Energy Efficiency and Climate Change Adaptation Design Statement

Proposed Residential Development at Grange Road, Dublin 13

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Comments

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Content

1. Introduction

Waterman Moylan Engineering Consultants have been appointed by Rondesere Ltd.to prepare this Energy Efficiency and Climate Change Adaptation Design Statement as part of the planning documentation for a proposed residential development on lands at Grange Road, Dublin 13.

The proposed Large-scale Residential Development consists of the following;

1. Demolition of existing, single storey, storage structures on the subject site (c. 446.5 m^2 GFA).

2. The construction of a residential development (c. 15, 234.11 m^2 GFA) comprising of 120 no. apartment units (15 no. studio units, 18 no. 1 bed units, 78 no. 2 bed units, 7 no. 3 bed units, 2 no. 4 bed penthouse units) within 1 no. block (ranging in height from 4 - 12 storeys over basement level).

3. The construction of a basement to be accessed off Myrtle Road with provision of c. 47 no. car parking spaces, including accessible spaces, electric vehicle charging points and residential visitor parking.

4. Addition of 2 no. crèche drop off car parking spaces at surface level.

5. Provision of 360 no. 'long stay' residential bicycle parking spaces at basement level together with additional 60 no. visitor bicycle parking spaces in secure locations at surface level.

6. All apartments are provided with private terraces / balconies.

7. Provision of c. 1877 m^2 of open space to serve the development including green roof garden terraces between 5th and 10th floor level.

8. Provision of a childcare facility at ground floor level (c. 156.6 m^2 GFA) with capacity in the order of 35 no. children and associated, secure, open play area (c. 117.1 m^2).

9. Provision of Café unit (c. 70 m^2 GFA) at ground floor level with associated outdoor seating area.

10. Provision of associated gymnasium at ground and first floor level (c. 273.12 m^2).

11. Provision of Multipurpose Room (c. 48 m^2 GFA) and Residents Lounge (c. 20 m^2) at first floor level.

12. Total non-residential use is c. 567.72 m^2 (3.73 % of overall development).

13. The development will also provide for all associated ancillary site development infrastructure including: ESB sub-station, bike stores, bin stores, plant rooms, public lighting, new watermain connection and foul and surface water drainage; internal roads & footpaths; site landscaping, including boundary treatments; associated scheme signage, and all associated site development and excavation works above and below ground necessary to facilitate the development.

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

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

2. Building Regulations Part L 2022 Dwellings

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

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

2.1 Regulation 8 Part (a)

The regulation requires that:

> *Providing that the energy performance of the building is such as to limit the calculated primary energy consumption and related carbon dioxide (CO2) to that of a nearly zero energy building within the meaning of the Directive insofar as is reasonably practicable.*

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

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

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

2.2 Regulation 8 Part (b)

The regulation requires that:

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

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

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

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

2.3 Regulation 8 Part (c)

The regulation requires that:

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

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

Typical compliant U-Values are as follows.

Pitched roof	0.16 W/m^{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 apartment types, testing can be conducted on a representative sample of units in accordance with Table 1.5.4.3 of TGD *Part L 2022 Dwellings*.

2.4 Regulation 8 Parts (d & e)

The regulation requires that:

> *Providing and commissioning energy efficient space and water heating systems with efficient heat sources and effective controls;*
>
> *Providing that all oil and gas fired boilers shall meet a minimum seasonal efficiency of 90%;*

These require that gas or oil-fired boilers are at least 90% efficient and that heating controls allow independent time control of the heating (2 zones for dwellings larger than 100m^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 dwelling. Instructions on how to control the heating & hot water systems based on time and temperature requirements.

2.6 Requirements for Common Areas

Section 0.1.2.3 requires that:

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

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

The regulation requires that:

> *(a) A multi-unit building containing one, or more than one, dwelling that is new shall have installed ducting infrastructure (consisting of conduits for electrical cables) for each car parking space, to enable the subsequent installation of recharging points for electric vehicles where the parking space is:*
>
> > *(i) located inside the building concerned, or*
> >
> > *(ii) is within the curtilage of the building concerned.*
>
> *(c) A new building that is a dwelling, other than where the dwelling forms part of a multi-unit building, where a parking space is located within the curtilage of the dwelling, shall have installed appropriate electric vehicle recharging infrastructure to enable the subsequent installation of recharging points for electric vehicles.*

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

3. Building Regulations Part L 2022 (Building Other than Dwellings)

Compliance with Building Regulations *Part L 2022 BOTD* 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 2022 BOTD 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^{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 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 dwelling. Instructions on how to control the heating & hot water systems based on time and temperature requirements.

