

Energy & Sustainability Report

Sandford Road Residential Development

Project No. A609

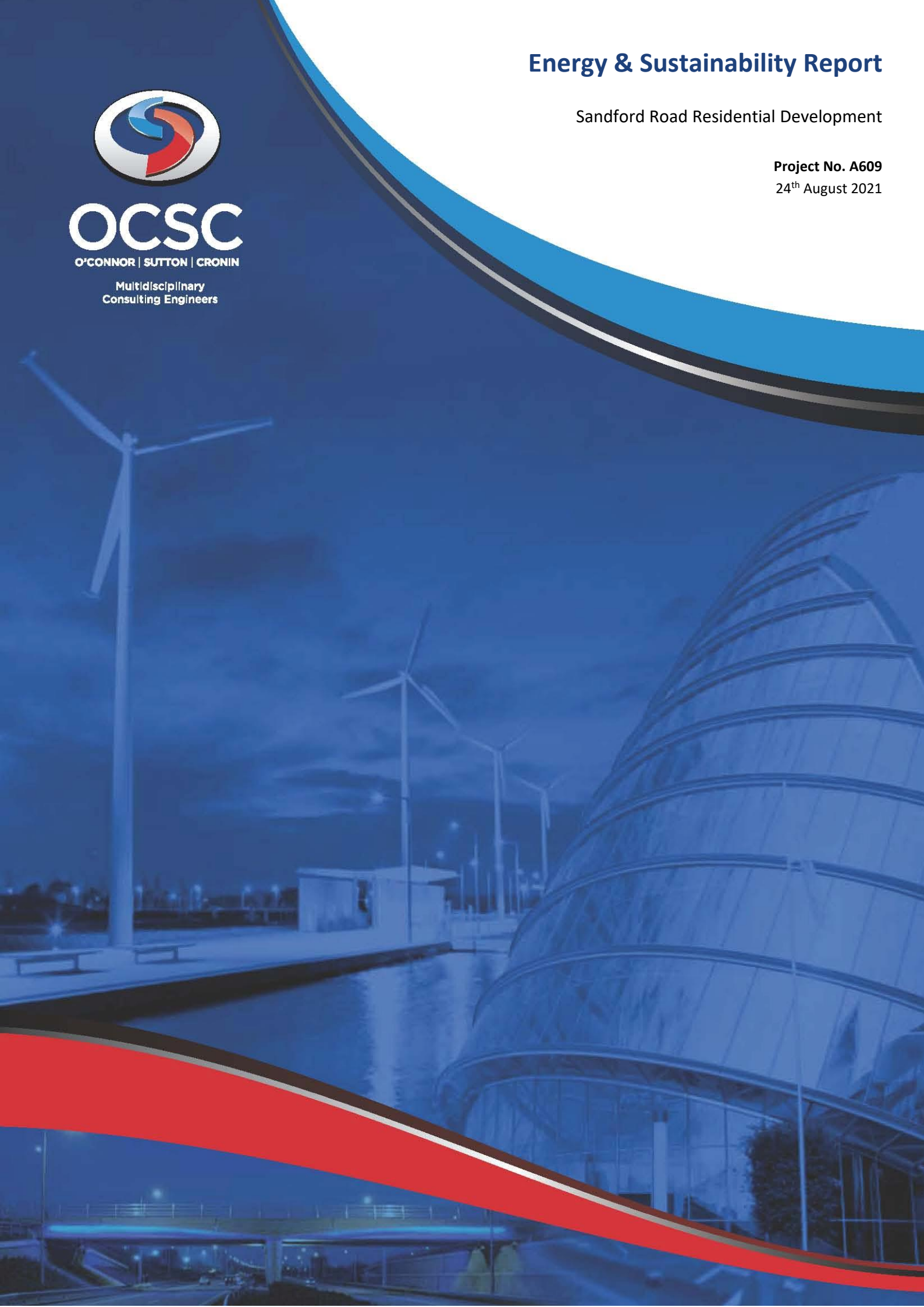
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OCSC

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Energy & Sustainability Report



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DOCUMENT CONTROL & HISTORY

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EXECUTIVE SUMMARY

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 throughout.

The following document sets out the energy design approach that requires the design to initially 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 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 are 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 Sandford Road development will achieve all energy and sustainability targets.

ENERGY & SUSTAINABILITY REPORT

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1. 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 Sandford Road development located in Dublin 6.

The proposed development will comply with Part L 2021 (NZEB) for residential areas and Part L 2021 (NZEB) for non-residential areas. As part of the development's efforts to further reduce energy consumption, the project is targeting an A2/A3 BER (Building Energy Rating).

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.

