Waterman Moylan
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Proposed Shared Living Accommodation

Western Way SHD, Dublin 7

Energy Statement

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Comments

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Disclaimer

Content

1. Introduction

This report has been prepared by Waterman Moylan as part of the documentation in support of a planning application for a proposed mixed-use development at the Western Way SHD site in Phibsborough, Dublin 7.

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

The subject site is located in Phibsborough, Dublin 7, and is bounded by Western Way to the north and west, Palmerston Place to the east and Dominick Street Upper to the south. A portion of the north-eastern perimeter is also bounded by the gardens of neighbouring houses.

The proposed development comprises demolition of the existing warehouse buildings and no. 36 Dominick Street Upper and retention of the Hendrons Building as part of an overall redevelopment of the site to accommodate a build-to-rent shared living scheme and publicly accessible neighbourhood uses (including café/shop, gym and yoga studios). The scheme will include; 280 no. shared living rooms (281. no bedspaces), internal and external amenity space over 5 no. blocks ranging in height from 5 no. storeys to 9 no. storeys, secure bicycle parking, site-wide landscaping, ESB substation and switch-room and site development works all on the 0.3285 hectare site.

Although the building will be residential in nature, it will be considered to be a “Non-Domestic” building in terms of Building Regulation compliance as the overall development will be served by a single ESB supply rather than a series of individual supplies to each unit. As such, the energy efficiency standard that will apply is Part L 2017; Buildings Other Than Dwellings and the development will be required to minimise overall energy use and to incorporate an adequate proportion of renewable energy in line with this standard.

2. 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 L4 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.

2.1 Regulation L4 Parts (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) 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 dwelling 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.

2.2 Regulation L4 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 set at 20% of the total energy consumption.

2.3 Regulation L4 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^{2}K
Flat roof	0.20 W/m^{2}K
Walls	0.21 W/m^{2}K
Floor	0.21 W/m^{2}K
Windows	1.6 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 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.

2.4 Regulation L4 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.

2.5 Regulation L4 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.

2.6 Regulation L4 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.

2.7 Regulation L4 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.

2.8 Regulation L4 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.

2.9 Regulation L4 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*;*

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 2017 (Commercial) Compliant Values**
Floor	0.15 to 0.21 W/m^{2}K	0.21W/m^{2}K
Roof (Flat)	0.15 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	0.14 to 0.21 W/m^{2}K	0.21 W/m^{2}K
Windows	0.9 to 1.6 W/m^{2}K	1.6W/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 **5 m^3/m^2/hr** should be targeted for the development.

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. Heat Sources & Renewable Energy Options.

All new 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 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. The minimum RER is 20%.

In order to determine the most efficient and effective means of complying with the requirements of Part L Part L 2017 Part (b) a detailed assessment of the various renewable energy systems available will be conducted during the design stage. A range of possible solutions are described below in Sections 4.1 to 4.3. 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 possible solutions can be broken down into two main categories, (i) district heating involving central plant and a network of distribution pipework and (ii) individual heating and hot water plant in each unit.

4.1 Option 1 – District / Communal Heating

This approach would involve the generation of heat and/or hot water in a central location on the site and the distribution of this heat to each dwelling via a network district 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 (CHP) plant or heat pumps.

Regardless of the central plant strategy adopted, a network of heating pipework will be installed to distribute the heat generated in the plant room throughout the development, serving each shared living unit The heat energy supplied can be supplied directly or via a heat interface unit and can be individually metered for each cluster unit if required.

The technologies that could be incorporated in the central plant that will provide adequate heat energy and provide the required renewable energy contribution are as follows: -