3.10 S.I No 393 of 2022 - Regulation 5 Part (e)

The regulation requires that:

> *A building which has more than 10 car parking spaces, that is (i) new, or (ii) undergoing major renovation, shall have installed at least one recharging point and ducting infrastructure (consisting of conduits for electric cables) for at least one in every 5 car parking spaces*

This requires that at least one functioning charging point be provided for carparks with more than 10 parking spaces and that a ducting provision be made for the future installation of additional charging points for one in every 5 spaces.

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 2022 (Dwellings) Compliant Values**	**Part L 2022 (BOTDl) 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 m3/m2/hr** has been identified for the dwellings 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”

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/m2K. 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 adhered where suitable benchmarks exist and/or that thermal modelling will be carried out for any non-standard junction details within proposed development.

5. Heat Sources & Renewable Energy Options & Proposals

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

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

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

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

5.1 Option 1 –Exhaust Air Heat Pumps

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

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

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

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

5.2 Option 2 – Electric Heaters, Hot Water Heat Pumps, Heat Recovery Ventilation & PV Panels

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

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

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

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

5.3 Option 3 - District Heating

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

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

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

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

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

5.4 Apartment Corridors/Landlord Areas

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

6. Heat Sources & Renewable Energy Options – Creche & Cafe

All new commercial buildings (Buildings Other Than Dwellings) must meet the overall energy performance standards and have a have a portion of their annual energy demand provided by renewable energy sources as set out in Part L 2022 Dwellings. 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 2022 BOTD* 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 2022BOTD Part (b) a detailed assessment of the various renewable energy systems available will be conducted during the design stage using the SBEM calculation methodology.

There is a wide variety of possible solutions for heating, cooling and ventilation of non-domestic buildings which can be tailored to suit the proposed uses of the spaces and to meet the occupancy needs. Some spaces may require mechanical ventilations systems or comfort cooling to meet the required internal comforts levels, while others may simply need heating and natural ventilation. Hot water demands in non-domestic buildings also vary considerably depending on building use.

As part of the detailed design process, an SBEM analysis will be carried out to assess the proposed design solutions for compliance with the requirements of *Part L 2022 BOTD*. Typical design solutions that will be assessed will include the following:

- Water based heating systems incorporating air source heat pumps or condensing gas boilers
- Natural ventilation where possible
- Mechanical ventilation systems incorporating heat recovery and/or heat pump technology
- Comfort cooling where required with invertor driven, R32 air conditioning technology
- LED lighting with occupancy and daylight controls
- Solar renewable energy systems (photovoltaic or solar thermal) if required to meet renewable contribution energy targets

7. Climate Change Adaptation Actions in the Built Environment

The following measures have been implemented in the design to address policy CAP 11 of the Fingal Development Plan 2023-2029. This is a summary of the measures with separate reports addressing each measure in more detail.

7.1 On-site Construction

The construction and waste management proposals for the scheme are comprehensively addressed in the Resource Waste Plan submitted with this planning application, the measures below are provided as a summary of the recommendations contained within the plan.

During the construction phase of the project, proposals for the minimisation / reuse and recycling of construction arisings will be implemented as set out in the Resource Waste Plan including:

- Demolition waste from the existing buildings and storage sheds;
- Topsoil and subsoil;
- Packaging and general waste from construction activities; and
- General site clearance waste including tree stumps, etc.

7.2 Long-term management

Encouraging the use of public transport by using the principles of environmental assessment methodologies to reduce the reliance on cars and encourage a shift to less carbon intensive modes of transport.

All parking spaces provided within the scheme will be ducted for EV charging, with 20% fitted out with active charges from the outset.

7.3 Transport

The traffic and transport proposals for the scheme are comprehensively addressed in the Traffic & Transport Assessment report submitted with this planning application, the measures below are provided as a summary of the recommendations contained within the assessment.

Currently there are good levels of public transport in the local area, provided in the form of a high-frequency bus route along R809 Grange Road and rail services through Clongriffin rail station. These are located within walking and cycling distances from the proposed development site and already facilitates the connection between the proposed development site to Dublin City Centre and other key towns and work/educational destinations.

The use of private cars for daily commuting and for recreational purposes is unavoidable however the potential long term climate impacts of private car use can be off-set by forward planning of electrical vehicle charging infrastructure. Providing ducting & ESB metering capabilities within the scheme will allow for future expansion of electric vehicle charging facilities to meet increasing demand in the short to medium term.

