temperature requirements.

## 2.6 Requirements for Common Areas

Section 0.1.2.3 requires that:

*Where a new dwelling forms part of a larger building, the guidance in this document applies to the individual dwelling, and the relevant guidance in Technical Guidance Document L - Conservation of Fuel and Energy – Buildings other than dwellings applies to the non-dwelling parts of the building*

## 2.7 L2A & S.I No 393 of 2021 Regulation 5 Part (f) – Electric Vehicle Charging

The regulation requires that:

*(a) A multi-unit building containing one, or more than one, dwelling that is new shall have installed ducting infrastructure (consisting of conduits for electrical cables) for each car parking space, to enable the subsequent installation of recharging points for electric vehicles where the parking space is:*

*(i) located inside the building concerned, or*

*(ii) is within the curtilage of the building concerned.*

*(c) A new building that is a dwelling, other than where the dwelling forms part of a multi-unit building, where a parking space is located within the curtilage of the dwelling, shall have installed appropriate electric vehicle recharging infrastructure to enable the subsequent installation of recharging points for electric vehicles.*

This requires that ducting provision for the future installation of car charging point be made in all car parks with more than 10 parking spaces associated with multi-unit residential buildings. It also requires that individual / own-door dwellings which have on curtilage parking are provided with ducting infrastructure to allow the future installation of e-car charging.



### 3. Building Fabric

Before considering efficient building services or renewable energy systems, the form and fabric of a building must be assessed and optimised so as to reduce the energy demand for heating, lighting and ventilation. Target performance levels have been identified by the design team and are presented below.

#### 3.1 Elemental U-Values

The U-Value of a building element is a measure of the amount of heat energy that will pass through the constituent element of the building envelope. Increasing the insulation levels in each element will reduce the heat lost during the heating season and this in turn will reduce the consumption of fuel and the associated carbon emissions and operating costs.

It is the intention of the design team to exceed the requirements of the building regulations. Target U-Values are identified below.

U-Values	Range of Target Values Proposed	Part L 2022 (Dwellings) Compliant Values
Floor	0.10 to 0.18 W/m <sup>2</sup> K	0.18W/m <sup>2</sup> K
Roof (Flat)	0.12 to 0.20 W/m <sup>2</sup> K	0.20 W/m <sup>2</sup> K
Roof (Pitched)	0.10 to 0.16 W/m <sup>2</sup> K	0.16 W/m <sup>2</sup> K
Walls	0.10 to 0.18 W/m <sup>2</sup> K	0.18 W/m <sup>2</sup> K
Windows	0.9 to 1.4 W/m <sup>2</sup> K	1.4W/m <sup>2</sup> K

#### 3.2 Air Permeability

A major consideration in reducing the heat losses in a building is the air infiltration. This essentially relates to the ingress of cold outdoor air into the building and the corresponding displacement of the heated internal air. This incoming cold air must be heated if comfort conditions are to be maintained. In a traditionally constructed building, infiltration can account for 30 to 40 percent of the total heat loss, however construction standards continue to improve in this area.

With good design and strict on-site control of building techniques, infiltration losses can be significantly reduced, resulting in equivalent savings in energy consumption, emissions and running costs.

In order to ensure that a sufficient level of air tightness is achieved, air permeability testing will be specified in tender documents, with the responsibility being placed on the main contractor to carry out testing and achieve the targets identified in the tender documents.

A design air permeability target of **3 m<sup>3</sup>/m<sup>2</sup>/hr** has been identified for the houses on the site.

The air permeability testing will be carried out in accordance with BS EN 13829:2001 'Determination of air permeability of buildings, fan pressurisation method' and CIBSE TM23: 2000 'Testing buildings for air leakage'

### 3.3 Thermal Bridging

Thermal bridges occur at junctions between planar elements of the building fabric and are typically defined as areas where heat can escape the building fabric due to a lack of continuity of the insulation in the adjoining elements.

Careful design and detailing of the manner in which insulation is installed at these junctions can reduce the rate at which the heat escapes. Standard good practice details are available and are known as Acceptable Construction Details (ACDs). Adherence to these details is known to reduce the rate at which heat is lost.

The rate at which heat is lost is quantified by the Thermal Bridging Factor of the dwelling and measured in  $W/m^2K$ . The Thermal Bridging Factor is used in the overall dwelling Part L calculation, this value can be entered in three different ways:

0.15 $W/m^2K$	Used where the ACDs are not adhered to
0.08 $W/m^2K$	Used where the ACDs are fully adhered to
< 0.08 $W/m^2K$	Used where the thermal details are thermally modelled and considered to perform better than the ACDs

It is intended that the ACDs will be adhered where suitable benchmarks exist and/or that thermal modelling will be carried out for any non-standard junction details within proposed development.

