Energy Efficiency and Climate Change Adaptation Design Statement

Proposed Residential Development at Ballycullen, Dublin 16, Co. Dublin

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Comments

Disclaimer

Content

1. Introduction

Waterman Moylan Engineering Consultants have been appointed by Lagan Homes to prepare this Energy Statement as part of the planning documentation for a proposed residential development on lands at Ballycullen, Dublin 16.

The proposed development will consist of 502 no. residential units (108no. 1-bed, 170no. 2-bed, 162 no. 3-bed; 62 no. 4-bed) comprising 197no. 2 storey houses (terraced/semi-detached/detached) (19no. 2-bed, 116no. 3-bed; 62no. 4-bed) and 29no. 3 and 4 storey simplex/duplex apartment blocks providing 305no. apartments (108no. 1-bed apartments, 151no. 2-bed apartments, 46no. 3-bed apartments). The proposed development also includes a crèche, public open space, car parking (surface/undercroft), bicycle parking, bicycle storage structures and lockers, bin stores, and 8no. ESB substations. Vehicular access to be provided from the existing spur road connection to Stocking Avenue to the west of the site, and via Stocking Wood Drive to the east of the site (with relocation of existing ESB substation and associated works to the existing hammerhead). Pedestrian/cycle routes will be provided for to the boundaries with Abbot's Grove Park, Stocking Wood Way, Stocking Wood Manor and White Pines Park are also proposed. The proposed development includes all associated site development works (including site reprofiling, retaining structures and downing of ESB overhead lines), landscaping, boundary treatments and services provision.

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^2K
Flat roof	0.20 W/m^2K
Walls	0.18 W/m^2K
Floor	0.18 W/m^2K
Windows	1.4 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 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 S.I No 393 of 2021 - Regulation 5 Part (f)

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 2021 (Building Other than Dwellings)

Compliance with Building Regulations *Part L 2021 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 2021 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^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.

3.10 S.I No 393 of 2021 - 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 2021 (BOTDI) Compliant Values**
Floor	0.10 to 0.18 W/m^2K	0.18W/m^2K	0.21W/m^2K
Roof (Flat)	0.12 to 0.20 W/m^2K	0.20 W/m^2K	0.20 W/m^2K
Roof (Pitched)	0.10 to 0.16 W/m^2K	0.16 W/m^2K	0.16 W/m^2K
Walls	0.10 to 0.18 W/m^2K	0.18 W/m^2K	0.21 W/m^2K
Windows	0.9 to 1.4 W/m^2K	1.4W/m^2K	1.6W/m^2K

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 houses on the site.

The air permeability testing will be carried out in accordance with BS EN 13829:2001 ‘Determination of air permeability of buildings, fan pressurisation method’ and CIBSE TM23: 2000 ‘Testing buildings for air leakage”

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^{2}K	Used where the ACDs are not adhered to
0.08W/m^{2}K	Used where the ACDs are fully adhered to
< 0.08 W/m^{2}K	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 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.

5.2 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.

5.3 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.

5.4 Gas Fired Boilers with Solar Panels.

The use of natural gas to provide heating and hot water to dwellings and commercial buildings is becoming less popular as the use of fossil fuels directly on site is generally avoided. Nonetheless, it is still possible to achieve compliance with Building Regulations and the nZEB standard when implemented correctly.

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.

5.5 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 would be installed throughout the scheme to distribute the heat generated in the plant room throughout the development, serving each dwelling via a heat interface unit (HIU). The HIU would then 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.

It should be noted that the low to medium density nature of the proposed development would likely render it unsuitable for a district heating approach.

6. Heat Sources & Renewable Energy Options – Creche

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 2021 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 2021 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 2021BOTD 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 2021 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

7.1 On-site Demolition and Construction

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

The waste arising on site will consist of the following expected construction waste: -

- Soil, Stone, Gravel & Clay
- Mixed construction & demolition waste
- Timber
- Plasterboard
- Metals
- Concrete.