7.4 Environmental Assessment Methodologies

Addressing operational energy use in a manner set out in the preceding sections of this report is a vital component of any construction project however consideration must also be given to other aspects of sustainable design such as water use, material selection and minimising pollutants.

Various assessment methodologies have been developed by organisations such as the Building Research Establishment (BREEAM Methodology) and the US Green Building Council (LEED Certification) to measure the performance of various environmental and sustainable aspects of the design, construction and operation of proposed developments.

The Irish Green Building Council has also developed a similar assessment methodology in recent years which is specifically aimed at residential developments in Ireland. **The Housing Performance Index (HPI)** assessment provides a method for measuring the performance of residential developments against a range of verifiable indicators that are divided into five technical categories.

- Environment
- Economic
- Health and Wellbeing
- Quality Assurance
- Sustainable Location

It allows several levels of achievement based on good, better and best practice. The award of the certificate is based on the overall attainment across all categories.

A decision will be made during detailed design as to whether formal HPI certification will be sought on the project, however, the principles set out within the HPI system will be used as guidance throughout the design process regardless of whether certification is targeted.

7.5 Embodied Carbon

Recent advances in the energy efficiency of buildings have reduced operational energy use to such an extent that the life cycle carbon emissions of a building are actually influenced more by the carbon that is embodied in the materials and processes used during the construction than it is by the carbon emitted as a result of energy used in the buildings operation. As such, the embodied carbon of a building must now be considered if a construction project is to be considered low carbon or “net-zero” carbon.

Addressing the embodied carbon requires that all the key building element categories (substructure, structure, façade, MEP services) are assessed to identify the optimal solutions in terms of embodied carbon and assess them through a multidisciplinary and holistic approach, considering implications in different areas such as efficiency, cost, programme etc.

The process of design and of material and product selection must include an analysis of the final embodied carbon and comparison with benchmarks to identify the areas that need to be optimised. This process allows the building designers and procurement managers to focus on how to eliminate the impact of the key identified hotspots, through comparative assessments and specification of products that demonstrate low embodied carbon and facilitate the production of the final embodied carbon assessment at the end of the detailed design to identify the expected impact of the Development.

7.6 Sustainable Urban Drainage.

The Surface Water drainage proposals for the scheme are comprehensively addressed in the Engineering Assessment Report submitted with this planning application, the measures below are provided as a summary of the recommendations contained within the assessment.

It is proposed to discharge the surface water from the proposed development, via a series of SuDS features and downstream defender manholes, into the existing downstream stormwater system. The methodology involved in developing a Storm Water Management Plan for the subject site is based on recommendations in the Greater Dublin Strategic Drainage Study (GDSDS) and in the SuDS Manual. It is proposed to incorporate a Storm Water Management Plan though the use of various SuDS techniques.

Based on three key elements, Water Quantity, Water Quality and Amenity, the targets of SuDS train concept will be implemented in the design. The following SuDS measures are proposed for the site:

- **Source Control**
  the provision of green roofs, permeable paving, filter drains, rainwater butts and tree planting
- **Site Control**
  the provision of a detention basin and bio-retention area and flow control measures.
- **Regional Control**
  It is proposed to provide attenuation as a site control measure, and as such no regional control measures are proposed for the subject site.

8. Proposed Solutions

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

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

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

8.1 Energy in Use Measures

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

- Meet or exceed minimum U-Value standards
- Achieve a high level of air tightness (typically 3m^3/m^2/hr)
- Ensure thermal bridging details are designed to meet the performance of the ACDs or an equivalent standard.
- Provide an appropriate combination of technologies to ensure energy consumption is in line with Part L 2022 requirements. This will either include air source heat pumps and/or an alternative heating system such as gas boilers with PV panels for renewable energy.
- Install centralised mechanical ventilation systems to ensure adequate ventilation rates are achieved in the dwelling which maximising the benefits of the airtight construction

8.2 Creche & Cafe

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

- Meet or exceed minimum U-Value standards
- Achieve air tightness standards of 5 m^3/m^2/hr
- Provide an air source heat pump and/or PV panels to meet Part L renewable contribution requirements

8.3 Sustainability & Embodied Carbon

In addition to the measures targeted at reduction of energy in use, the design process will include the following measures:

- Use the guidance provided within the HPI Certification System to inform and steer the designs of the dwellings
- Review the embodied carbon of the materials and products proposed for the development and implement procedures that ensure that embodied carbon is considered when selections are being finalised.

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