Waterman Moylan
Engineering Consultants

ENERGY STATEMENT
for
Proposed Residential Development & Creche

Enniskerry, Co. Wicklow

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Waterman Moylan Consulting Engineers Limited
Block S Eastpoint Business Park, Alfie Byrne Road, Dublin D03 H3F4
www.waterman-moylan.ie

Waterman Moylan
Engineering Consultants

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1	10-03-2020	Alan Brophy	Niall Coughlan	Niall Coughlan
2	12-03-2020	Alan Brophy	Margaret Dolan	Niall Coughlan
3	02-11-2020	Alan Brophy	Margaret Dolan	Niall Coughlan
4	11-12-2020	Margaret Dolan	Margaret Dolan	Niall Coughlan
5	15-03-2021	Margaret Dolan	Margaret Dolan	Niall Coughlan

Comments

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Disclaimer

Content

1. Introduction

The development will consist of the construction of 165 no. dwellings and associated ancillary infrastructure as follows:

A) 105 no. 2 storey houses (49 no. 3 bedroom houses [House Types B, B1, & B2], 56 no. 4 bedroom houses [House Types A, D, E & E1];

B) 56 no. apartments/duplex apartments in 6 no. 3 storey buildings – (28 no. 2 bedroom apartments and 28 no. 3 bedroom duplex apartments) all with terrace;

C) 4 no. 1 bedroom Maisonette dwellings in a 2 storey building;

D) Part 2-storey and single storey creche (c. 510 sq. m - including storage);

E) Open space along southern boundary of c. 0.93 hectares [with pedestrian connections to boundary to '*Lover's Leap Lane'* to the south and to boundary to the east and west], hard and soft landscaping (including public lighting) and open space (including boundary treatment), communal open space for duplex apartments; regrading/re-profiling of site where required [including import/export of soil as required] along with single storey bicycle/bin stores and ESB substation;

F) Vehicular access (including construction access) from the Cookstown Road from a new junction as well as 313 no. car parking spaces and 150 no. cycle spaces;

G) Surface water attenuation measures and underground attenuation systems as well as connection to water supply, and provision of foul drainage infrastructure (along the Cookstown Road to existing connection at junction with R760) and provision of underground local pumping station to Irish Water specifications;

H) 3 no. temporary (for 3 years) marketing signage structures [2 no. at the proposed entrance and 1 no. at the junction of the R760 and the Cookstown Road] and a single storey marketing suite (c. 81 sq.m) within site;

I) All ancillary site development/construction/landscaping works, along with provision of footpath/public lighting to Powerscourt National School pedestrian entrance and lighting from Powerscourt National School entrance to the junction of the R760 along southern side of Cookstown Road and pedestrian crossing across Cookstown Road.

2. Building Regulations Part L 2019

Compliance with Building Regulations Part L 2019 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 2019 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 5m^3/m^2/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 100m^2) 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 Regulations Part L 2017 (Building Other than Dwellings)

Compliance with Building Regulations Part L 2017 is broken down into seven distinct categories, known as Regulation L5 parts (a) to (i).

A summary of each of these parts as listed in Technical Guidance Document L 2017 is provided below together with a description of what is required to demonstrate compliance and suggested routes to meeting the required standards.

3.1 Regulation L5 Parts (a)

The regulation requires that:

> *(a) providing that the energy performance of the building is such as to limit the calculated primary energy consumption and related Carbon Dioxide (CO2) emissions to a Nearly Zero Energy Building level insofar as is reasonably practicable, when both energy consumption and Carbon Dioxide emissions are calculated using the Non-domestic Energy Assessment Procedure (NEAP) published by Sustainable Energy Authority of Ireland;*

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

This requires that the energy consumption and carbon emissions of every building is assessed using the SBEM software and that the energy consumption and carbon emissions associated with the building being assessed are in line with the required standards.

3.2 Regulation L5 Parts (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 produced on-site or nearby.*

This requires that Renewable Energy Technologies are provided. This to be reflected by Renewable Energy Ratio (RER) which is the ratio of the primary energy from renewable energy sources to total primary energy as defined and calculated in NEAP. RER for commercial buildings was as follows

- Where the MPEPC of 1.0 and MPCPC of 1.15 is achieved an RER of 0.20
- Where an EPC of 0.9 and a CPC of 1.04 is achieved an RER of 0.10

3.3 Regulation L5 Parts (c)

The regulation requires that:

> *limiting the heat loss and, where appropriate, availing of the heat gains 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^2K
Flat roof	0.20 W/m^2K
Walls	0.21 W/m^2K
Floor	0.21 W/m^2K
Windows	1.6 W/m^2K

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 building 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 Acceptable Construction Details and/or certified details for all key junctions.

