Energy & Sustainability Report

Sandyford Central

Project No. R478

11th November 2019

OCSC
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Executive Summary

This document provides an overview of how the project intends to integrate sustainability as a key strategy in the building's design. The report focuses on the performance targets required by the Building Regulations Part L 2019 (NZEB) for residential and Part L 2017 (NZEB) for all commercial (café, amenities and creche) aspects. Furthermore a Building Energy Rating (BER) of an 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 through a ''fabric first'' approach. With regards to the residential development, either Exhaust Air Heat Pumps (EAHP) or a District Heating System comprising of Combined Heat and Power (CHP) and Gas Boilers with the potential of Air Source Heat Pump (ASHP) are being assessed for the space heating and the domestic hot water requirements. Either Mechanical Ventilation with Heat Recovery (MVHR) or Mechanical Extract Ventilation (MEV) are being assessed to satisfy the ventilation requirements of the residential development.

With regards to the commercial development, a Variable Refrigerant Flow (VRF) system is being proposed to satisfy the space heating and cooling requirements, while instantaneous electric water heaters or Air Source Heat Pumps will be utilised for the domestic hot water requirements. Mechanical Ventilation Heat Recovery (MVHR) is bring proposed to satisfy the ventilation requirements.

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1. INTRODUCTION

The intention of this report is to identify the energy efficiency measures associated with the design, construction, ongoing management and maintenance of the proposed Sandyford Central development in Sandyford, Dublin 18.

The proposed development will comply with Part L 2019 (NZEB) for residential and Part L 2017 (NZEB) for the commercial aspects of the development. 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.

Residential Energy Performance Targets		
Standard/Rating	**Mandatory**	**Target**
Part L	**Yes**	**2019 (NZEB)**
BER	**Yes**	**A2/A3**
Renewable Energy Ratio Target	**Yes**	**20%**

Table 1: Residential Energy Performance Targets

Commercial Energy Performance Targets (café and amenities)		
Standard/Rating	**Mandatory**	**Target**
Part L	**Yes**	**2017 (NZEB)**
BER	**Yes**	**A3**
Renewable Energy Ratio Target	**Yes**	**20%**

Table 2: Commercial Energy Performance Targets

The following sections identify a range of energy efficient measures that have been considered for the proposed development at the former Aldi site, Carmanhall Road, Sandyford Business District, Dublin 18.

2. PROPOSED DEVELOPMENT

Sandyford GP Limited (acting in its capacity as general partner for the Sandyford Central Partnership) intend to apply to An Bord Pleanála for permission for a strategic housing development at a 1.54 ha site at the former Aldi Site, Carmanhall Road, Sandyford Business District, Dublin 18.

The development, which will have a Gross Floor Area of 49,342 sq m will principally consist of: the demolition of the existing structures on site and the provision of a Build-to-Rent residential development comprising 564 No. apartments (46 No. studio apartments, 205 No. one bed apartments, 295 No. two bed apartments and 18 No. three bed apartments) in 6 No. blocks as follows: Block A (144 No. apartments) is part 10 to part 11 No. storeys over basement; Block B (68 No. apartments) is 8 No. storeys over basement; Block C (33 No. apartments) is 5 No. storeys over lower ground; Block D (103 No. apartments) is part 16 to part 17 No. storeys over lower ground; Block E (48 No. apartments) is 10 No. storeys over semi-basement; and Block F (168 No. apartments) is 14 No. storeys over semi basement.

