OCSC
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MULTIDISCIPLINARY CONSULTING ENGINEERS

L333: FORTFIELD ROAD RESIDENTIAL DEVELOPMENT

CLIMATE ACTION AND ENERGY STATEMENT REPORT

For
1 Celbridge West Land Ltd.

10 December 2024

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1 EXECUTIVE SUMMARY

OCSC M&E have been appointed to carry out a Climate Action and Energy Statement in order to comply with the policies set out in Section 3.5.2 'The Built Environment' and Section 3.5.3 'Energy' of Chapter 3 of the Dublin City Development Plan 2022-2028.

This document provides an overview of how the project intends to integrate sustainability as a key strategy into the development's design. The report focuses on the performance targets required by the Building Regulations Part L – Conservation of Fuel and Energy and what energy measures are needed to ensure compliance. Furthermore, a Building Energy Rating (BER) of A2/A3 has been targeted.

The following document sets out the energy design approach that requires the design from the outset to focus on an energy demand reduction. This will primarily be through passive strategies such as an energy efficient envelope, which in turn reduces the demands relating to items such as Heating, Ventilation, and Air Conditioning (HVAC) and renewable energy systems. This initial approach in reducing the energy demand significantly aids the project in obtaining the desired energy goals while reducing running costs. Performance criteria relating to the development's building envelope, which refers to the physical components like walls, roofs, windows, and doors that enclose and protect the interior, are also set out within this document.

The energy systems design must also focus on specifying energy efficient equipment to ensure the day to day running of the energy systems are optimised to further enhance energy savings and related energy cost. Specifications relating to efficient heating, cooling, lighting and auxiliary equipment are also set out in this document.

This report confirms that if the energy and sustainability strategy is successfully implemented, the proposed Fortfield Road residential development will achieve all energy and sustainability targets.

2 INTRODUCTION

The purpose of this report is to identify the energy efficiency measures associated with the design, construction, ongoing management, and maintenance of the proposed Fortfield Road residential development located in Terenure, Dublin 6.

The proposed residential aspects of the development will comply with Part L 2022 (Dwellings), and Part L 2022 (Buildings Other Than Dwellings) for non-residential areas. As part of the development's efforts to further reduce energy consumption, the project is targeting a minimum A3 BER (Building Energy Rating) across the development.

Extensive work has been carried out to develop a balanced design approach to achieve these onerous targets with a number of sustainable features being incorporated into the design from the early stages.

Table 1: Energy Performance Targets

Standard / Rating	Mandatory	Target
Part L Residential	Yes	2022 (Dwellings)
Part L Non-residential	Yes	2022 (Buildings Other Than Dwellings)
BER Residential	Yes	A2/A3
BER Non-residential	Yes	A3 minimum

The following sections identify a range of energy efficient measures that have been considered for the proposed Fortfield Road residential development.

3 PROPOSED DEVELOPMENT

The development will comprise a Large-Scale Residential Development (LRD) on a site at Fortfield Road, Terenure of 284 no. units delivering 19 no. houses and 265 no. apartments made up of studios; 1 beds; 2 beds; 3 beds; and 4 beds. The development will also provide community, cultural and arts space and a creche. Communal internal space for residents will also be delivered. Provision of car, cycle and motorbike parking will be provided throughout the development, including at basement and surface level. Vehicular/pedestrian/cyclist access from Fortfield Road. Proposed upgrade works to the surrounding road network is also included. All associated site development works, open space, services provision, ESB substations, plant areas, waste management areas, landscaping (both public and communal) and boundary treatments.

Figure 1: Proposed Site Layout

4 DUBLIN CITY DEVELOPMENT PLAN 2022 – 2028

The Dublin City Development Plan 2022 – 2028 adopted on 2nd November 2022 and came into effect on 5th December 2022. The Plan sets out how the city will develop to meet the needs of all residents, workers and visitors , not only for the six-year life of the plan, but for the long term.

'The plan guides future growth and development, and provides the overall strategy to achieve proper planning and sustainable development, through a range of policies and objectives..'

Through this report, it will be addressed how the proposed Fortfield Road Residential Development will comply with the following policies and objectives accord with the overall objectives of National Climate Action Policy, the Dublin City Council Climate Action Plan as well as the climate action principles set out in the National Planning Framework (NPF) and Regional Spatial and Economic Strategy (RSES).

4.1.1 POLICY CA1 - NATIONAL CLIMATE ACTION POLICY

'To support the implementation of national objectives on climate change including the 'Climate Action Plan 2021: Securing Our Future' (including any subsequent updates to or replacement thereof), the 'National Adaptation Framework' 2018 and the 'National Energy and Climate Plan for Ireland 2021-2030' and other relevant policy and legislation'

4.1.2 POLICY CA2 - MITIGATION AND ADAPTATION

'To prioritise and implement measures to address climate change by way of both effective mitigation and adaptation responses in accordance with available guidance and best practice.'

4.1.3 POLICY CA3 – CLIMATE RESILIENT SETTLEMENT PATTERNS, URBAN FORMS AND MOBILITY

'To support the transition to a low carbon, climate resilient city by seeking sustainable settlement patterns, urban forms and mobility in accordance with the National Planning Framework 2018 and the Regional Spatial and Economic Strategy 2019'

The development will help ensure the creation of attractive, liveable, well-designed, high-quality urban spaces that are home to diverse and integrated communities, enjoying a high quality of life and well-being, in line with National Policy Objective 4. It will also contribute to the target of delivering 550,000 additional households by 2040, as outlined in National Policy Objective 32. Furthermore, the development supports the provision of new homes in locations that can accommodate sustainable development at an appropriate scale relative to the location, in accordance with National Policy Objective 33, and promotes the provision of lifetime adaptable homes that can meet the changing needs of households over time, as per National Policy Objective 34.

