

**Energy Efficiency Compliance Report**  
**on**  
**Proposed Dwellings at**  
**Slievekeale,**  
**Waterford**

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## **1. Introduction**

This is a report on the compliance of the dwellings proposed for construction at Slievekeale, Waterford with Part L of the Building Regulations and with the Sustainable Building Design and Construction objectives of the Waterford City Development Plan.

This report has been prepared as part of the overall Part 8 Planning Application pack for the development in question. The overall site layout and the dwelling types proposed are detailed on Architectural Drawings which are included in the above-mentioned pack.

There are 58no. new dwellings proposed for construction on the site herein. The dwellings are to be constructed in compliance with all currently applicable building regulations and best practice guidelines. There will be a variety of dwelling types on the site as detailed on the drawings. This report demonstrates the integration of various mechanical and electrical service combinations in the dwellings which will achieve compliance with the Technical Guidance Document (TGD) on Part L of the Building Regulations<sup>1</sup>, and also ensure the construction of “A-rated” dwellings on the site.

## **2. Background**

The first version of the Energy Performance of Buildings Directive (EPBD), directive 2002/91/EC, was approved by the European Parliament on 16 December 2002. This directive is aimed at improving the energy performance of both new and existing buildings. It entered into force on 4 January 2003. Under this directive, EU Member States were obliged to comply with the Directive within three years of its inception date (4 January 2006), by bringing into force necessary laws, regulations and administrative provisions.

In May 1992 the current incarnation of the Building Regulations Technical Guidance Documents (TGDs) were introduced. These incorporated a section on Energy Efficiency in buildings (Part L – Conservation of Fuel & Energy in Buildings). These TGDs have been regularly revised and updated to match current building practices and regulatory requirements.

As part of the EPBD, a Building Energy Rating (BER) certificate is required for any newly constructed building, as well as any building that is to be sold or leased. A BER assessment gives a comparative indication of the energy efficiency of the building against a notional standard building, as well as an assessment of the building’s likely carbon footprint. After the EPBD became part of Irish law, the Sustainable Energy Authority of Ireland (SEAI) introduced the Dwelling Energy Assessment Procedure (DEAP) with associated software programme. The DEAP software is the recognised method by which a dwelling’s energy performance may

be analysed and a BER calculated for it. The DEAP software also checks for compliance with the current revision of Part L<sup>2</sup> of the Technical Guidance Documents (TGDs).

## **2.1 Energy Efficiency Design Statement**

The Waterford City Development plan 2013-2019 requires that *'All new building developments shall comply with a minimum low energy performance as a pre-requisite to receiving planning permission'*.

It is also *"the policy of Waterford City Council to encourage the establishment and maintenance of sustainable residential communities within the City (POL 13.1.1)"*

This is achieved by:

- *The encouragement of energy efficiency both during the construction phase and during the lifetime of the development by sensitive design and layout taking into account the topography, orientation and surrounding features of each site, the use of energy efficient materials and forms of construction and heating systems.*

Implementation of the above also assists in ensuring compliance of the dwellings to be constructed here with Part L of the Building Regulations and with the Energy Performance of Buildings Directive.

## **2.2 Achieving Compliance with Part L and with the objectives of the Development Plan**

Compliance with Part L of the Building regulations for new dwellings involves the achievement of objectives L1 & L3 – detailed in the Second Schedule to the Building Regulations 1997 (S.I. No. 497 of 1997) as amended by the Building Regulations (Part L Amendment) Regulations 2011 (S.I. No. 259 of 2011).

### Objective L1 :

*A building shall be designed and constructed so as to ensure that the energy performance of the building is such as to limit the amount of energy required for the operation of the building and the amount of carbon dioxide (CO<sub>2</sub>) emissions associated with this energy use insofar as is reasonably practicable.*

The specimen design of the dwellings has been prepared in compliance with current building regulations, applicable standards and best practice guidelines. This will ensure that (insofar as is reasonably practicable that):

- the amount of energy required for the operation of the building will be limited and
- the amount of carbon dioxide (CO<sub>2</sub>) emissions associated with this energy use will also be limited

Objective L3: For new buildings, the requirements of L1 shall be met by: -

(a) *providing that the energy performance of the dwelling is such as to limit the calculated primary energy consumption and related carbon dioxide (CO<sub>2</sub>) emissions insofar as is reasonably practicable, when both energy consumption and carbon dioxide (CO<sub>2</sub>) emissions are calculated using the Dwelling Energy Assessment Procedure (DEAP) published by Sustainable Energy Authority of Ireland;*

- This requirement will be stated in the specimen design specification furnished to tenderers on this project – meaning that this obligation will be complied with. Details of minimum values to be applied in respect of building insulation properties and airtightness expectations are set out in Section 3 of this report.