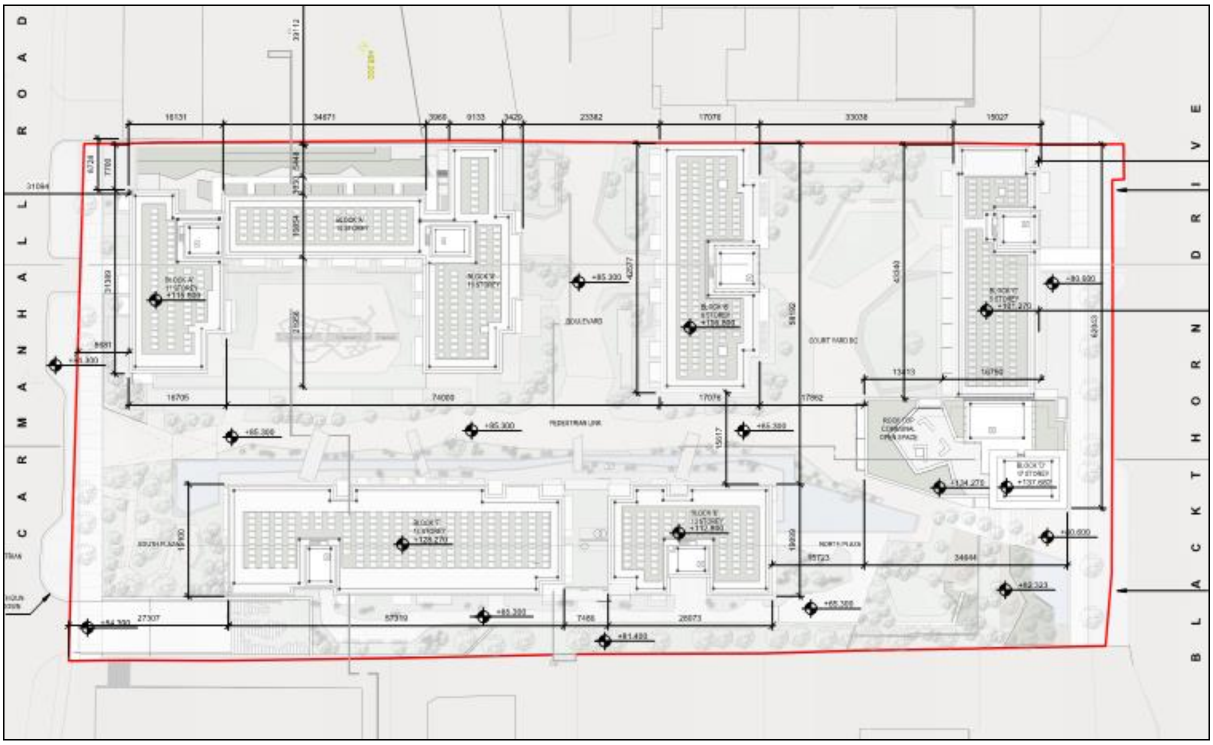

Figure 1: Proposed Site Plan

The development provides resident amenity spaces (1,095 sq m) in Blocks A, C and D including concierge, gymnasium, lounges, games room and a panoramic function room at Roof Level of Block D; a creche (354 sq m); café (141 sq m); a pedestrian thoroughfare from Carmanhall Road to Blackthorn Drive also connecting into the boulevard at Rockbrook to the west; principal vehicular access off Carmanhall Road with servicing and bicycle access also provided off Blackthorn Drive; 285 No. car parking spaces (254 No. at basement level and 31 No. at ground level); 21 No. motorcycle spaces; set-down areas; bicycle parking; bin storage; boundary treatments; hard and soft landscaping; lighting; plant; ESB substations and switchrooms; sedum roofs; and all other associated site works above and below ground.

3. PART L BUILDING REGULATIONS - RESIDENTIAL

The new Part L 2019 (NZEB) Technical Guidance Document has been issued by the Minister for Housing, Planning and Local Government. This document is the new standard for dwellings constructed from November 2019.

The Part L 2019 (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"

Renewable Energy Ratio (RER):

For the Part L 2019 (NZEB) requirements, a Renewable Energy Ratio (RER) is to replace 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 Documents, 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 Coefficient of performance *(COP) of 2.5);

*COP is a measure of the efficiency of a heat pump at specified source and sink temperatures as stated in Appendix F of Part L 2019.

To demonstrate that an acceptable primary energy consumption rate has been achieved, the calculated Energy Performance Coefficient (EPC) of the dwelling being assessed should be no greater than the Maximum Permitted Energy Performance Coefficient (MPEPC).

The MPEPC is 0.3 (NZEB compliant)

To demonstrate that an acceptable CO_2 emission rate has been achieved, the calculated Carbon Performance Coefficient (CPC) of the dwelling being assessed should be no greater than the Maximum Permitted Carbon Performance Coefficient (MPCPC).