## **4. Heat Sources & Renewable Energy Options & Proposals**

All new dwellings must meet overall energy performance levels (as defined by the Energy Performance Coefficient - EPC) and must have a portion of their annual energy demand provided by renewable energy sources.

The renewable energy source can be thermal energy such as solar thermal collection, biomass boilers or heat pumps or it can be electrical energy as generated by photovoltaic solar panels or wind turbines. The minimum renewable energy contributions defined in Part L 2022 Part (b) is 20% of the total energy consumption for the dwelling.

Two main fuel sources are generally available for developments of this nature, natural gas and electricity. Each present distinct options for compliance with the new standards. Solutions involving gas as the primary fuel source will typically include a solar technology such as PV panels to meet the renewable energy requirements while solutions relying on electricity will include heat pump technology.

The options presented below set out the options for the dwellings proposed for the site. The final selection and combination of technologies will most likely be selected from these options based on a more in-depth technical and financial appraisal of the technologies which will be carried out during detailed design.

### **4.1 Houses & Duplex Units Option 1 - Gas Fired Boilers with Solar PV**

The use of natural gas to provide heating and hot water to dwellings and commercial buildings is very common due to its convenience and to low fuel prices. There is existing Gas Networks Ireland infrastructure in the vicinity of the proposed development and Gas Networks Ireland are aware of the proposed extent of development on the subject lands and have confirmed that there is adequate capacity in the network. High efficiency gas fired condensing boilers convert gas to heat energy with an efficiency of over 90%.

Both Solar PV and Solar Thermal Collection harvest the sun's energy to provide a renewable energy source for the dwelling. In the case of PV, the sun's energy is converted into electrical energy which offsets the use of grid electricity while in the case of solar thermal collection it is converted into thermal energy which is used to heat domestic hot water within the building.

### **4.2 Houses & Duplex Units Option 2 - Air Source Heat Pumps**

Air source heat pumps (ASHPs) utilise grid supplied electricity to extract thermal energy from a heat source, in this case, the external ambient air. While the electricity consumed is obviously not renewable energy, the efficiency at which a heat pump operates allows a significant portion of the heat delivered to be considered as renewable energy. The amount of heat considered to be renewable is determined by the efficiency of the heat pump and the "primary energy conversion factor" for grid supplied electricity. Typically, approximately 40% to 50% of the heat supplied is considered to be renewable energy.

Air source heat pumps require an indoor and an outdoor component. The outdoor unit is the evaporator which extracts the thermal energy from the ambient air while the indoor unit typically includes the heating buffer tanks and the hot water cylinder for the dwelling. The outdoor unit is typically located in the back garden of a dwelling.

In recent years, the design of ASHPs has improved bringing about higher efficiencies and reduced costs. This, in turn, has led to an increase use of this technology in large scale housing developments. Certified seasonal efficiencies of some models can exceed 500% meaning that the use of this technology can easily deliver compliance with current Part L requirements.

### **4.3 Additional Solar PV**

The additional of Solar PV arrays to houses where heat pumps have been provided offer homeowners an excellent combination of renewable heating systems and on-site renewable energy generation.

This combination will also offer the possibility of achieving A1 BER ratings for the dwellings on the site.

### **4.4 Apartments Option 1 –Exhaust Air Heat Pumps**

Exhaust Air heat pumps (EAHPs) operate in a very similar manner to the more conventional air source heat pumps and utilise grid supplied electricity to extract thermal energy from a heat source, in this case, the internal air within the apartment. The internal air is extracted from kitchens and wet rooms and is drawn into the heat pump via ductwork in the ceiling void. The heat pump extracts heat from this air before expelling it from the apartment.

As noted in Section 4.2 above, the electricity consumed is not renewable energy but the efficiency at which a heat pump operates allows a significant portion of the heat delivered to the dwelling be considered as renewable.

There are a number of manufacturers offering products of this type and the certified seasonal efficiencies of some models can exceed 450% in heating mode and 170% to 190% in hot water mode. These efficiencies can deliver Part L 2022 compliance in most circumstances but in some instances may need supplementary PV panels in order to meet the required energy targets.

There is no requirement for a separate Mechanical Extract Ventilation (MEV) systems when an exhaust air heat pump is used as the heat pump draws the air from all wet rooms in the same manner as an MEV system would. The fan will run continuously to ensure that the minimum ventilation rates are maintained and the supply air to the dwelling is provided through trickle vents in each habitable room.

### **4.5 Apartments Option 2 – Electric Heaters, Hot Water Heat Pumps, Heat Recovery Ventilation & PV Panels**

This approach includes the provision of electric storage and/or convector heaters in the living & sleeping areas to meet all of the space heating requirements with electric towel rads provided in main bathrooms and en-suites.