(b) *providing that, for new dwellings, a reasonable proportion of the energy consumption to meet the energy performance of a dwelling is provided by renewable energy sources;*

- Provision has been made in the specimen designs for a variety of currently available Renewable Energy Technology systems required to ensure compliance with Part 1.2.1 of TGD L. Further details on the method by which the objective is complied with is contained in Sections 4 and 5 of this report.

(c) *limiting heat loss and, where appropriate, availing of heat gain through the fabric of the building;*

- The specimen designs on this project have been prepared based on current guidance and best practice for limiting heat loss and availing of heat gain where appropriate.

(d) *providing and commissioning energy efficient space and water heating systems with efficient heat sources and effective controls;*

- The specimen designs shall explicitly state this requirement meaning that the obligation will be complied with.

(e) *providing that all oil and gas fired boilers shall meet a minimum seasonal efficiency of 90%;*

- This will also be an explicit requirement of the specimen design specification

(f) *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.*

- The Private Public Partnership Company (PPP Co) engaged to construct this development will own & operate these buildings for an extended period following completion of construction. Consequently, the PPP Co. will be in possession of all of the necessary information in respect of the efficient operation of the buildings.

It will be in their interest to ensure that the development is maintained & operated efficiently – they will stand to gain financially over the duration of the maintenance period if the buildings are operated efficiently.

### **Sample DEAP Analysis**

We have undertaken a DEAP analysis of a specimen dwelling in the project in order to demonstrate the compliance in principle of the design presented with the requirements of Part L of the Building Regulations. The results of this analysis are set out in Section 5.2 of this report.

### 3. Building Details

A three bed two storey end of terrace house was chosen for this study because it represents a good sample unit on which to carry out analysis for the purposes of this report. All three external walls were taken to be unsheltered. The U-values used for this building are listed in subsection 3.1.

#### 3.1 U-values

- Walls: 0.15 W/m<sup>2</sup> K.
- Window: 0.8 W/m<sup>2</sup> K (solar transmittance of 0.65, frame factor of 0.7).
- Roof: 0.12 W/m<sup>2</sup> K
- Doors: 1.1 W/m<sup>2</sup> K
- Ground Floor: 0.13 W/m<sup>2</sup> K.

#### 3.2 Air Permeability<sup>3</sup>

Air infiltration and draughts is one of the main sources of heat loss in a dwelling. An air permeability of 4 m<sup>3</sup>/ m<sup>2</sup>/ hr at 50 Pa was applied for this analysis. It is expected that the actual air permeability will be lower than this value – current construction methods are at a standard whereby values of 3 m<sup>3</sup>/ m<sup>2</sup>/ hr at 50 Pa are regularly achieved. A lower air change rate would improve the BER.

#### **4. Possible Renewable Technology Options for incorporation into Scheme**

Objective L3(b) of TGD L – Conservation of Fuel & Energy Dwellings 2017 requires that a dwelling achieves:-

- 10 kWh/m<sup>2</sup>/annum contributing to energy use for domestic hot water heating, space heating or cooling; or
- 4 kWh/m<sup>2</sup>/annum of electrical energy; or
- a combination of these which would have equivalent effect.

In order to meet this requirement, several renewable energy sources can be utilised, such as:

- Air Source Heat Pumps
- Solar Photovoltaic (PV) Panels.
- Solar Thermal Collectors.
- Woodchip Boilers.

These systems can be used in isolation or in combination with other systems to achieve the required targets.

It is proposed that this scheme be developed and maintained by a Private Public Partnership Company (PPPCo). for an extended period of time. The PPPCo will be obliged to comply with the requirement and so the final decision on the specifics of the renewable technology design will rest with the PPPCo.

Our sample analysis covers a range of potential installation types that will ensure compliance with Objective L3(b).

## 5. Building Service Options

### 5.1 Mechanical and Electrical Combinations

Table 5.1.1 below describes four methods of achieving an A-rated BER for this house. In all four cases the house does not have any secondary space heating facilities.