4.1.4 POLICY CAP 5 – CLIMATE MITIGATION AND ADAPTATION IN STRATEGIC GROWTH AREAS

'To ensure that all new development including in Strategic Development and Regeneration Areas integrate appropriate climate mitigation and adaptation measures.'

4.1.5 POLICY CA8 CLIMATE MITIGATION ACTIONS IN THE BUILT ENVIRONMENT

'Promote low carbon development within the County which will seek to reduce carbon dioxide emissions and which will meet the highest feasible environmental standards during construction and occupation. New development should generally demonstrate/provide for:

(a) Building layout and design which maximises daylight, natural ventilation, active transport and public transport use;
(b) Sustainable building/services/site design to maximise energy efficiency;
(c) Sensitive energy efficiency improvements to existing buildings;
(d) Energy efficiency, energy conservation, and the increased use of renewable energy in existing and new developments;
(e) On-site renewable energy infrastructure and renewable energy;
(f) Minimising the generation of site and construction waste and maximising reuse or recycling;
(g) The use of construction materials that have low to zero embodied energy and CO_2 emissions; and'
(h) Connection to (existing and planned) decentralised energy networks including the Dublin District Heating System where feasible.

4.1.6 POLICY CA9 CLIMATE ADAPTATION ACTIONS IN THE BUILT ENVIRONMENT

'Development proposals should demonstrate sustainable design principles for new buildings/ services/ site. The Council will promote and support development which is resilient to climate change. This would include:

(a) Measures such as green roofs and green walls to reduce internal overheating and the urban heat island effect;
(b) Ensuring the efficient use of natural resources (including water) and making the most of natural systems both within and around buildings;
(c) Minimising pollution by reducing surface water runoff through increasing permeable surfaces and use of Sustainable Drainage Systems (SuDS);
(d) Reducing flood risk, damage to property from extreme events– residential, public and commercial;
(e) Reducing risks from temperature extremes and extreme weather events to critical infrastructure such as roads, communication networks, the water/drainage network, and energy supply;
(f) Promoting, developing and protecting biodiversity and green infrastructure.

4.1.7 POLICY CA10 CLIMATE ACTION ENERGY STATEMENTS

'All new developments involving 30 residential units and/or more than 1,000sq.m. of commercial floor space, or as otherwise required by the Planning Authority, will be required to submit a Climate Action Energy Statement as part of the overall Design Statement to demonstrate how low carbon energy and heating solutions, have been considered as part of the overall design and planning of the proposed development.'

4.1.8 POLICY CA11 ENERGY FROM RENEWABLE SOURCES

'To support, encourage and facilitate the production of energy from renewable sources, such as from solar energy, hydro energy, wave/tidal energy, geothermal, wind energy, combined heat and power (CHP), heat energy distribution such as district heating/cooling systems, and any other renewable energy sources, subject to normal planning and environmental considerations.'

4.1.9 POLICY CA21 SUSTAINABLE ENERGY COMMUNITIES

'To support, encourage and facilitate the ongoing efforts and future development of Sustainable Energy Communities in Dublin City through the SEAI 'Sustainable Energy Communities' Initiative'

4.1.10 POLICY CA22 DUBLIN REGION ENERGY MASTERPLAN

'To support, encourage and facilitate the preparation of the Dublin Region Energy Masterplan by Codema and to support its implementation in conjunction with neighbouring Dublin local authorities, Dublin Metropolitan CARO and other relevant stakeholders.'

4.1.11 POLICY CA23 – THE CIRCULAR ECONOMY

'To support the shift towards the circular economy approach as set out in a Waste Action Plan for a Circular Economy 2020 to 2025, Ireland's National using-less/ Waste Policy, as updated together with The Whole of Government Circular Economy Strategy 2022- 2023.'

4.1.12 POLICY CA25 - ELECTRIC VEHICLES

'To ensure that sufficient charging points and rapid charging infrastructure are provided on existing streets and in new developments subject to appropriate design, siting and built heritage considerations and having regard to the Planning and Development Regulations (2001) as amended, which have been updated to include EV vehicle charging point installation'

The proposed Fortfield Road Residential Development will comply with the above stipulations outlined in the Dublin City Development Plan 2022-2028 as shown in the following table:

Table 2: Dublin City Development Plan Summary

Policy	Policy Description	Policy Compliance Statement
CA1	National Climate Action Policy	Achieving an 'A Rated' development demonstrates that the building's design ensure energy efficiency and provides users with certainty about their energy consumption and carbon footprint.
CA2	Mitigation and adaption	Design of the development to prioritise future-proofing the buildings design for climate change/ climate action and circular economies through high performance façade, high efficiency HVAC, and utilising an all electric strategy.
CA3	Climate Resilient Settlements Patterns, Urban Forms and Mobility	The development will evaluate sustainable settlement and transport strategies available in close proximity.
CA5	Climate Mitigation & Adaption in Strategic Growth Areas	Design of the development to prioritise future-proofing the buildings design for climate change/ climate action and circular economies through high performance façade, high efficiency HVAC, and utilising an all electric strategy.
CA8	Climate Mitigation actions in the built environment	The development will reduce carbon dioxide emissions through several key measures, as outlined in Section 10
	a. Building layout and design which maximises daylight, natural ventilation, active transport and public transport use	The development's design offers excellent levels of daylight, natural ventilation and offers alternative modes of transport as can be seen within Key Sustainable Features
	b. Sustainable building/services/site design to maximise energy efficiency;	The Energy Hierarchy Plan approach maximises the energy efficiency, energy conservation, and the increased use of renewable energy within the development
	c. Sensitive energy efficiency improvements to existing buildings	There are no existing buildings within the development
	d. Energy efficiency, energy conservation, and the increased use of renewable energy in existing and new developments	The development will comply with Part L 2022 which sets the energy performance requirements to achieve Nearly Zero Energy Buildings performance.
	e. On-site renewable energy infrastructure and renewable energy	Different sources of renewable energy are proposed and described in Section Step 3 (Be Green) – use of renewable technologies
	f. Minimising the generation of site and construction waste and maximising reuse or recycling	The construction waste will be minimised according to the 'Outline Resource & Waste Management Plan'
	g. The use of construction materials that have low to zero embodied energy and CO_2 emissions	Where possible local low-maintenance materials that contain recycled content will be used.
	h. Connection to (existing and planned) decentralised energy networks including the Dublin District Heating System where feasible	Due to the location of the development the connection to Dublin District Heating System is not feasible