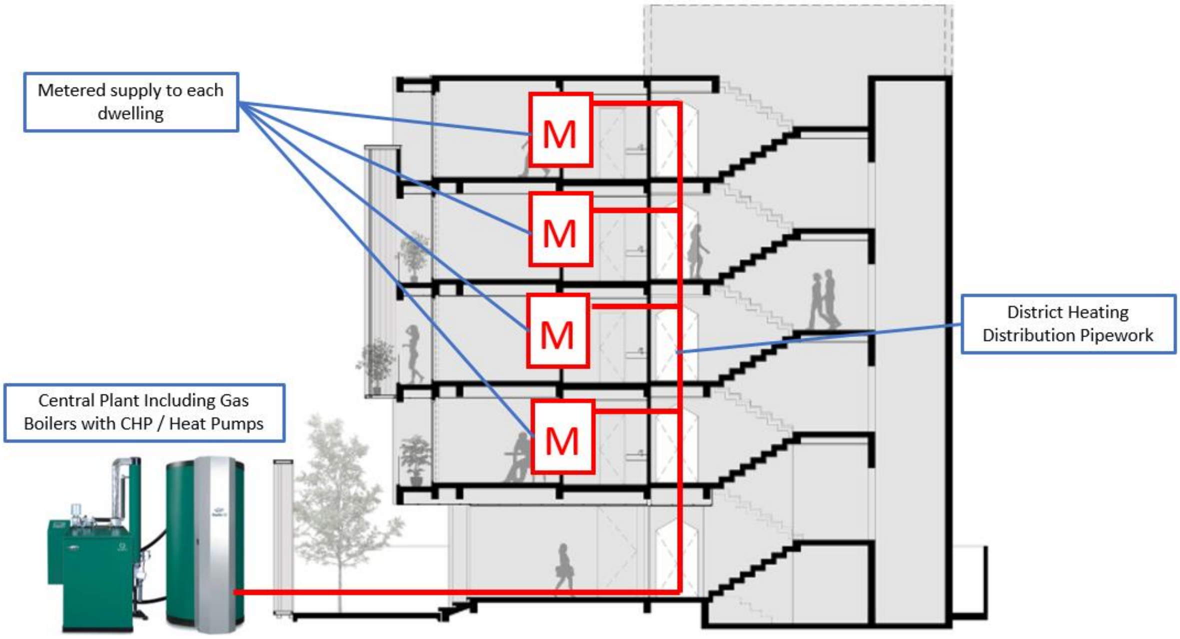

Figure 1 – District Heating Approach

Option 1A – Gas Boiler & CHP

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 development. The waste heat is considered to be renewable energy and will therefore contribute to the renewable energy required to meet the requirements of Part L 2017. A detailed building model would need to be developed in order to assess the total renewable energy contribution using the SBEM calculation methodology. If the CHP alone is not sufficient to meet minimum renewable energy contribution, then this could be supplemented with roof mounted photovoltaic solar panels.

Option 1B – Heat Pump with Gas Boiler Back-Up

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 (over 400%) 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, 40% to 50% of the heat supplied is considered to be renewable energy.

Photovoltaic Solar Arrays

Solar Photovoltaic (PV) arrays can be mounted on the roof of the building and can generate electricity from the suns energy The electricity that is generated is 100% renewable energy and offsets the use of grid electricity. PV arrays can be sized according to the estimated base electrical demand of the building or could be coupled with storage batteries to maximise the amount of renewable energy that can be used on site.

4.2 Option 2 – Individual Plant in Each Unit

As an alternative to a centralised district heating solution, individual heating and hot water plant could be provided in every shared living unit. There are various means of generating heat and hot water on an individual basis, each of which is described in more detail below.

The choice of fuel for each apartment will be either gas or electricity. Technically gas fired solutions are a valid option, and one such option is listed below, however in practical and financial terms it is unlikely that it would be feasible to distribute gas to every cluster unit within the scheme.

Option 2A - Gas Boilers & Photovoltaic (PV) 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. High efficiency gas fired condensing boilers convert gas to heat energy with an efficiency of over 90%.

PV panels harvest the sun's energy to provide a renewable energy source for the dwelling. The solar energy is converted into electrical energy which offsets the use of grid electricity. Total quantity of PV panels provided at roof level can be tailored to ensure that the overall compliance with Part L 2017 can be achieved.

Option 2B – Exhaust Air Heat Pumps

Exhaust Air heat pumps (EAHPs) operate in a very similar manner to 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 cluster. Exhaust air heat pumps only require an indoor component as the air needed is extracted from the dwelling and ducted to the compressor within the heat pump.

There are several manufacturers offering products of this type and the certified seasonal efficiencies of some models can exceed 450% in heating mode and 200% in hot water mode. These efficiencies can deliver Part L 2017 compliance in most circumstances but in some instances, there may be a need to provide supplementary PV panels in order to meet the required renewable energy targets.

One advantage of this approach is that there will be 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. All other solutions discussed in this report will require a separate ventilation system.

Option 2C – Hot Water Heat Pumps & Electric Heating

Modern storage heaters and direct acting electric convector heaters are a significant improvement on their predecessors that were used in the 1990s and now feature advance controls, thermostats and heat retention properties. Storage or direct acting convector heaters can be installed in the living & sleeping areas and an electric towel rad installed in the bathroom.

The hot water demand is satisfied using a hot water heat pump which is very similar to the exhaust air heat pump. The heat pump is ducted directly to the external façade through insulated supply & exhaust ductwork using 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. A detailed building model would need to be developed in order to assess the total renewable energy contribution using the SBEM calculation methodology. If the heat pump alone is not sufficient to meet minimum renewable energy contribution, then this could be supplemented with roof mounted photovoltaic solar panels.