Energy Performance Targets		
Standard / Rating	Mandatory	Target
Part L Residential	Yes	2021 (NZEB)
Part L Non-residential	Yes	2021 (NZEB)
BER Residential	Yes	A2/A3
BER Non-residential	Yes	A3

Table 1: Energy Performance Targets

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

2. PROPOSED DEVELOPMENT

Sandford Living Limited intend to apply to An Bord Pleanála for permission for a strategic housing development at this c. 4.26 hectare site at Milltown Park, Sandford Road, Dublin 6, D06 V9K7. Works are also proposed on Milltown Road and Sandford Road to facilitate access to the development including improvements to pedestrian facilities on an area of c. 0.16 hectares. The development's surface water drainage network shall discharge from the site via a proposed 300mm diameter pipe along Milltown Road through the junction of Milltown Road / Sandford Road prior to outfalling to the existing drainage network on Eglinton Road (approximately 200 metres from the Sandford Road / Eglinton Road junction), with these works incorporating an area of c. 0.32 hectares. The development site area, road works and drainage works areas will provide a total application site area of c. 4.74 hectares.

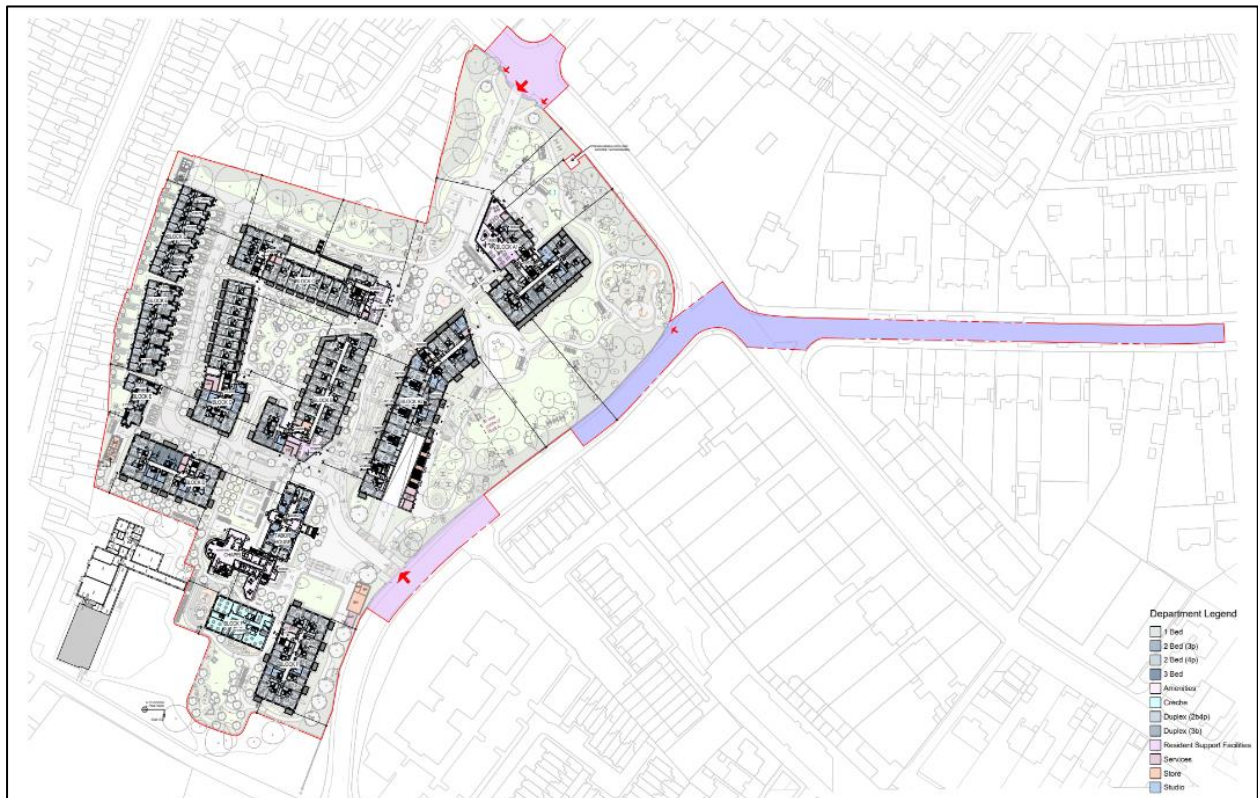


Figure 1 – Proposed Site Plan

The development will principally consist of: the demolition of c. 4,883.9 sq m of existing structures on site including Milltown Park House (880 sq m); Milltown Park House Rear Extension (2,031 sq m); the Finlay Wing (622 sq m); the Archive (1,240 sq m); the link building between Tabor House and Milltown Park House rear extension to the front of the Chapel (74.5 sq m); and 36.4 sq m of the 'red brick link