Only after in-situ reuse and recycling options have been fully considered will the demolition waste be disposed of off-site by licensed waste contractors. Waste streams will be dealt with in the following manner:

- While it is not envisaged that bedrock will be encountered, if bedrock is encountered, it is anticipated that it will not be crushed on site. Any excavated rock is expected to be removed off- site for appropriate reuse, recovery and / or disposal. If bedrock is to be crushed on- site, the appropriate mobile waste facility permit will be obtained from SDCC.
- During the construction phase, silt and petrochemical interception will be carried out on runoff and pumped water from site works, where required. Sludge and silt will then be collected by a suitably licensed contractor and removed offsite.
- The majority of concrete blocks, bricks, tiles and ceramics generated as part of the construction works are expected to be clean, inert material and will be recycled, where possible.
- As hard plastic is a highly recyclable material, much of the plastic generated will be primarily from material off-cuts. All recyclable plastic will be segregated and recycled, where possible.
- Timber that is uncontaminated, i.e. free from paints, preservatives, glues etc., will be disposed of in a separate skip and recycled off-site.
- Metals will be segregated where practical and stored in skips. Metal is highly recyclable and there are numerous companies that will accept these materials.
- There are currently a number of recycling services for plasterboard in Ireland. Plasterboard from the construction phases will be stored in a separate skip, pending collection for recycling. The site manager will ensure that oversupply of new plasterboard is carefully monitored to minimise waste.
- Glass materials will be segregated for recycling, where possible.

- Any Waste Electrical and Electronic Equipment (WEEE) will be stored in dedicated covered cages/receptacles/pallets pending collection for recycling.
- Where any other recyclable wastes such as cardboard and soft plastic are generated, these will be segregated at source into dedicated skips and removed off-site C&D waste which is not suitable for reuse or recovery, such as polystyrene, some plastics and some cardboards, will be placed in separate skips or other receptacles. Prior to removal from site, the non-recyclable waste skip/receptacle will be examined by a member of the waste team (see Section 9.0) to determine if recyclable materials have been placed in there by mistake. If this is the case, efforts will be made to determine the cause of the waste not being segregated correctly and recyclable waste will be removed and placed into the appropriate receptacle.
- On-site storage of any hazardous wastes produced (i.e., contaminated soil if encountered and/or waste fuels) will be kept to a minimum, with removal off-site organised on a regular basis. Storage of all hazardous wastes on-site will be undertaken so as to minimise exposure to on-site personnel and the public and to also minimise potential for environmental impacts. Hazardous wastes will be recovered, wherever possible, and failing this, disposed of appropriately.
- It is currently not envisaged that the crushing of waste materials will occur on- site. However, if the crushing of material is to be undertaken, a mobile waste facility permit will first be obtained from SDCC, and the destination of the accepting waste facility will be supplied to the SDCC waste unit. It should be noted that until a construction contractor is appointed it is not possible to provide information on the specific destinations of each construction waste stream. Prior to commencement of construction and removal of any construction waste offsite, details of the proposed destination of each waste stream will be provided to SDCC by the project team.

7.2 Electric Vehicle Charging

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 in-curtilage parking spaces will be capable of being fitted with EV charging points while all off-curtilage spaces will be ducted for EV charging, with 20% installed from the outset.

7.3 Transport

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

- Car and Bicycle parking for the proposed development have been designed in accordance with the requirements set out in the Sustainable Residential Development and Compact Settlement Guidelines for Planning Authorities (2024).
- The subject site is located within reasonable walking time to local bus stops in Stocking Avenue to the west of the site.

- The design of the site and the existing pedestrian facilities in the surrounding areas means the site is well suited in terms of pedestrian permeability. There are also a number of local cycle routes on Ballycullen Road and Stocking Avenue, providing facilities for cyclists.

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 detention basins and tree pits to both the existing stream which bisects the site and via an existing surface water manhole in Abbots Grove to the northwest of the site. The methodology involved in developing a Storm Water Management Plan for the subject site is based on recommendations in the Sustainable Drainage Explanatory Design & Evaluation Guide (2022) (SDCC), 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:

- **Site Control**
  the use of detention basins and bio-retention tree pits and swales to provide attenuation throughout the 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 Residential

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

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.

UK and Ireland Office Locations