Building must also be subjected to an air pressure test to determine the air tightness and must achieve an air tightness of less than $5m^3/m^2$/hour when tested at 50 Pascals.

3.4 Regulation L5 Parts (d)

The regulation requires that:

providing and commissioning energy efficient space heating and cooling systems, heating and cooling equipment, water heating systems, and ventilation systems, with effective controls.

This requires that heat- generators should be designed and installed so that they operate efficiently over the range of loading likely to be encountered. This means that gas or oil-fired boilers are at least 86% efficient for output less than 70kW and 93% efficient for output over 70kW. Space and water heating systems should be effectively controlled so as to limit energy use by these systems.

Additionally, buildings should be designed and constructed in such way that there is no requirement for excessive installed capacity of Air Conditioning and Mechanical Ventilation for cooling purposes and the ventilating and cooling systems installed are energy efficient and are capable of being controlled to achieve optimum energy efficiency.

3.5 Regulation L5 Parts (e)

The regulation requires that:

ensuring that the building is appropriately designed to limit need for cooling and, where air-conditioning or mechanical ventilation is installed, that installed systems are energy efficient, appropriately sized and adequately controlled.

This requires that the glazed elements of the proposed building are design to limit solar gain to acceptable levels. Design approaches that are often adopted to address this requirement include reducing total glazing areas, introducing internal or external shading devices or using specifically selected solar control glazing to reduce the solar gain.

3.6 Regulation L5 Parts (f)

The regulation requires that:

> *limiting the heat loss from pipes, ducts and vessels used for the transport or storage of heated water or air.*

this requires that hot water storage vessels, pipes and ducts associated with the provision of heating and hot water in a building should be insulated to limit heat loss, except where the heat flow through the wall of the pipe, duct or vessel is always useful in conditioning the surrounding space.

3.7 Regulation L5 Parts (g)

The regulation requires that:

> *limiting the heat gains by chilled water and refrigerant vessels, and by pipes and ducts that serve air conditioning systems.*

this requires that storage vessels for chilled water and refrigerant, and pipes and ducts that serve air-conditioning systems should be insulated to limit heat gain from the surrounding environment.

3.8 Regulation L5 Parts (h)

The regulation requires that:

> *providing energy efficient artificial lighting systems and adequate control of these systems.*

this requires that artificial lighting systems shall be designed and controlled so as to ensure the efficient use of energy for this purpose. Lighting controls should encourage the maximum use of daylight and help avoiding unnecessary artificial lighting.

3.9 Regulation L5 Parts (i)

The regulation requires that:

> *providing to the building owner or occupants sufficient information about the building, the fixed building services, controls 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.

4. 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.

4.1 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**	**Part L 2019 (Commercial) Compliant Values**
Floor	0.10 to 0.18 W/m^{2}K	0.18W/m^{2}K	0.21W/m^{2}K
Roof (Flat)	0.12 to 0.20 W/m^{2}K	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	0.16 W/m^{2}K
Walls	0.10 to 0.18 W/m^{2}K	0.18 W/m^{2}K	0.21 W/m^{2}K
Windows	0.9 to 1.4 W/m^{2}K	1.4W/m^{2}K	1.6W/m^{2}K

4.2 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^3/m^2/hr** has been identified for the apartments and houses on the site. As set in Part L 2017 target air tightness for Creche will be 5 **m^3/m^2/hr.**

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"

4.3 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:

$0.15W/m^2K$	Used where the ACDs are not adhered to
$0.08W/m^2K$	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 complied with or 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 0.04W/m2K to 0.08W/m2K..

5. 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.

5.1 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).

5.2 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.

5.3 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.

5.4 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: -

5.4.1 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.

5.4.2 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.