building' (single storey over basement) towards the south-western boundary; the refurbishment and reuse of Tabor House (1,575 sq m) and the Chapel (768 sq m), and the provision of a single storey glass entrance lobby to the front and side of the Chapel; and the provision of a 671 No. unit residential development comprising 604 No. Build-to-Rent apartment and duplex units (88 No. studios, 262 No. one bed units, 242 No. two bed units and 12 No. three bed units) and 67 No. Build-to Sell apartment and duplex units (11 No. studios, 9 No. one bed units, 32 No. two bed units and 15 No. three bed units).

Block A1 will range in height from part 5 No. storeys to part 10 No. storeys and will comprise 94 No. Build-to-Rent apartments; Block A2 will range in height from part 6 No. storeys to part 8 No. storeys (including part double height at ground floor level) and will comprise 140 No. Build to-Rent apartments and duplex units; Block B will range in height from part 3 No. to part 7 No. storeys and will comprise 91 No. Build-to-Rent apartments; Block C will range in height from part 2 No. storeys to part 8 No. storeys (including part double height at ground floor level) and will comprise 163 No. Build-to-Rent apartments; Block D will range in height from 3 No. storeys to 5 No. storeys and will comprise 39 No. Build-to-Sell apartments; Block E will be 3 No. storeys in height and will comprise 28 No. Build-to-Sell duplex units and apartments; Block F will range in height from 5 No. storeys to part 7 No. storeys and will comprise 92 No. Build-to-Rent apartments; and the refurbished Tabor House (4 No. storeys including lower ground floor level) will comprise 24 No. Build-to-Rent apartments.

The development also includes a creche within Block F (400 sq m) with outdoor play area; and the provision of communal internal amenities (c. 1,248.8 sq m) and facilities (c. 158.3 sq m) throughout the residential blocks, Tabor House and the converted Chapel building including co-working space, gym, lounges, reading rooms, games room, multi-purpose space, concierge, mail rooms and staff facilities

The proposed works also include a new 2.4 metre high boundary wall across the site from east to west (towards the southern boundary) requiring the demolition of a portion of the red brick link building that lies within the subject site towards the south-western boundary (36.4 sq m) and the making good of the façade at the boundary. The existing Link Building is the subject of a separate application for permission (DCC Reg. Ref. No. 3866/20) that includes a request for permission to demolish that Link Building, including the part of the building on the lands the subject of this application for SHD permission. If that application is granted and first implemented, no demolition works to the Link Building will be required under this application for SHD permission. If that application is refused

permission or not first implemented, permission is here sought to demolish only that part of the Link Building now existing on the lands the subject of this application for permission and to make good the balance at the red line with a blank wall.

The development also provides a new access from Milltown Road (which will be the principal vehicular entrance to the site) in addition to utilising and upgrading the existing access from Sandford Road as a secondary access principally for deliveries, emergencies and taxis; new pedestrian access points; pedestrian/bicycle connections through the site; 344 No. car parking spaces (295 No. at basement level and 49 No. at surface level) which includes 18 No. mobility impaired spaces, 10 No. car share spaces, 4 No. collection/drop-off spaces and 2 No. taxi spaces; bicycle parking; 14 No. motorcycle spaces; bin storage; boundary treatments; private balconies and terraces facing all directions; external gantry access in sections of Blocks A1, A2 and C; hard and soft landscaping including public open space and communal open space (including upper level communal terraces in Block A1, Block B and Block C which will face all directions); sedum roofs; PV panels; substations; lighting; plant; lift cores; and all other associated site works above and belowground. The proposed development has a gross floor space of c. 54,871 sq m above ground level over a partial basement (under part of Block A1 and under Blocks A2, B and C) measuring c. 10,607 sq m, which includes parking spaces, bin storage, bike storage and plant

3. PART L CONSERVATION OF FUEL & ENERGY – DWELLINGS

3.1. PART L 2021 (NZEB)

Part L 2021 (NZEB) 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 from 27th July 2021.

The Part L 2021 (NZEB) 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”.

For the Part L 2021 (NZEB) requirements, a Renewable Energy Ratio (RER) has replaced the Part L 2011 renewable requirements. A RER of 20% (ratio of total primary energy generated from renewable energy resources to total primary energy consumption) is required to achieve compliance.

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).

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

4.1. LOCATION OF NON-RESIDENTIAL DEVELOPMENT

The non-residential aspects of the development will consist of amenity spaces / common - areas to the apartment blocks which include co-working spaces, lounges, multi-purpose hall and creche facilities.