CA9	Climate Adaption Actions in the Built Environment	Green and blue roofs will be implemented within the development, as well as various Sustainable Urban Drainage Systems, as indicated in the Engineering Planning Report.
CA10	Climate Action Energy Statements	Provided as part of this report to demonstrate how low carbon energy and heating solutions, have been considered as part of the overall design and planning of the proposed development.
CA11	Energy from Renewable Sources	Provided by evaluating the use of high efficiency heat pumps and solar PV to maximise renewable energy contributions.
CA21	Sustainable Energy Communities	The development is an example of SEAI's Sustainable Energy Communities initiative due to its highly efficient systems and use of renewable energies
CA22	Dublin Region Energy Masterplan	The development is to evaluate the masterplan and support its implementation through implementing high efficiency systems and renewable energy contributions.
CA23	The Circular Economy	Materials designed for disassemble and design for adaptability with recycled content will be preferable.
CA25	Electric Vehicles	The development is to allocate 10% of parking spaces for E.V charging stations, with 100% of infrastructure provided to all remaining spaces for future provision of charging points.

5 PART L CONSERVATION OF FUEL & ENERGY - DWELLINGS

5.1 PART L 2022 (DWELLINGS)

Part L 2022 (Dwellings) of the Technical Guidance Document has been issued by the Minister for Housing, Local Government and Heritage. This document is the new standard for dwellings constructed after 25th October 2022.

The Part L 2022 (Dwellings) regulations set energy performance requirements to achieve Nearly Zero Energy Buildings performance as required by Article 4 (1) of the Directive for new buildings.

The definition of Nearly Zero Energy Buildings is defined as:

"'Nearly zero-energy building' means a building that has a very high energy performance, as defined in Annex 1. The nearly zero or very low amount of energy required should be covered to a very significant extent by energy from renewable sources, including energy from renewable sources produced on-site or nearby".

In line with the requirements detailed within the Technical Guidance Document, renewable energy technologies are defined as technologies that derive their energy directly from a renewable energy source, such as:

- Solar Photo-Voltaic Systems;
- Solar Thermal System;
- CHP Units (Combined Heat & Power);
- Heat Pumps (Minimum COP of 2.5).

Compliance with Part L of the Building Regulations will be addressed by adhering to the Energy Hierarchy approach to design.

6 PART L CONSERVATION OF FUEL & ENERGY - BUILDINGS OTHER THAN DWELLINGS

6.1 PART L 2022 (BUILDINGS OTHER THAN DWELLINGS)

The Part L 2022 (Buildings Other Than Dwellings) building regulations is the new standard for all buildings other than dwellings constructed after 25th October 2022. The Part L 2022 (Buildings Other Than Dwellings) regulations set energy performance requirements to achieve Nearly Zero Energy Buildings performance as required by Article 4 (1) of the Directive for new buildings.

For new buildings other than dwellings, the Part L 2022 (NZEB) 'L1' requirements shall be met by:

a) providing that the energy performance of the building is such as to limit the calculated primary energy consumption and related Carbon Dioxide (CO_2) 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 (1.0 for EPC and 1.15 for CPC);

b) 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;

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

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

e) 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;

f) limiting the heat loss from pipes, ducts and vessels used for the transport or storage of heated water or air;

g) limiting the heat gains by chilled water and refrigerant vessels, and by pipes and ducts that serve air conditioning systems;

h) providing energy efficient artificial lighting systems and adequate control of these systems;

i) 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.

However, Part L (2022) – Buildings Other Than Dwellings now has additional requirements relating to self-regulating devices and electric vehicle charging. For both new and existing buildings other than dwellings, the Part L 2022 (NZEB) 'Regulation 5' requirements shall be met by:

a) a new building shall, where technically and economically feasible, be equipped with self-regulating devices for the separate regulation of the temperature in each room or, where justified, in a designated heated zone of the building unit;

b) Where a heat generator is being replaced in an existing building, where technically and economically feasible, self-regulating devices shall also be installed;

c) A building which has more than 10 car parking spaces, that is:

   i. New, or

   ii. Subject to subparagraph (g), 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 to enable the subsequent installation of recharging points for electric vehicles.

d) The requirements of subparagraph (e) shall apply to a building undergoing major renovation where:

   i. In a case where the car park is located inside the building, the renovation concerned include the car park or the electrical infrastructure of the building; or

   ii. In a case where the car park is physically adjacent to the building, the renovations concerned include the car park or the electrical infrastructure of the car park.