5.4.3 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 3,500mm^2

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

6. Heat Sources & Renewable Energy Options – Creche

All new 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 a development of this nature is defined in Part L 2017 L5 Part (b) and is measured by the Renewable Energy Ratio (RER). This is the ratio of the primary energy from renewable energy sources to total primary energy demands of the building. Depending on the overall performance of the building, as measured by the EPC and CPC the required renewable energy contribution is either 20% or 10%

In order to determine the most efficient and effective means of complying with the requirements of Part L 2017 Part (b) a detailed assessment of the various renewable energy systems available will be conducted during the design stage using the SBEM calculation methodology. A range of possible solutions are described below in Sections 6.1 to 6.6 . Each of these will need to 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 are set out below.

6.1 Gas Fired Boilers with Solar Panels.

The use of natural gas to provide heating and hot water to 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.

Both Solar PV and Solar Thermal Collection harvest the sun's energy to provide a renewable energy source for the building. 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.

The use of PV panels has become the a very common approach for achieving Part L compliance as the quantity of panels provided can be tailored specifically to ensure minimum targets are compliant with regulations L5 (a) and (b).

6.2 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. The outdoor unit is typically located at roof level.

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 commercial developments. The heat pump can be utilised to meet the heating and cooling demand.

6.3 Heating, Ventilation, Air Conditioning (HVAC) Design

The fresh air requirements shall be provided to the building areas from dedicated air handling units located at roof level or ceiling voids. The air handling unit shall be provided with attenuators on the fresh air intake and discharge sides of the unit along with pre-filter, bag filter, thermal wheel, cooling coil, heating coil and fan.

The fresh air shall be distributed through the building. Air shall be introduced into the space through the ceiling voids through high induction diffusers. Air will be extracted from the space via extract ductwork in the risers with extract “bellmouths” within the ceiling voids making use of the ceiling void as an extract plenum. The air handling units will be installed with a heat recovery device such as a thermal wheel or plate heat exchanger to extract energy from the exhaust air and provide renewable energy to the incoming fresh air.

7. Proposed Solutions for the Cookstown Development

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:

7.1 Dwellings

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

- Exceed minimum U-Value standards
- Achieve air tightness standards of 3m3/m2/hr @50Pa or lower
- Thermally model all thermal bridging details to achieve thermal bridging factors of 0.08W/m2K or lower
- Install Exhaust Air Heat Pumps for space and water heating with radiators with time and temperature zone control in all dwellings
- Install centralised mechanical ventilation systems (either MEV or HRV) to ensure adequate ventilation rates are achieved in the dwelling which maximising the benefits of the airtight construction
- Provide roof mounted PV panels as required to compliment the overall energy strategy adopted and to meet the minimum renewable energy requirements.
- Install Air Source Heat Pumps to meet NZEB requirement

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7.2 Creche

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 5 $m^3/m^2/hr$
- Analyse the proposed glazing proportions and orientations and select appropriate solar control glazing and/or shading devices to reduce the solar gain to the spaces to an appropriate level.
- Provide roof mounted PV panels to provide the required renewable energy contribution
- Provide a full central ventilation system with heat recovery devices
- Provide a heat pump to meet Part L renewable contribution requirements

8. Existing & Proposed Utilities

8.1 Natural Gas

Gas Networks Ireland have been contacted and they have advised that they do not have any services in the vicinity of this site.

8.2 ESB Networks

ESB Networks have been contacted and an existing ESB network map for the area surrounding the proposed development has been obtained. Please see attached

There is extensive ESB Networks infrastructure in the vicinity of the site and we understand it has the capacity to cater for this new development.

The number and approximate locations of substations for providing new power supply to the dwellings on site have been identified to comply with the ESB current guild lines and will also be discussed and agreed once the formal application is made. A formal application cannot be made at this stage but will be made as soon as the planning permission has been granted and the addresses are confirmed.

8.3 Openeir

Openeir have been contacted and an existing Openeir map for the area surrounding the proposed development has been obtained. Please refer to Appendix A.

There is existing Openeir Networks infrastructure in the vicinity of the site. A formal application cannot be made at this stage but will be made as soon as the planning permission is granted.

The Opemeir infrastructure will allow for multiple broadband providers.

8.4 Virgin Media

Virgin Media have been contacted and they have advised that they do not have any services in the vicinity of this site. However, they recommend that an additional comms duct will be installed as part of the infrastructure for future services / connectivity as this area may be part of a Virgin Media new development programme in the future.

UK and Ireland Office Locations