4.2. PART L 2021 (NZEB)

The Part L 2021 (NZEB) building regulations is the new standard for all buildings other than dwellings constructed after 27th July 2021. The Part L 2021 (NZEB) 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 significant extent by energy from renewable sources, including energy from renewable sources produced on-site or nearby”.

For new buildings other than dwellings, the Part L 2021 (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 (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 (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 (2021) – Buildings Other Than Dwellings now has additional requirements relating to self-regulating devices and electric vehicle charging. For new and existing buildings other than dwellings, the Part L 2021 (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;
- e) 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.
- g) 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.

Renewable Energy Ratio (RER):

This is the most significant change introduced as part of the Part L 2021 (NZEB) regulations for non-residential buildings. 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.;
- 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:
 - 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;
 - 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.

For existing buildings other than dwellings, the Part L 2021 (NZEB) requirements shall be met by:

- a) limiting the heat loss and, where appropriate, availing of the heat gains through the fabric of the building;
- b) providing energy efficient space heating and cooling systems, heating and cooling equipment, water heating systems, and ventilation systems, with effective controls;
- c) 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;
- d) limiting the heat loss from pipes, ducts and vessels used for the transport or storage of heated water or air;
- e) limiting the heat gains by chilled water and refrigerant vessels, and by pipes and ducts that serve air conditioning systems;
- f) providing energy efficient artificial lighting systems and adequate control of these systems;
- g) providing to the building owner or occupants sufficient information about the building fabric, the fixed building services, controls and their maintenance requirements when replaced so that the building can be operated in such a manner as to use no more fuel and energy than is reasonable;

- h) when a building undergoes major renovation, the minimum energy performance requirement of the building or the renovated part thereof is upgraded in order to meet the cost optimal level of energy performance in so far as this is technically, functionally and economically feasible.

However, Part L (2021) – Buildings Other Than Dwellings now has additional requirements relating to self-regulating devices and electric vehicle charging. For new and existing buildings other than dwellings, the Part L 2021 (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;
- e) A building which has more than 10 car parking spaces, that is:
 - iii. New, or
 - iv. 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.
- g) The requirements of subparagraph (e) shall apply to a building undergoing major renovation where:
 - iii. 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
 - iv. 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.

5. 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:*
 - a) *Limiting the moisture content of the air within the building so that it does not contribute to condensation and mould growth, and*
 - b) *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.

6. 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 BER (Building Energy Rating) 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.

7. 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:

1. 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.
2. The second step is to utilise energy in the most efficient way through the selection and installation of energy efficient plant and equipment.
3. The final step is to introduce energy from renewable sources to reduce the burden on fossil fuels.

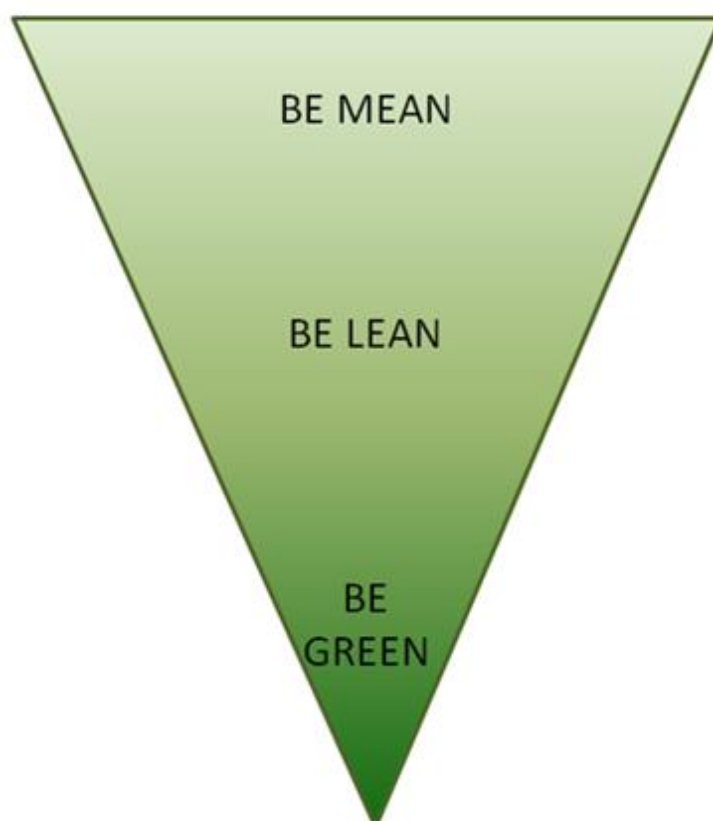


Figure 2: Energy Hierarchy Plan

7.1. 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.