6.2 RENEWABLE ENERGY RATIO (RER):

One of the most significant changes made in the newer version of the new Part L 2022 document regulations for non-residential buildings is the addition of a renewable energy contribution target for all non-residential new builds. Some of the main performance requirements are as follows:

- The new regulations will require a significant level of energy provision be provided onsite or nearby by renewable energy technologies, e.g. solar energy (thermal and photovoltaic), air and exhaust air source heat pumps, combined heat and power, biomass boiler, etc.;
- This level of renewable source contributions can also be fulfilled through efficient district heating and cooling using a significant share of renewable energy and waste heat and cold;
- The current NZEB definition does not allow the renewable requirement to be met though the purchase of off-site green electricity;
- There are two routes in achieving compliance with the renewable target:

    i. Route 1 = If the Part L compliance is achieved with no tolerance (0% margin), 20% of the building's energy use must be provided by onsite / near site renewable technologies;

    ii. Route 2 = If the Part L compliance is achieved with a minimum of 10% margin, then 10% of the building's energy use must be provided by onsite / near site renewable technologies. To achieve the 10% margin, the building envelope, lighting and M&E specification will likely have to be improved above minimum requirements.

7 PART F VENTILATION

This report is primarily focused around achieving compliance with Part L of the building regulations, but in doing so, the ventilation systems proposed must also comply with Part F (Ventilation) of the Technical Guidance Documents (TGD).

The TGD Part F (2019) document revolves around two requirements as outlined below:

Means of ventilation.

- F1 – Adequate and effective means of ventilation shall be provided for people in buildings. This shall be achieved by:

(g) Limiting the moisture content of the air within the building so that it does not contribute to condensation and mould growth, and

(h) Limiting the concentration of harmful pollutants in the air within the building.

Condensation in roofs.

- F2 - Adequate provision shall be made to prevent excessive condensation in the floor or in a roof void above an insulated ceiling.

The proposed development will be designed to achieve compliance with Part F of the building regulations.

8 BUILDING ENERGY RATING (BER)

As of 1st July 2009, all newly built domestic and non-domestic buildings and existing buildings that are for sale or rent require a Building Energy Rating (BER) certificate.

The actual building energy rating is based on the primary energy used for one year and is classified on a scale of A1 to G with A1 being the most energy efficient. It also provides the anticipated carbon emissions for a year of occupation based on the type of fuel that the building systems use. The following determines the extent of primary energy consumption within the building:

- Building type (residential, office, retail, etc.);
- Building orientation;
- Thermal envelope (insulation levels of the façade, roofs, ground floor etc);
- Air permeability (how much air infiltrates into the building through the façade);
- Heating systems (what type of plant is used and how efficient it is);
- Cooling systems (what type of plant is used and how efficient it is);
- Ventilation (what form of ventilation is used - natural ventilation, mixed mode mechanical ventilation);
- Fan and pump efficiency (how efficient are the pumps and fans);
- Domestic hot water generation (what type of plant is used and how efficient it is); and
- Lighting systems (how efficient is the lighting).

The areas identified above will be described within this report and categorised under three main headings through “The Energy Hierarchy Plan”. i.e. Be Mean, Be Lean, Be Green.

9 THE ENERGY HIERARCHY PLAN

Through the specification of an energy efficient façade and HVAC systems, the energy consumption of a building will be reduced compared to a set baseline. This ensures the environmental and economic impact of the operation of the building is reduced.

The key steps in the Energy Hierarchy Plan are outlined as follows:

2. The key philosophy of this plan is to first reduce energy demand by improving the building's thermal envelope, increasing air tightness, improving thermal transmittance and applying passive design techniques.
3. The second step is to utilise energy in the most efficient way through the selection and installation of energy efficient plant and equipment.
4. The final step is to introduce energy from renewable sources to reduce the burden on fossil fuels.

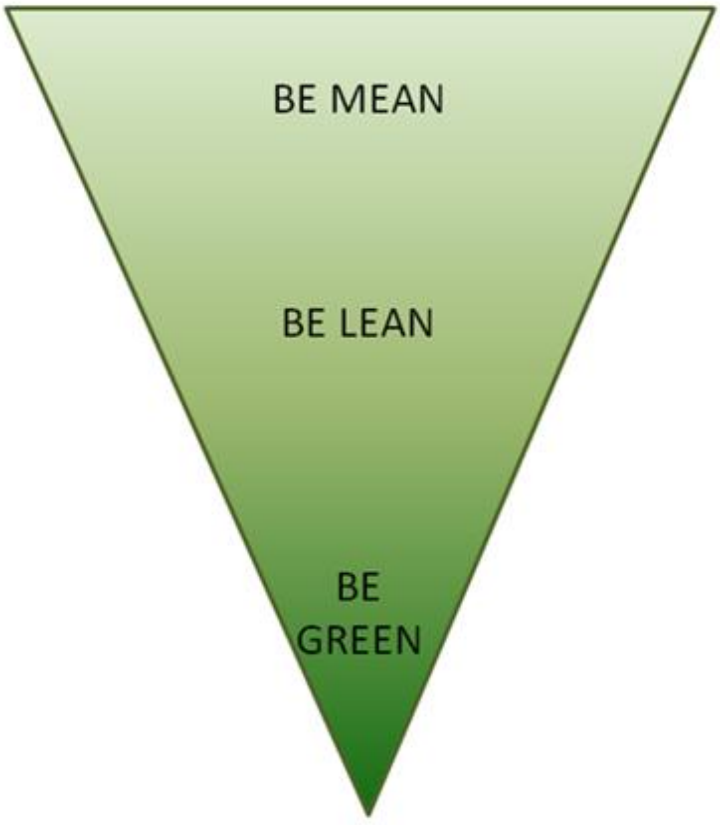

Figure 2: Energy Hierarchy Plan

9.1 STEP 1 (BE MEAN) – USE LESS RESOURCES

The following measures will be implemented to reduce the energy consumption of the proposed development:

- High performance U-values;
- Improved air tightness; and
- Improved thermal transmittance and thermal bridging design.