	<b>Option 1</b>	<b>Option 2</b>	<b>Option 3</b>	<b>Option 4</b>
<b>Mechanical Plant</b>	Air Source Heat Pump:  Mitsubishi PUHZ-SW75VHA Air to Water Variable Outlet  Space heating efficiency: 408 %	Air Source Heat Pump:  Mitsubishi PUHZ-SW75VHA Air to Water Variable Outlet  Space heating efficiency: 485 %	Gas Boiler:  91 % efficiency	Oil Boiler:  95 % efficiency
<b>Heat Emitters</b>	Standard Radiators	Fan coil low temperature radiators and/ or underfloor heating.	Standard Radiators	Standard Radiators
<b>Domestic Hot Water</b>	Mitsubishi PUHZ-SW75VHA Air to Water Variable Outlet  Domestic Hot Water Efficiency: 159 %	Mitsubishi PUHZ-SW75VHA Air to Water Variable Outlet  Domestic Hot Water: 159 % efficiency	300 Litre  50 mm factory insulated	300 Litre  50 mm factory insulated
<b>Solar Water Heating</b>	None	None	None	Kingspan Thermomax 40 evacuated tubes
<b>PV Panels</b>	1 x 287 kWh/ yr	1 x 287 kWh/ yr	4 x 278 kWh/ yr	None
<b>Ventilation</b>	Whole house Extract	Whole house extract	Mechanical Ventilation with Heat Recovery	Whole house extract

## 5.2 Results

Table 5.2.1 below compares the performance of each of the four proposed building service combinations for this dwelling.

	<b>Option 1</b>	<b>Option 2</b>	<b>Option 3</b>	<b>Option 4</b>
<b>Energy Rating</b>	A3	A3	A3	A3
<b>Energy Value</b> kWh/ m <sup>2</sup> / yr	63.70	63.23	58.45	63.30
<b>CO<sub>2</sub> Emissions Indicator</b> kgCO <sub>2</sub> / m <sup>2</sup> / yr	12.53	12.43	10.82	14.69
<b>CPC</b> (MPCPC <sup>4</sup> = 0.46)	0.378	0.375	0.327	0.444
<b>EPC</b> (MPEPC <sup>5</sup> = 0.4)	0.396	0.393	0.363	0.394

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4 MPCPC: Maximum Permitted Carbon Performance Coefficient.

5 MPEPC: Maximum Permitted Energy Performance Coefficient.

## **6. Findings**

Both options 1 and 2 used an air source heat pump for space and water heating. Option 1 was designed to heat the dwelling using standard radiators. The heat pump used in option 2 was designed to work with low temperature radiators and/ or underfloor heating, which are more efficient than standard radiators. Both of these options also required one PV panel to meet the renewable energy requirements outlined in TGD Part L.

Option 3 utilised a natural gas boiler, while option 4 utilised an oil boiler. While the oil boiler is slightly more efficient, natural gas releases less carbon dioxide than oil. Option 3 also includes Mechanical Ventilation with Heat Recovery (MVHR) to prevent heat loss to ventilation sources.

In order to meet the requirements for renewable energy generation in Part L of the building regulations, four PV panels were required in option 3. It was decided to implement PV panels as they would generate electricity to power the MVHR unit.

Solar thermal collectors for water heating were selected to meet the renewable energy requirement for option 4. While the maintenance requirement associated with solar thermal collectors is higher than that required for PV panels, these were selected in order to reduce oil consumption for water heating.

This study demonstrates that there are several methods of delivering low environmental impact housing by using energy efficient services in the dwelling.

## **7. Conclusions**

Construction of A-rated dwellings in the above development is achievable utilising building regulations compliant construction components and methods. There are a number of different permutations and combinations of energy installations that can be provided which yield top class Energy Ratings that comply with the objectives of the Waterford City Development Plan, and which also ensure compliance with part L of the Building Regulations and the Energy Performance of Buildings Directive. The house type examined herein was examined as a 'worst case scenario' – to demonstrate that achievement of extremely high quality energy performance in the development is relatively easily possible.

The achievement of A3 BERs on this development will be a minimum requirement – with incentives provided to the PPPCo to improve on this.

This verifies that the housing types and configurations proposed for this development will achieve A rated BER assessments, and Part L compliance