7.1.1. 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.

New Build Elements:

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.

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

Table 2: Residential Building Envelope Thermal Performance Targets

Fabric Element	Sandford Road Residential Development Maximum Average Elemental U-value (W/m ² .K)
External Walls	0.20
Flat Roof	0.18
Ground Contact & Exposed Floor	0.20 (0.15 if underfloor heating installed)
External Windows & Doors	1.40

Table 3: Non-residential Building Envelope Thermal Performance Targets

Existing Elements:

Each existing element to be refurbished will be analysed from the purposes of thermal performance, the risk of interstitial condensation and protecting the architectural merit of the element. After an evaluation of each of these points, the existing element will be insulated if possible.

7.1.2. 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.

New Build Elements:

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



Figure 3: Air Tightness Testing

Existing Elements:

Every effort will be made to improve the air tightness of the existing building elements where possible.

7.1.3. 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 Ψ value of $\leq 0.08 \text{ W/m}^2\cdot\text{K}$ is being targeted for the residential side of the development, in accordance with Part L (2021) – Dwellings requirements. The risks relating to mould growth/ condensation risks will also be assessed, in accordance with Part L (2021) – Dwellings.

Non-residential:

There are no Ψ 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 (2021) – Buildings Other Than Dwellings.

Existing Elements:

Where an existing element shows a risk of thermal bridging, every effort will be made to reduce the risk.

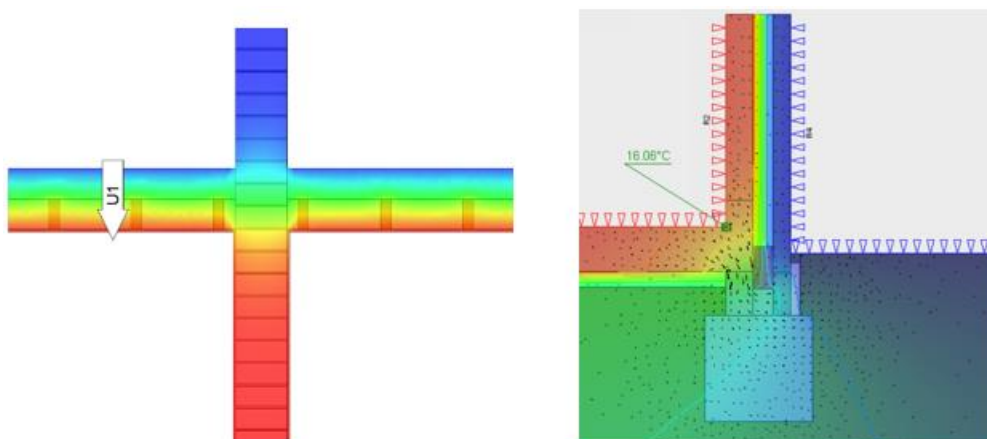


Figure 4: Thermal Bridge Assessment

7.1.4. 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.

Residential:

The proposed Sandford Road residential development will be evaluated and analysed with respect to overheating as outlined in Part L 2021 (NZEB) and CIBSE TM59 (Design Methodology for the Assessment of Overheating Risk in Homes).

Non-residential:

The proposed Sandford Road non-residential development will be evaluated and analysed with respect to overheating as outlined in Part L 2021 (NZEB) and CIBSE TM52 (Limits of Thermal Comfort: Avoiding Overheating in European Buildings).

7.2. 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 building as efficiently as possible.

7.2.1. LOW ENERGY PLANT - RESIDENTIAL

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 following space heating plant has been considered for implementation:

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

Domestic Hot Water: The following domestic hot water plant has been considered for implementation:

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

Ventilation: The following ventilation strategy has been considered for implementation:

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

7.2.2. LOW ENERGY PLANT - NON-RESIDENTIAL

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

Space Heating: The following space heating plant has been considered for implementation:

- Variable Refrigerant Flow (VRF) Heat Pumps

Space Cooling: The plant options for space cooling are:

- Natural ventilation where possible, and/or
- Variable Refrigerant Flow (VRF) Heat Pumps

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

- High Efficiency Condensing Gas Boilers, and/or
- Air Source Heat Pumps (ASHP)

Ventilation: The proposed ventilation strategy for the building will be natural ventilation where possible and/or mechanical ventilation. The mechanical ventilation system will be a high efficiency, variable speed drive system that also incorporates heat recovery and CO₂ control.

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.

7.2.3. 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 building façade also allows high levels of natural daylight to enter into occupied zones.

7.2.4. 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.

7.3. STEP 3 (BE GREEN) – USE OF RENEWABLE TECHNOLOGIES

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

7.3.1. 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.