9.1.1 HIGH PERFORMANCE U-VALUES

To limit the heat loss through the façade, careful consideration must be shown when designing the external façade. The specification of the insulation utilised, and the continuity of insulation are crucial. Insulation slows the rate at which heat is lost to the outdoors. Heat flows in three ways: by conduction, convection and radiation.

The targeted maximum average elemental U-Values for both the residential and non-residential aspects of the proposed development are outlined in Table 2 and Table 3 below.

Table 3: Residential Building Envelope Thermal Performance Targets

Fabric Element	Fortfield Road Residential Development Maximum Average Elemental U-value ($W/m^2.K$)
External Walls	0.18
Flat Roof	0.18
Pitched Roof	0.16
Ground Contact & Exposed Floor	0.18 (0.15 if underfloor heating installed)
External Windows, Roof-lights & Doors	1.40

Table 4: Non-Residential Building Envelope Thermal Performance Targets

Fabric Element	Fortfield Road Residential Development Maximum Average Elemental U-value ($W/m^2.K$)
External Walls	0.21
Flat Roof	0.20
Pitched Roof	0.16
Ground Contact & Exposed Floor	0.21 (0.15 if underfloor heating installed)
External Windows, Roof-lights & Doors	1.40

9.1.2 AIR TIGHTNESS

One major contributing factor to unnecessary heat loss is infiltration. Infiltration is the air leakage of external air into a building due to the pressure difference associated with internal and external temperatures.

It is intended that the residential and non-residential aspects of the development will both target an air permeability rate of ≤ 3 $m^3/hr/m^2$ @50 Pa.

Figure 3: Air tightness testing examples

9.1.3 THERMAL TRANSMITTANCE

Thermal bridges occur where the insulation layer is penetrated by a material with a relatively high thermal conductivity and at interfaces between building elements where there is a discontinuity in the insulation. The residential and non-residential aspects of the development will be designed to achieve low thermal bridging values throughout.

Residential:

A Y value of ≤ 0.08 $W/m^2.K$ is being targeted for the residential side of the development, in accordance with Part L (2022) – Dwellings requirements. The risks relating to mould growth/ condensation risks will also be assessed, in accordance with Part L (2022) – Dwellings.

Non-residential:

There are no Psi value targets required for the non-domestic elements of the development. However, the risks relating to mould growth/ condensation risks will still have to be assessed, in accordance with Part L (2022) – Buildings Other Than Dwellings.

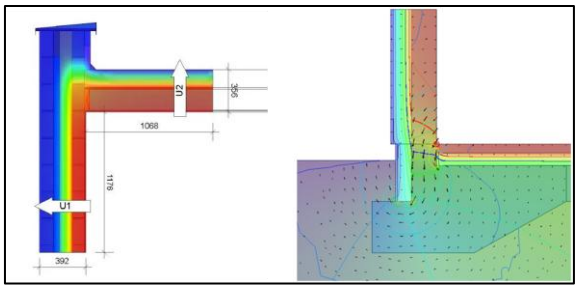

Figure 4: Thermal Bridge Assessment Examples

9.1.4 OVERHEATING ANALYSIS

Due to factors such as climate change, population increase and construction of high-rise buildings there has been an increase in high internal temperatures. Overheating of buildings can be extremely uncomfortable for the occupant and can ultimately lead to costly mitigation measures.

The development has been assessed for overheating risks through detailed overheating studies carried out in accordance with CIBSE TM59 stipulations. Comfortable spaces for all occupants can be shown as achieved as a result of this assessment, with openable windows having a key part in air movement and reduction of peak temperatures.

Residential:

The proposed Fortfield Road residential development will be evaluated and analysed with respect to overheating as outlined in Part L 2022 (Dwellings) and CIBSE TM59 (Design Methodology for the Assessment of Overheating Risk in Homes).

Non-residential:

The non-residential aspects of the proposed Fortfield Road residential development will be evaluated and analysed with respect to overheating as outlined in Part L 2022 (Buildings Other Than Dwellings) and CIBSE TM52 (Limits of Thermal Comfort: Avoiding Overheating in European Buildings).

9.1.5 DAYLIGHT

The proposed Fortfield Road residential developmentt has been evaluated and analysed with respect to daylight, sunlight and overshadowing, in order to determine the following:

- The daylight levels within the living and bedroom areas, to give an indication of the expected daylight levels throughout the proposed development;
- The expected sunlight levels within the living areas and bedrooms within the proposed development;
- The quality of amenity space, being provided as part of the development, in relation to sunlight;
- Any potential daylight or sunlight impact the proposed development may have on properties adjacent to the site.

Calculations and methodology used are in accordance with BRE Guidelines for daylight and sunlight and based on the Building Research Establishments “Site Layout Planning for Daylight and Sunlight: A Good Practice Guide” by PJ Littlefair, 2022 Third Edition.

9.1.6 PASSIVE DESIGN

An extensive analysis was carried out on the proposed façade to limit the effects of unnecessary solar gains during the summer time period. The image below illustrates the design intent to provide local shading utilising the building structure which allows glazing areas to be maximised, where required.

This balance of shading and maximised glazing areas provides both enjoyable and interesting workspaces, full of natural light and without undue solar gains in summertime. The shading coefficient of the glazing units has also been optimised to limit unnecessary solar gains, while allowing as much natural daylight to enter the workspace as possible.