The MPCPC is 0.35 (NZEB compliant)

4. PART L BUILDING REGULATIONS - COMMERCIAL

The Part L 2017 (NZEB) building regulations is the new standard for all commercial buildings constructed after 1st January 2019. The Part L 2017 (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 2017 (NZEB) 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.

Renewable Energy Ratio (RER):

This is the most significant change introduced as part of the Part L 2017 (NZEB) regulations for commercial 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.

5. 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 (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.

6. COMPLIANCE WITH PART F OF BUILDING REGULATIONS

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 (TGDs).

The TGD Part F 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.*

In relation to F1, the proposed design for the apartments will comply with the requirements. In relation to F2, all roof systems throughout will be effectively ventilated in order to avoid condensation. This shall be achieved through either Mechanical Ventilation Heat Recovery (MVHR) or Mechanical Extract Ventilation (MEV).

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.

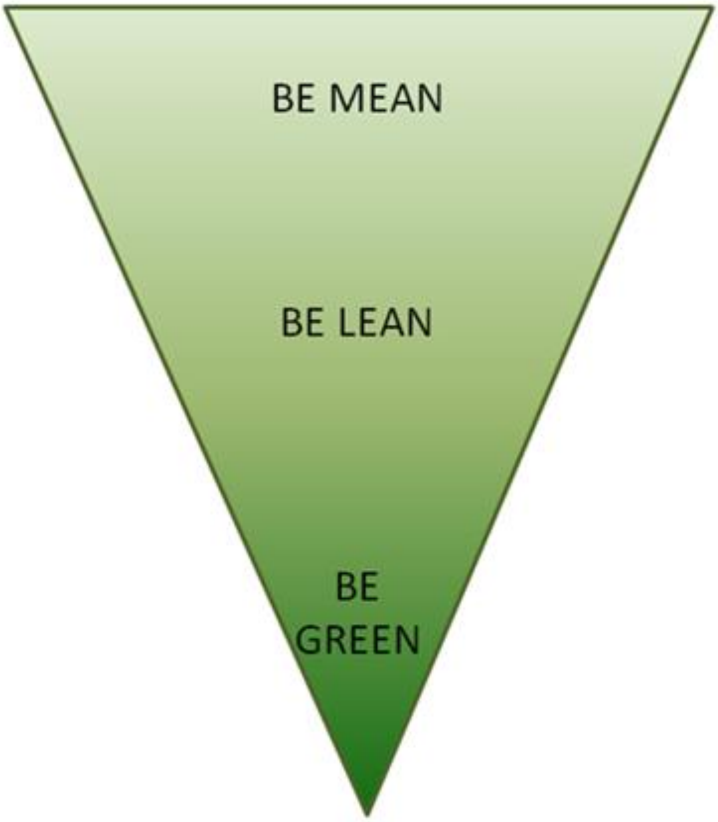

Figure 2: Energy Hierarchy Plan

7.1. STEP 1 (BE MEAN) – USE LESS RESOURCES

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

- 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.

The targeted maximum average elemental U-Values for both the residential and commercial aspects of the proposed development are outlined in Table 3 and Table 4.

Fabric Element	Sandyford Central - Residential Maximum Average Elemental U-value ($W/m^2.K$)
Above & Below Grade 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 3: Residential Thermal Performance Targets

Fabric Element	Sandyford Central - Commercial Maximum Average Elemental U-value ($W/m^2.K$)
Above & Below Grade External Walls	0.21
Flat Roof	0.20
Ground Contact & Exposed Floor	0.21 (0.15 if underfloor heating installed)
External Windows & Doors	1.40

Table 4: Commercial/ Common Areas Thermal Performance Targets

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.

It is intended that the residential and commercial elements of the development will both target an air permeability rate of 3 m³/hr/m² @ 50 Pa.

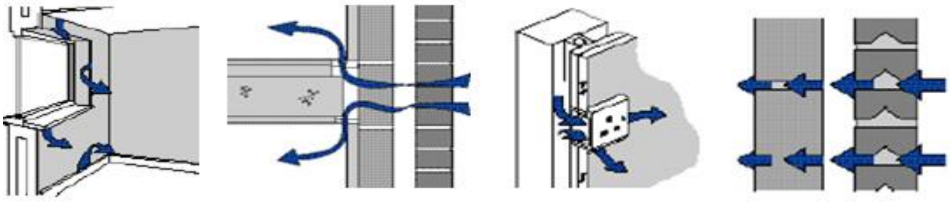

Figure 3: Typical Air Leakage Paths

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.