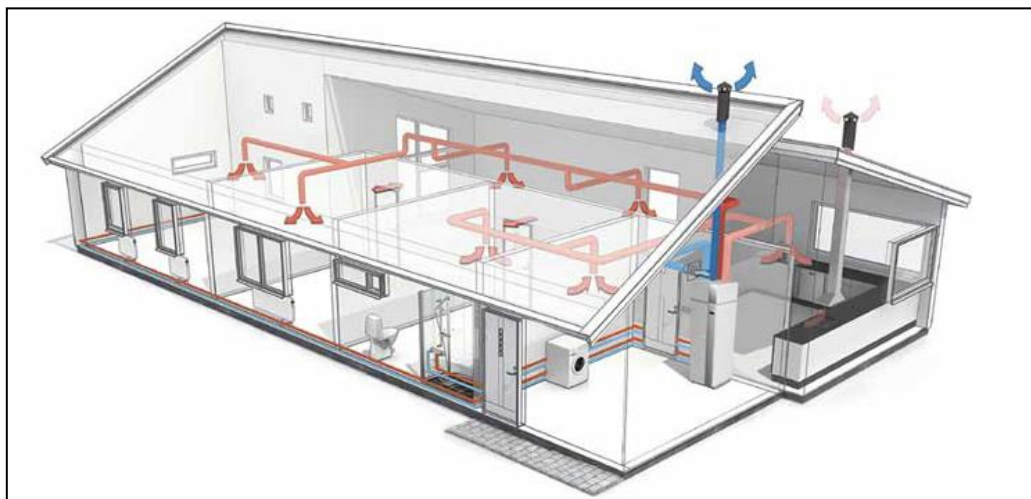


Figure 5: Example Diagram of Typical Exhaust Air Heat Pump Layout

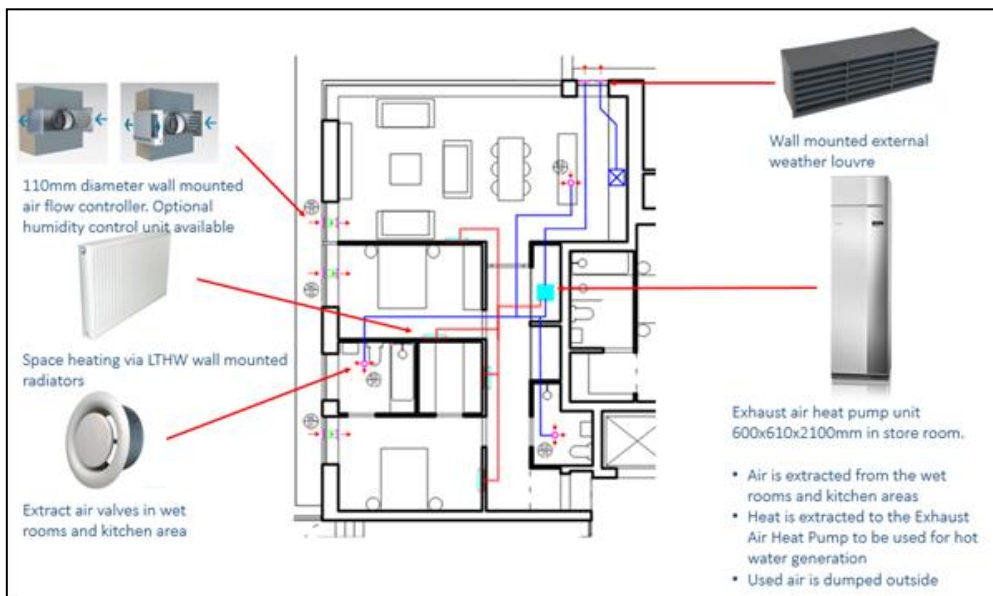


Figure 6: Example Diagram of Typical Apartment Exhaust Air Heat Pump Layout

7.3.2. AIR SOURCE HEAT PUMP

Air source heat pumps convert energy from the air to provide hot water for buildings. They are powered by electricity and are highly efficient. The air source heat pump proposed, pulls in external air via insulated ductwork. This air then flows over a heat exchanger, which contains a refrigerant liquid. An evaporator uses the latent 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 to heat water within the dwelling.