Figure 5: CGI Image of Proposed Facade Design

Lighting accounts for typically 12% of the overall primary energy. Typically, this is even higher for non-residential spaces. Maximising natural daylighting in the main non-residential areas reduces this demand during daylight hours.

9.2 STEP 2 (BE LEAN) – USE RESOURCES EFFICIENTLY

To maximise the effectiveness of changes to the construction, it is important to use the energy sources within the development as efficiently as possible.

9.2.1 LOW ENERGY PLANT

To improve the overall energy efficiency of the residential aspect of the development, plant is to be selected based on performance and energy efficiency.

Space Heating: The plant options for space heating are:

- Electric Panel Heaters, or
- Air Source Heat Pumps (ASHP), or
- Exhaust Air Heat Pumps (EAHP)

Domestic Hot Water: The plant options for domestic hot water are:

- Air Source Heat Pumps (ASHP), or
- Exhaust Air Heat Pumps (EAHP), or

Ventilation: The plant options for ventilation are:

- Mechanical Ventilation and Heat Recovery (MVHR), or
- Mechanical Extract Ventilation (MEV) via the EAHP

Variable Speed Drives (VSDs): Variable speed drive motors are to be fitted to all fans and pumps servicing all HVAC systems. Standard fans and pumps operate at a constant speed to meet maximum demand even though only half the building may be occupied. VSDs have the ability to ramp up or down depending on the load requirements, making this the most efficient auxiliary system to install.

9.2.2 LIGHTING

The design intent for internal lighting design is to introduce artificial lighting in all applicable areas. Energy efficient light fittings will be installed throughout. The design of the developments façades also allows high levels of natural daylight to enter into occupied zones.

9.2.3 ONGOING MONITORING

A BEMS (Building Energy Management System) system is to be installed to monitor the use of all major systems in the building. The BEMS system is a graphical interface that allows the facilities/building manager to monitor and control all systems throughout the building.

9.3 STEP 3 (BE GREEN) – USE OF RENEWABLE TECHNOLOGIES

The following renewable technologies are being considered for implementation in the Fortfield Road residential development.

9.3.1 AIR SOURCE HEAT PUMP - RESIDENTIAL

Air source heat pumps convert energy from the air to provide heat and hot water for buildings. They are powered by electricity and are highly efficient. The air source heat pump is located outside in the open air and it uses a fan to draw air across it. This air then flows over a heat exchanger, which contains a refrigerant liquid. An evaporator uses the heat from the air to heat the refrigerant sufficiently until it boils and turns to a gas. This gas is then compressed which causes a significant rise in temperature. An additional heat exchanger removes the heat from the refrigerant which can then be used as useful heat within a building.

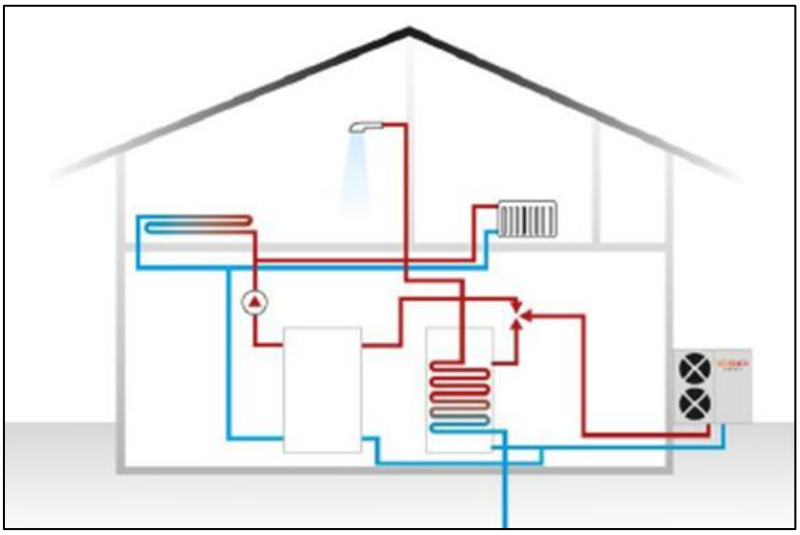

Figure 6: Air-Source Heat Pump Diagram

9.3.2 EXHAUST AIR HEAT PUMP

Exhaust air heat pumps collect warm air as it leaves a building via the ventilation system and then reuse the heat that would otherwise be lost to the outside to heat fresh air coming into the building or to heat water. Exhaust air heat pumps operate on a similar basis to other heat pumps such as air source heat pumps and ground source heat pumps and are suitable for providing hot water and heating for buildings such as houses, apartments or flats.

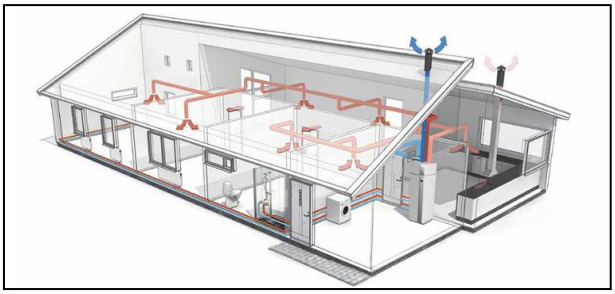

Figure 7: Example Diagram of Typical Exhaust Air Heat Pump Layout

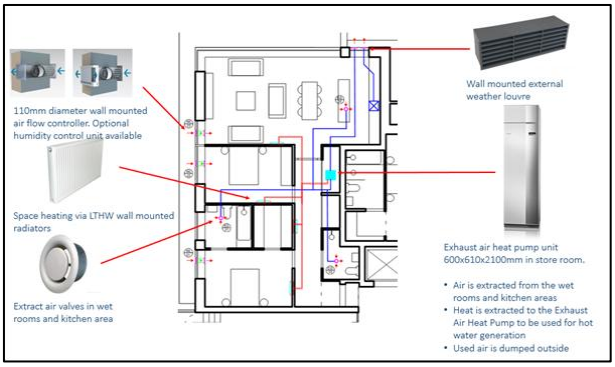

Figure 8: Example Diagram of Typical Exhaust Air Heat Pump Layout

9.3.3 SOLAR PHOTOVOLTAICS

Photovoltaic (PV) Panels convert the solar radiation into electricity, which can be connected to the mains supply of a building. The panels are placed on the roof and are most efficient with an incline angle of 30°. Panels are typically arranged in arrays on building roofs, with the produced electricity fed either directly into the dwelling, office or into the landlord's supply.