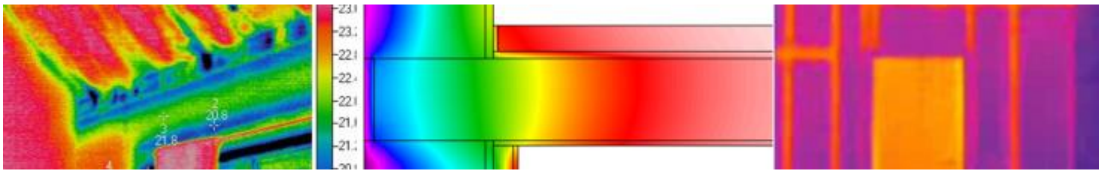

Figure 4: Typical Thermal Bridging Details

Both the residential and commercial aspects of the development will be designed to achieve low thermal bridging values throughout. A Y value of ≤ 0.05 W/m^2.K must be achieved for the residential development in accordance with Part L 2019 (NZEB) requirements.

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 Sandyford Central residential development will be evaluated and analysed with respect to overheating as outlined in Part L 2019 (NZEB) and CIBSE TM59 (Design Methodology for the Assessment of Overheating Risk in Homes).

Commercial:

The proposed Sandyford Central commercial development will be evaluated and analysed with respect to overheating as outlined in Part L 2017 (NZEB) and CIBSE TM52 (Limits of Thermal Comfort: Avoiding Overheating in European Buildings).

7.1.5. PASSIVE DESIGN

The proposed Sandyford Central development has been evaluated and analysed with respect to daylight/ sunlight/ overshadowing, in order to determine the following:

- The expected daylight levels within the living and bedroom areas of selected apartments, to give an indication of the expected daylight levels throughout the proposed development.
- The quality of amenity space being provided as part of the development, in relation to sunlight.
- Any potential overshadowing 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 British Research Establishments "Site Layout Planning for Daylight and Sunlight: A Good Practice Guide" by PJ Littlefair, 2011 Second Edition.

Please refer to the Daylight Sunlight Report for the internal daylight and sunlight analysis for the proposed development.

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 options are being assessed to satisfy the space heating requirements of the development:

- Exhaust Air Heat Pump (EAHP);
- District Heating System (DHS) comprising of Combined Heat and Power (CHP) and Gas Boilers with the potential of additional Air Source Heat Pumps (ASHP).

Domestic Hot Water: The following options are being assessed to satisfy the domestic hot water requirements of the development:

- Exhaust Air Heat Pump (EAHP);
- District Heating System (DHS) comprising of Combined Heat and Power (CHP) and Gas Boilers with the potential of additional Air Source Heat Pumps (ASHP).

Ventilation: The following options are being assessed to satisfy the ventilation requirements of the development:

- Mechanical Ventilation with Heat Recovery (MVHR);
- Mechanical Extract Ventilation (MEV).

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.

7.2.2. LOW ENERGY PLANT - COMMERCIAL

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

Space Heating: A Variable Refrigeration Flow (VRF) system is being proposed to satisfy the space heating requirements of the development.

Domestic Hot Water: Instantaneous electric water heaters or Air Source Heat Pumps (ASHP) will be utilised in order to satisfy the domestic hot water (DHW) requirements of the development.

Space Cooling: A Variable Refrigerant Flow (VRF) system is being proposed to satisfy the space cooling requirements of the development.

Ventilation: Mechanical Ventilation with Heat Recovery (MVHR) is being proposed to satisfy the ventilation requirements of the development.

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 Sandyford Central 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 dwellings.