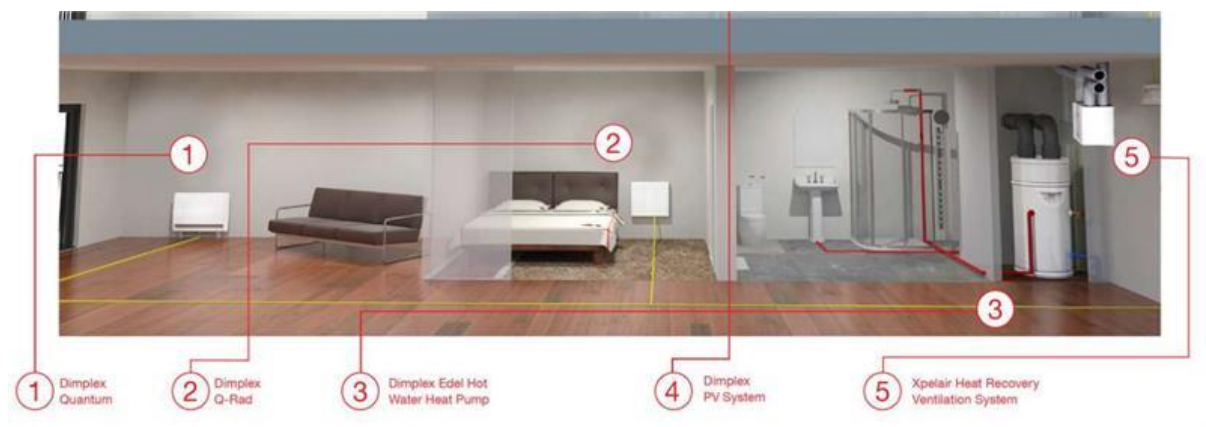


Figure 8: Typical Air-Source Heat Pump with Electric Panel Heaters Arrangement

7.3.3. SOLAR PHOTOVOLTAICS

Photovoltaic (PV) Panels convert the solar radiation into electricity, which can be connected to the mains supply of a dwelling. 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, apartment or into the landlord's supply.

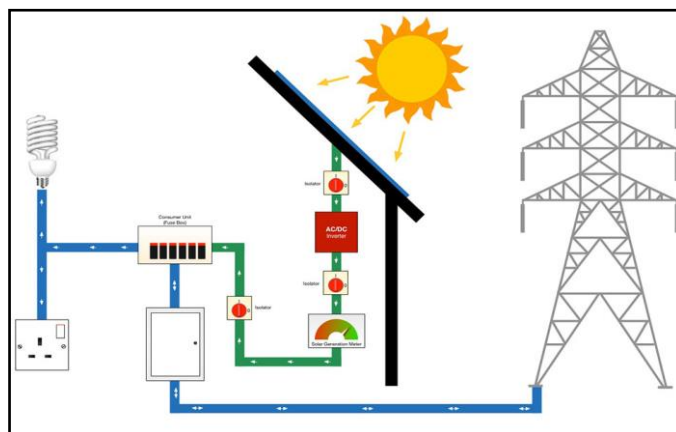


Figure 9: Solar PV Diagram

7.3.4. AIR SOURCE HEAT PUMP – NON-RESIDENTIAL

Air-Source Heat Pumps (ASHP) are deemed a renewable energy technology under Part L 2021 (NZEB). In heating mode, ASHPs are designed to extract heat from the ambient outside air and release it inside the building via heat emitters. In cooling mode, the cycle is reversed with heat being extracted from inside the building to the outside.



Figure 10: Air-Source Heat Pump

7.3.5. VRF HEAT PUMPS

Variable Refrigerant Flow systems utilise heat pumps in order to provide space heating as well as space cooling. These systems are capable of serving multiple zones with different heating and cooling requirements and they can modulate their output according to zone requirements, increasing system efficiencies and reducing the energy demand of these systems.

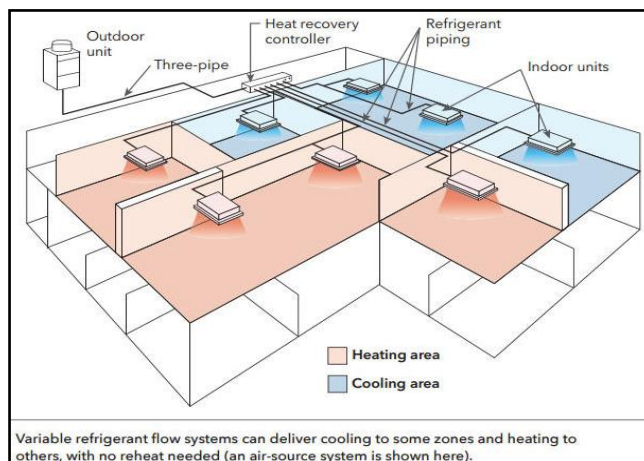


Figure 11: Typical VRF Schematic Diagram

8. KEY SUSTAINABLE FEATURES

The location of the Sandford Road 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.

8.1. 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 Luas stops, Dublin bus stops, bicycle lanes and local car sharing locations and their proximity to the proposed development.

