

ENERGY STATEMENT for Residential Development

Foxburrow, Portlaoise

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Waterman Moylan Consulting Engineers Limited

Block S Eastpoint Business Park, Alfie Byrne Road, Dublin D03 H3F4
www.waterman-moylan.ie



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1	04-06-2020	A. Cruise	N. Coughlan	Niall Coughlan

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1. Introduction

The proposed development will comprise the construction of 155 no. dwellings. The dwellings will include a mix of 115 two, three and four bedroom houses, 4 one bedroom maisonettes and 36 one and two bedroom apartments.

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 2019, Conservation of Energy & Fuel (hereinafter referred to as Part L) and anticipated future revisions.

The Department of Environment has recently issued revisions to Part L of the Building Regulations which have been published as “Part L 2019”. This standard introduces the “Near Zero Energy Buildings” (NZEB) concept for dwellings. NZEB targets will require that the energy consumption of new dwellings be reduced by 25% from the previously compliant level.

The new standard comes into effect for buildings for which planning permission is applied for after November 2019 and as such will apply to this scheme.

Achieving compliance with the required energy standards will deliver houses and apartments with a Building Energy Rating (BER) of A2

2. Building Regulations Part L 2019

Compliance with Building Regulations Part L 2011 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 2011 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 (CO₂) to that of a nearly zero energy building within the meaning of the Directive insofar as is reasonably

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 the 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-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 2019 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 ² K
Flat roof	0.20 W/m ² K
Walls	0.18 W/m ² K
Floor	0.18 W/m ² K
Windows	1.4 W/m ² 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 and **air tightness of less than 5m³/m²/hour** when tested at 50 Pascals. In multiple dwelling developments with repeating house/apartment types, testing can be conducted on a representative sample of units in accordance with Table 1.5.4.3 of TGD Part L 2019

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 100m²) 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 house. Instructions on how to control the heating & hot water systems based on time and temperature requirements.

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 2019 (Residential) Compliant Values
Floor	0.15 to 0.18 W/m ² K	0.18W/m ² K
Roof (Flat)	0.12 to 0.20 W/m ² K	0.20 W/m ² K
Roof (Pitched)	0.10 to 0.16 W/m ² K	0.16 W/m ² K
Walls	0.15 to 0.18 W/m ² K	0.18 W/m ² K
Windows	0.9 to 1.4 W/m ² K	1.4W/m ² 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 m³/m²/hr** has been identified for the apartments and 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 adjoin 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 thermal modelling will be carried out for all thermal bridges on the dwellings within proposed development and that the resultant Thermal Bridging Factor will be in the range of 0.04 W/m^2K to 0.08 W/m^2K .

4. Heat Sources & Renewable Energy Options – Houses & Apartments

All new dwellings and commercial buildings must have a portion of their annual energy demand provided by renewable energy sources. This 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 for dwellings as required by Part L 2019 is defined as the Renewable Energy Ratio (RER) which is the ratio of the primary energy from renewable energy sources to total primary energy. In order to meet the requirements of Part L 2019, the RER is required to be a minimum 20%.

In order to determine the most efficient and effective means of complying with the requirements of Part L 2019, a detailed assessment of the various renewable energy systems available will be conducted during the detailed design stage. A range of possible solutions will be assessed in terms of their technical suitability; ease of operation for end-users; operating costs to be borne by end users and capital costs of the plant and equipment required.

The most common approach to meeting the required standards is set out below.

4.1 Individual Gas Fired Boilers with Solar Panels.

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.

Since the introduction of Part L 2011 the use of PV panels has become the most common approach for achieving Part L compliance as the quantity of panels provided on each dwelling can be tailored specifically to ensure that both the minimum renewable energy requirements and the overall dwelling energy performance coefficient (EPC) are compliant with regulations L3 (a) and (b).

4.2 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.

For apartments, there is an increasing number of manufacturers offering products which incorporate air source heat pump technology but which do not require the traditional “outdoor unit” making them suitable for apartments, these are general referred to as “Exhaust Air Heat Pumps” and are capable of extracting air from both the air within the apartment and from the outdoor air through a ducting system.

4.3 District Heating

This approach would involve the generation of heat in a central location of an apartment block and the distribution of this heat to each dwelling via a network of heating pipework. The central plant used to generate the heat could include gas boilers and a renewable energy contribution such as a combined heat and power plant or air source heat pumps

This approach is often considered to be suitable for high density developments such as large apartment complexes (100+ dwellings), it becomes inefficient both in terms of capital cost and operational cost on smaller apartment schemes and as such would not be considered to be a viable approach on a project of this scale.

4.4 Ventilation Design

The provision of a well-designed ventilation for dwellings and commercial building is vitally important in order to control the odours and moisture levels and to provide an adequate supply of fresh air to the dwelling.

Three different options are generally considered for schemes of this nature. These are as follows: -

4.4.1 Traditional Natural Ventilation Approach

This approach operates with intermittent extract fans in wet rooms and background ventilation provided in accordance with the guidance of Technical Guidance Document F (TGD-F)

In the DEAP calculation used for Part L compliance, the number of “intermittent fans and passive vents” entered in the calculation is typically one (fan) per wet room and one (passive vent) per habitable room.

4.4.2 Whole House Mechanical Heat Recovery Ventilation (MHRV)

Where MHRV are used, 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 using the heat recovered to raise the temperature of the incoming air stream leading to improved overall efficiency.

The system also has the benefit of eliminating the requirement for trickle ventilation as it runs continuously, thereby increasing the benefits of an airtight construction. It is also possible to incorporate a humidity control function into the fans which will result in a system which is capable of varying supply and extract rates in accordance with the humidity levels in the dwelling.

In the DEAP calculation used for Part L compliance, the number of “intermittent fans and passive vents” entered in the calculation will only need to take account of the kitchen extract fan and therefore only 1 “intermittent fans and passive vents” will be entered in the software.

4.4.3 Mechanical Whole House Extract (MEV)

MEV systems are similar to MHRV systems in that they extract air from all wet rooms using a central extract fan which runs continuously however there is no supply air provided by the system and there is no heat recovery. In order to supply air to the dwelling trickle vents are required but the total free area required is typically 60% to 70% less than that which is required using the traditional ventilation approach. As with MHRV it is possible to incorporate a humidity control function into the fan which will result in a system which is capable of varying air extract rates in accordance with the humidity levels in the dwelling.

In the DEAP calculation used for Part L compliance, the number of “intermittent fans and passive vents” entered in the calculation will only need to take account of the kitchen extract fan and therefore only 1 “intermittent fans and passive vents” will be entered in the software. The trickle vents provided in the windows can be ignored since their area is less than 3,500mm²

Of the three systems discussed above, it is likely that either an MHRV system or an MEV System will be used.

5. Proposed Solutions for Foxburrow

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 Houses & Apartments

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

- Exceed minimum U-Value standards by 20% to 30%,
- Achieve air tightness standards of 3m³/m²/hr
- Ensure thermal bridging details are design to achieve thermal bridging factors of 0.08W/m²K or less.
- Utilise heat pump technology in the form of Air Source Heat Pumps for houses and Exhaust Air Heat Pumps for apartments.
- Install centralised mechanical ventilation systems to ensure adequate ventilation rates are achieved in the dwelling which maximising the benefits of the airtight construction
- Achieving compliance with the energy standards set out in Part L 2019, (Dwellings) will deliver a building with an A2 energy rating.

UK and Ireland Office Locations