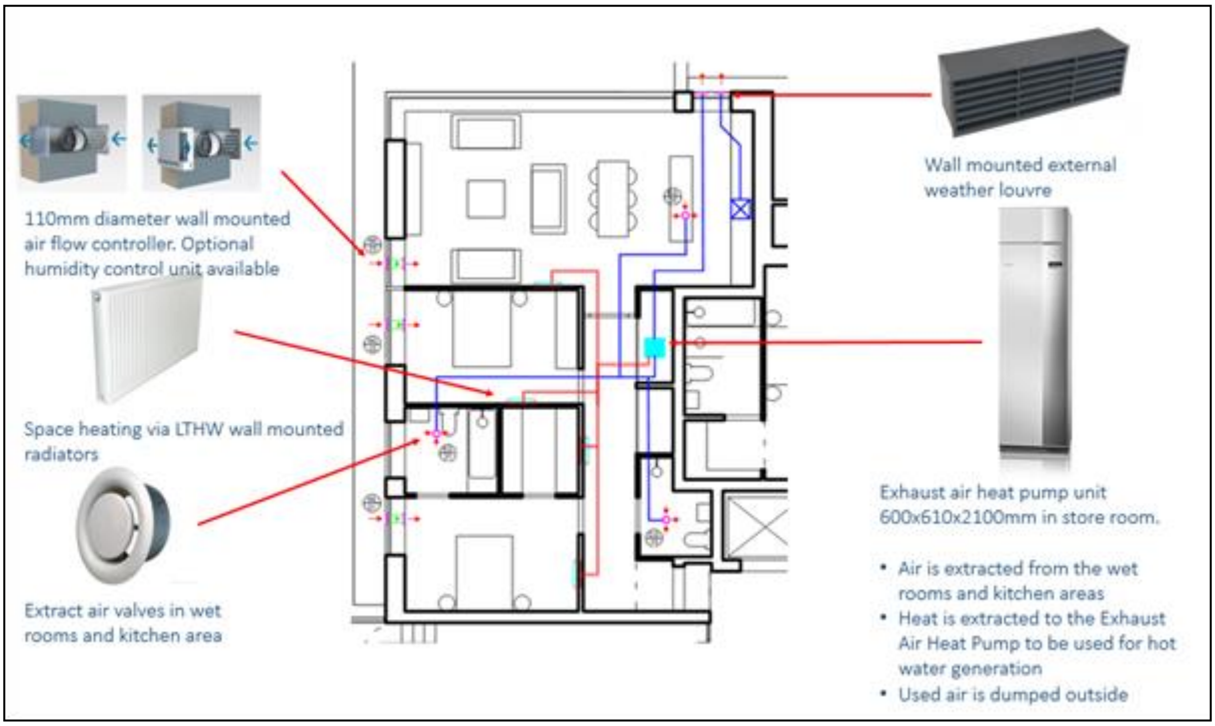

Figure 5: Example Diagram of Typical Exhaust Air Heat Pump Layout

7.3.2. AIR SOURCE HEAT PUMP

Air-Source Heat Pumps (ASHP) are deemed a renewable energy technology under Part L (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 6: Air-Source Heat Pump

7.3.3. COMBINED HEAT AND POWER

Combined Heat and Power, or CHP as it is commonly referred to, is the simultaneous generation of usable heat and power in a single process. The system utilises the heat produced in electrical generation rather than releasing it wastefully into the atmosphere. A centralised plantroom will be utilised and will contain the CHP unit, along with all associated pipework and equipment.