Bus Stop & Train Station:



Figure 12: Local Luas and Dublin Bus Stops

Dublin Bikes/Trails:

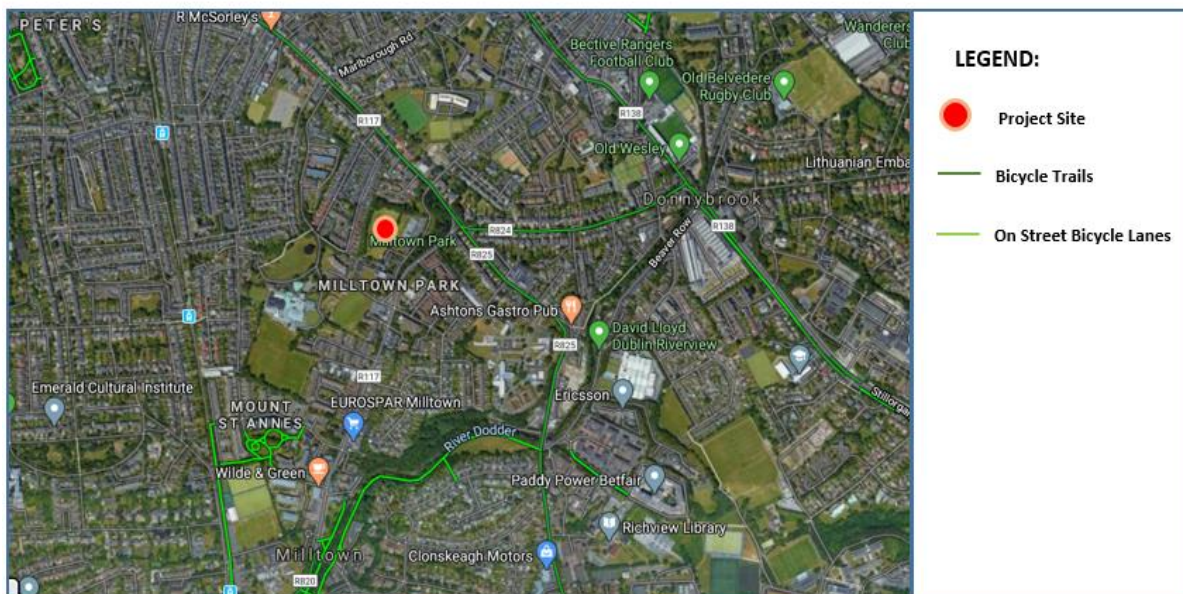


Figure 13: Local Bicycle Lanes

Go-Car:



Figure 14: Local Car Sharing Locations

8.2. COMMISSIONING

To ensure efficient operation of the building 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.

8.3. 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. Where possible local materials will be specified, and in addition materials that contain recycled content will be considered as preferable.

8.4. 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.

8.5. 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/occupants.

8.6. 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.

8.7. GREEN ROOF

Extensive green roofs are being incorporated into the design throughout. This will not only enhance the ecology value of the proposed scheme but will also form part of the SuDS design and contribute to rainwater attenuation and reducing the urban heat island effect.

8.8. ELECTRIC VEHICLE CHARGING

As part of the sustainable design strategy, the development shall provide the following provisions relating to electric vehicle charging:

Residential Dwellings:

- Installation of 'infrastructure' for E.V charging for residential buildings with more than 10 car parking spaces, to allow for future installation of recharging points.

Non-residential Buildings:

- Where the development has more than 10 car parking spaces, to provide one car recharging point for E.V charging;
- Where the development has more than 10 car parking spaces, to provide at least one accessible recharging point (or 5% of total recharging points – whichever the greater), as also outlined within Part M;
- Where the development has more than 10 car parking spaces, to provide mandatory 'infrastructure' for E.V charging for at least one in every 5 parking bays to allow for future installation of recharging points.

9. CONCLUSION

A holistic sustainable approach been adopted by the design team for the proposed Sandford Road development located at 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 2021 (NZEB), as well as targeting an A2/A3 BER, while the proposed non-residential development will comply with non-residential Part L 2021 (NZEB), as well as targeting an A3 BER.

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 central 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 Exhaust Air Heat Pumps (EAHPs), Solar PV and VRF Heat Pumps 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 which incorporates adequate ventilation and filtration, low-emitting materials and natural daylight and views.

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



OCSC
O'CONNOR | SUTTON | CRONIN

Multidisciplinary
Consulting Engineers

9 Prussia Street
Dublin 7
Ireland

T | +353 (0)1 8682000
F | +353 (0)1 8682100
W | www.ocsc.ie