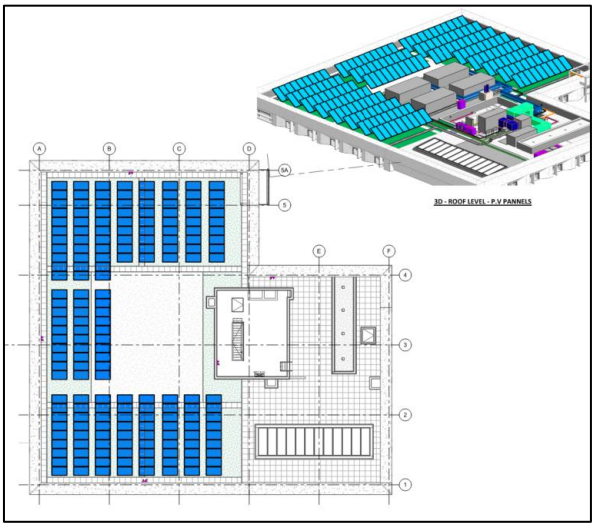

Figure 9: Solar PV Diagram

10 KEY SUSTAINABLE FEATURES

The location of the Fortfield Road residential development provides availability to alternative modes of transportation, use of water efficient fixtures, consideration for materials and resources and indoor environmental quality for the building occupants.

10.1 LOCATION AND TRANSPORTATION

The proposed development will offer occupants travelling to and from the development alternative modes of transport other than the need to rely on a car. Developing in an area that has strong public transport nodes offers users the opportunity to travel to and from the site using alternative modes of transport.

The following figures identify the local Dublin bus stops, bicycle lanes and local car sharing locations and their proximity to the proposed development.

Dublin Bus:

Figure 10: Local Dublin Bus Stops

Dublin Bikes/Trails:

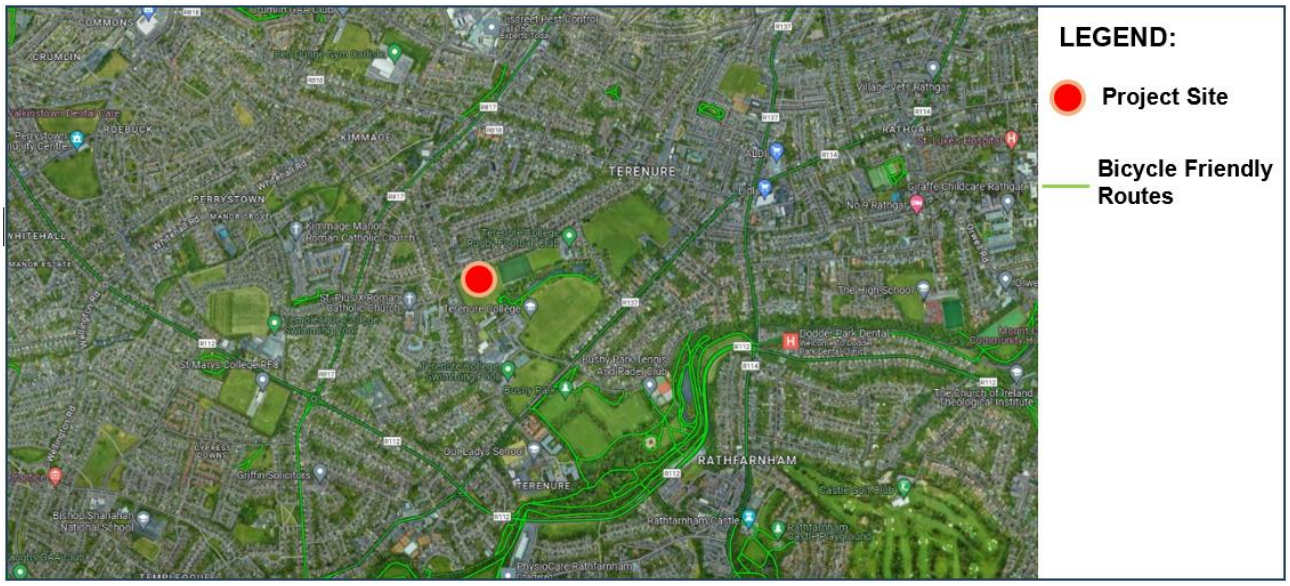

Figure 11: Local Bicycle Friendly Routes

Go-car/Yuko/Driveyou:

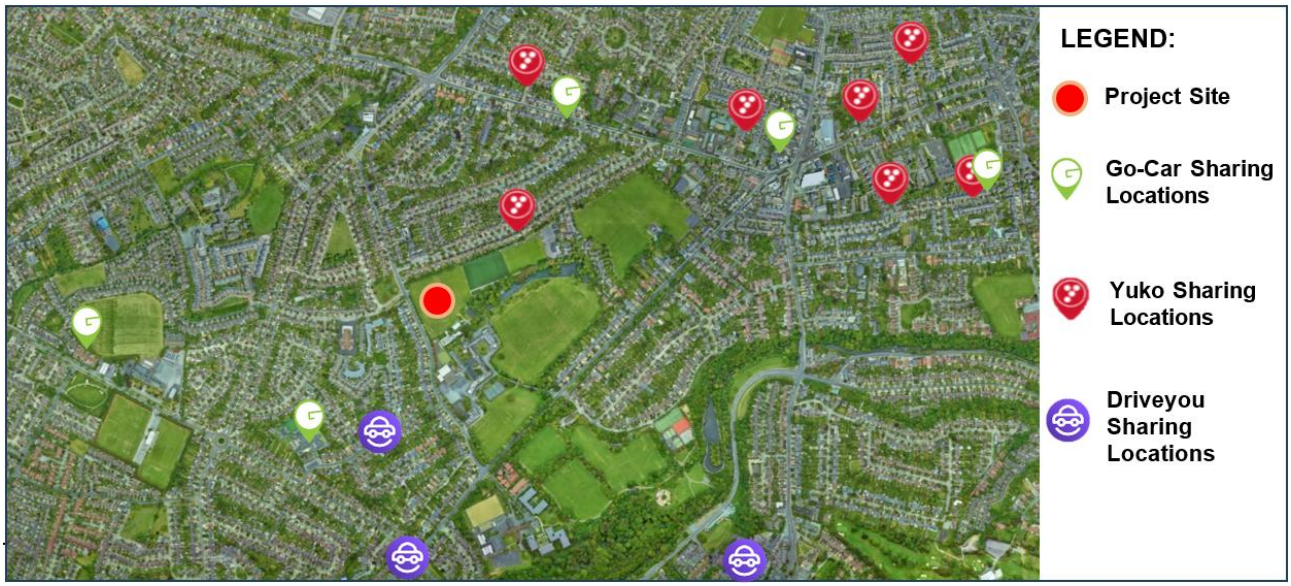

Figure 12: Local Car Sharing Locations

10.2 COMMISSIONING

To ensure efficient operation of the development, all systems will be commissioned. Commissioning of a developments systems ensures that the sustainable energy-design can be fully realised, with fewer operational issues during the building's lifetime. Building users' productivity improves and operational costs decrease also.

10.3 MATERIALS AND RESOURCES

The development will be designed and operated with the aim of a reduction in waste generation through construction and operation. Where possible waste streams will be separated on site and recycled or re-used as a secondary material. Where possible local low-carbon materials will be specified, and in addition materials that contain recycled content will be considered as preferable.

10.4 WATER EFFICIENCY

With increasing costs associated with potable water use, the proposed development will incorporate measures to reduce water usage through the appropriate selection of low consumption sanitary fittings, leak detection systems and water monitoring facilities.

10.5 BICYCLE FACILITIES

Cycling offers a sustainable alternative to personal vehicle use, which reduces gas and particulate emissions, noise pollution and also congestion in busy urban areas. The proposed development will provide private bicycle spaces for tenants.

10.6 INDOOR ENVIRONMENTAL QUALITY

As part of the sustainable design strategy, consideration of occupants and staff will be an integral part of the design process. As the productivity and well-being of building users depends strongly on the quality of the indoor environment, the following aspects will be addressed:

- Adequate ventilation and filtration;
- Low-emitting materials; and
- Natural daylight and views to the external environment.

10.7 ELECTRIC VEHICLE CHARGING

As part of the sustainable design strategy, the development will provide 10% of the total parking spaces for electric charging points.

10.8 GREEN ROOF

As part of the sustainable design strategy the development has considered a large extent of green and blue roof systems which will help to improve energy efficiency, manage stormwater, and reduce the urban heat island effect. These systems will enhance biodiversity, improve air quality, and provide natural insulation, leading to lower energy consumption. Additionally, they contribute to the aesthetic appeal of the area, create accessible green spaces, and promote a healthier and more resilient urban environment.

11 CONCLUSION

A holistic sustainable approach been adopted by the design team for the proposed Fortfield Road residential development located in Terenure, Dublin 6. Through detailed design, a number of sustainability and efficiency features have been considered throughout.

The proposed residential development will comply with residential Part L 2022 (Dwellings), as well as targeting an A2/A3 BER, while the proposed non-residential development will comply with non-residential Part L 2022 (Buildings other Than Dwellings) and target a minimum BER rating of A3.

The optimised approach is based on the Energy Hierarchy Plan - Be Mean, Be Lean, Be Green.

Be Mean

- The façade performance specification has been optimised to limit heat loss, improve air tightness and thermal transmittance and to maximise natural daylight.

Be Lean

- High efficiency plant will be specified to take advantage of the optimised façade design measures that have been introduced;
- A low energy lighting design will be utilised to further reduce energy consumption and increase occupant thermal comfort.

Be Green

- Renewable energy technologies such as Air Source Heat Pumps (ASHP), Exhaust Air Heat Pump (EAHP) and Solar PV will be considered for implementation.

A number of sustainable design features have been considered within the design to achieve the sustainability targets of the proposed development. These include:

- The proximity of the development to public transportation networks;
- Water efficiency measures such as low consumption sanitary fittings; and
- Improved indoor environmental quality.

This report confirms that if the energy and sustainability strategy is successfully implemented, the proposed Fortfield Road residential development will satisfy all Part L and BER requirements.

Consenting to this development would be consistent with the objectives of the Dublin City Development Plan, as it promotes a climate-resilient urban environment. The project prioritizes high-efficiency design and systems, encourages the use of public and active transport, and incorporates climate adaptation measures, ensuring compliance with national and local climate policies.

12 VERIFICATION

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