The hot water demand is met by a hot water heat pump which utilise grid supplied electricity to extract thermal energy from a heat source in a similar manner to an Exhaust Air Heat Pump. The heat pump is ducted directly to the external façade through insulated supply & exhaust ductwork and uses external air for the hot water needs. It can use up to 3 times less electricity than direct acting water heaters and produces renewable energy to aid Part L compliance.

Heat Recovery Ventilation would then be provided in order meet the ventilation needs of the apartments. Air is extracted from wet rooms and supplied to living spaces via a central unit which contains supply and extract fans and a heat exchanger. This system recovers the heat from the warm air being extracted from the dwelling and uses the heat recovered to raise the temperature of the incoming air stream leading to improved overall efficiency.

PV panels are also then needed to improve the overall renewable energy contribution and improve the overall energy performance of the dwellings. Generally, 1 or 2 PV panels will be required for each apartment.

## **4.6 Apartments Option 3 - District Heating**

This approach would involve the generation of heat in a central location on the site and the distribution of this heat to each apartment via a network district heating pipework. The central plant used to generate the heat could include Air Source Heat Pumps, Combined Heat and Power (CHP) plant and high efficiency gas fired condensing boilers.

A CHP unit uses gas as its energy source to create electricity which can be utilised within the proposed development. This process of creating electricity results in the generation of “waste heat” which can then be used to meet a proportion of the heating and hot water demands of the housing development. Since the waste heat is captured it can be considered to be renewable energy and therefore contributes towards the overall 20% renewable energy requirement.

The large Air Source Heat Pumps (ASHPs) operate in the same manner as the smaller units incorporated in houses or apartments but at a larger scale, with outputs of up to 90kW. The heat generated is fed in to the district heating network from where it can be supplied to the apartments. Typically, approximately 40% to 50% of the heat supplied is considered to be renewable energy.

The gas fired boilers act to top-up the heat produced by the CHP and heat pumps by raising the temperature of district heating system to the required level and by supplementing the overall heat production in the coldest periods of the year. Averaged over the year, the gas boilers will meet less than 30% of the total heat demand.

Heating pipework would be installed throughout the scheme to distribute the heat generated in the plant room throughout the apartment development, serving each apartment via a heat interface unit (HIU). The HIU will both control and meter the consumption of heat and hot water within each individual dwelling allowing occupants to set the times they need space heating and ensuring they are charged accordingly.

It is unlikely that a district heating system will be viable on the site as the overall scale of the development and dwelling density would not warrant this approach. In order to justify the large capital costs associated with the central plant and distribution network required for district heating, residential schemes would typically need to contain in excess of 200 units, ideally arranged around compact apartment cores.

## **4.7 Apartment Corridors/Landlord Areas**

In accordance with the requirements of Part L 2022, the common areas within the apartment blocks are required to meet the requirements of Part L 2022 for “Buildings Other Than Dwellings”. Under Part L 2022, a portion (10% to 20%) of the energy demand of the common areas must be met by a renewable energy source. The energy demand within these spaces will be exclusively provided by electrical energy (lighting, space heating & lifts etc) so a photovoltaic array would be best suited to meet this renewable energy demand.

## 5. Proposed Solutions

The preceding sections of this report set out the regulatory requirements with which the scheme will have to comply while identifying a number of technologies and design approaches that may be utilised to achieve compliance.

The building fabric standards and the technology solutions discussed will all be assessed in greater detail during the detailed design stage of the project. A cost benefit analysis of all these available solutions will be carried out to determine the correct balance between an efficient building envelope and the most appropriate combination of technology and renewable energy systems.

The proposed approach to achieving Part L Compliance will be based on a combination of the solutions below once a detailed analysis has been completed at detailed design stage. A final decision will be made once capital costs, renewable targets and regulation compliance have all been compared to find the most appropriate solution.

### 5.1 Energy in Use Measures

The most likely overall solution that will be implemented will include the following measures

- Meet or exceed minimum U-Value standards
- Achieve a high level of air tightness (typically 3m<sup>3</sup>/m<sup>2</sup>/hr)
- Ensure thermal bridging details are designed to meet the performance of the ACDs or an equivalent standard.
- Provide an appropriate combination of technologies to ensure energy consumption is in line with Part L 2022 requirements. As it is not intended to bring a natural gas supply to the development, air source heat pumps will be chosen as the main source of heating and hot water.
- Install centralised mechanical ventilation systems to ensure adequate ventilation rates are achieved in the dwelling which maximising the benefits of the airtight construction

# UK and Ireland Office Locations