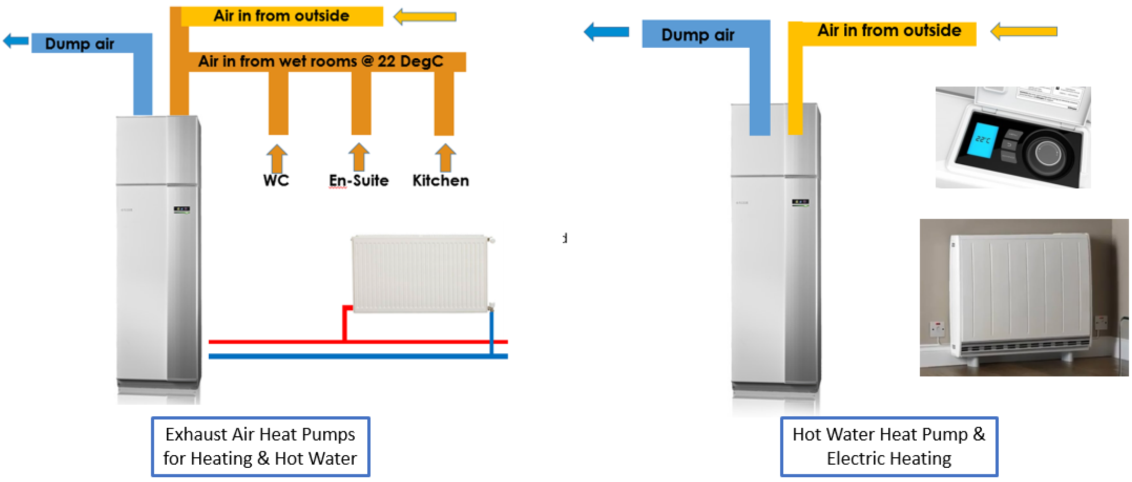

Figure 2 – Individual Plant using heat pumps

4.3 Option 3 – Hybrid Central & Individual Plant

A third option that may offer a benefit in terms of overall installation costs and the Part L compliance would be the adoption of a scheme that incorporates both central plant approach and individual heating in the units by combining Option 1B with 2C.

Electric heating will clearly offer the most cost-effective solution for heating to each individual cluster unit in terms of capital costs as there is no central plant or distribution network and no need for individual boilers or gas distribution. Option 2C above suggest a combination of electric heating with individual hot water heat pumps for hot water production which works well technically but the cost of these individual heat pumps is likely to offset any saving that might have been achieved from the use of electric heating.

Consideration could be given to implementing a centralised hot water only central plant and distribution network to meet the domestic hot water needs of the development. By incorporating high temperature heat pumps and central storage vessels into the central plant the renewable energy demands of the scheme could also be satisfied.

5. Recommendations

5.1 Natural Gas

Gas Networks Ireland (GNI) have been contacted and an existing gas network map for the area surrounding the proposed development has been obtained. Refer to attached Appendix A1.There is an extensive low pressure natural gas network in the vicinity of the site, including a 180mm 25mBar main on Dominic Street and a 90mm 25mBar main on Palmerstown Place, either of which will have sufficient capacity to service the proposed development.

Depending on which of the proposed systems for heating and hot water is chosen (refer to Section 4), an application will be made to GNI for connection to the site and the exact location and size of the connections will be agreed with GNI.

5.2 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 including both 10KV and 38kV below ground cables in Dominick St and on Western Way which will have the capacity required to cater for this new development.

The location of the building substation required to provide a power supply to the development has been identified on the architects planning drawings and will comply with the ESB current guide lines to provide uninhibited 24 hour vehicle access from a public road. 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.

5.3 Openeir

Openeir have been contacted and an existing Openeir map for the area surrounding the proposed development has been obtained. Refer to attached Appendix A1.

There is existing Openeir Networks infrastructure in the vicinity of the site, on Dominick St and on Western Way which will have the capacity to cater for this new development. A formal application cannot be made at this stage but will be made as soon as the planning permission is granted.

The Openeir infrastructure will allow for multiple broadband providers.

5.4 Virgin Media

Virgin Media have been contacted and an existing Virgin Media map for the area surrounding the proposed development has been obtained. Refer to attached Appendix A1.

There is existing Openeir Networks infrastructure in the vicinity of the site, on Dominick St which will all for a connection to be made to this development. A formal application cannot be made at this stage but will be made as soon as the planning permission is granted.

5.5 Mobile & Microwave Telecommunication Channels.

A review of the mobile telecommunications networks in the area of the site, using ComReg Site Viewer, shows that Vodafone, Meteor, and Three mobile operators all have telecommunication infrastructure in the area around the site. The closest of these is in the Dublin Bus Phibsboro Bus Depot.

However, given the location and scale of the proposed development, it is not expected that it will have any impact on the existing telecommunication links. Any impact that might arise will be identified by the mobile operators and they will then be able to re-align their microwave links via alternative sites, or, should that not deliver optimal performance, a new “hop site” can then easily be included in an appropriate location within the proposed development.

6. Recommendations

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 need to be assessed in greater detail during the detailed design stage of the project using SBEM software to confirm the exact requirements for compliance with Part L 2017.

A cost benefit analysis of all these available solutions will also need to be carried out to determine the correct balance between an efficient building envelope and the most appropriate combination of technology and renewable energy systems and to decide between the centralised and individual plant solutions, or indeed the hybrid option discussed.

UK and Ireland Office Locations