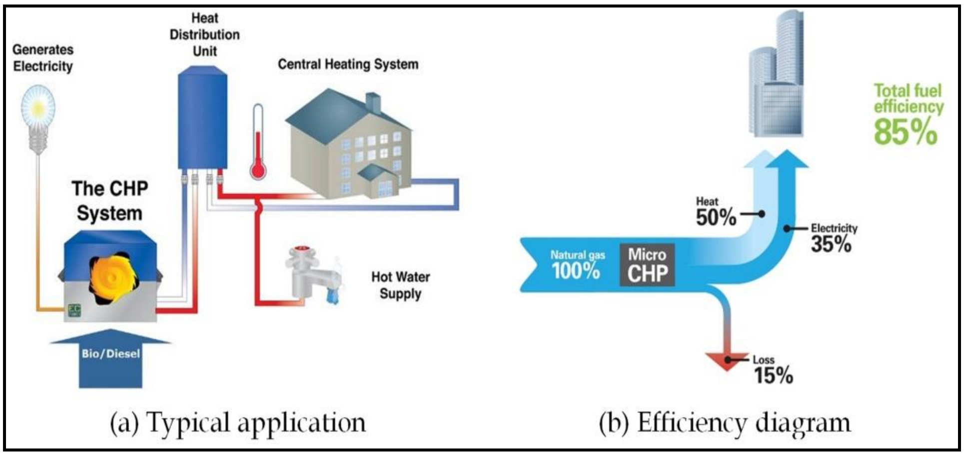

Figure 7: CHP Diagram

7.3.4. 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 apartment or into the landlord's supply. Figure 8 illustrates the solar PV layout on the rooftop of the development.

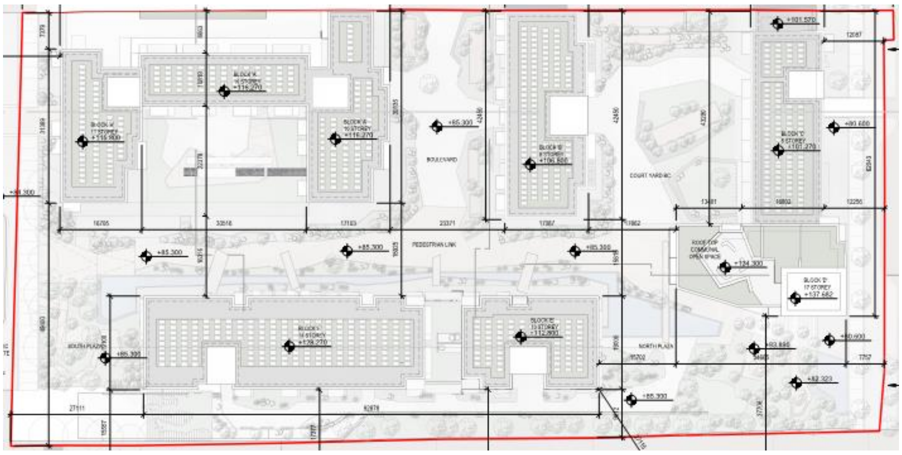

Figure 8: Proposed Solar PV Rooftop Plan

Although the Combined Heat and Power (CHP) system is one solution to meet the space heating and DHW production of each apartment, the mandatory Renewable Energy Ratio (RER) target of 20% must still be achieved. The need for an additional source of renewable energy is therefore required. As such, the incorporation of PV panels has been highlighted as one method of achieving compliance with this RER target of 20%.

Alternatively, the use of an Air Source Heat Pump (ASHP) working in conjunction with the Combined Heat and Power (CHP) unit will also achieve compliance. This is based on a detailed assessment carried out on the Sandyford Central development to ensure compliance is achieved upon project completion.

7.3.5. VARIABLE REFRIGERANT FLOW

A variable Refrigerant Flow system is an energy efficient method to provide space heating and space cooling for a building. 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.

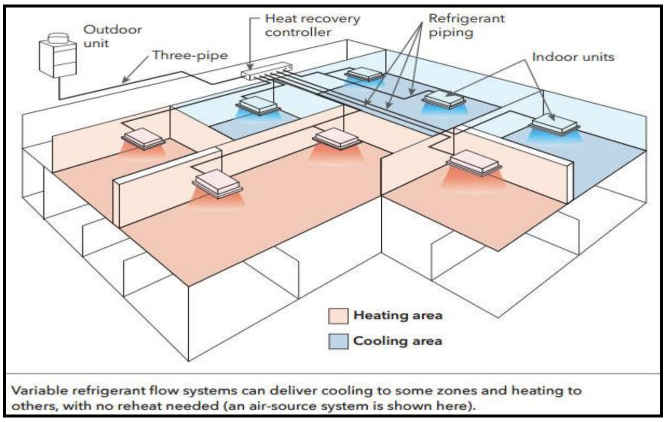

Figure 9: Typical VRF Schematic Diagram

8. KEY SUSTAINABLE FEATURES

The location of the Sandyford Central 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 building 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 figures below identify the local Luas stops, Dublin bus stops, bicycle lanes and local car sharing locations and their proximity to the proposed development.

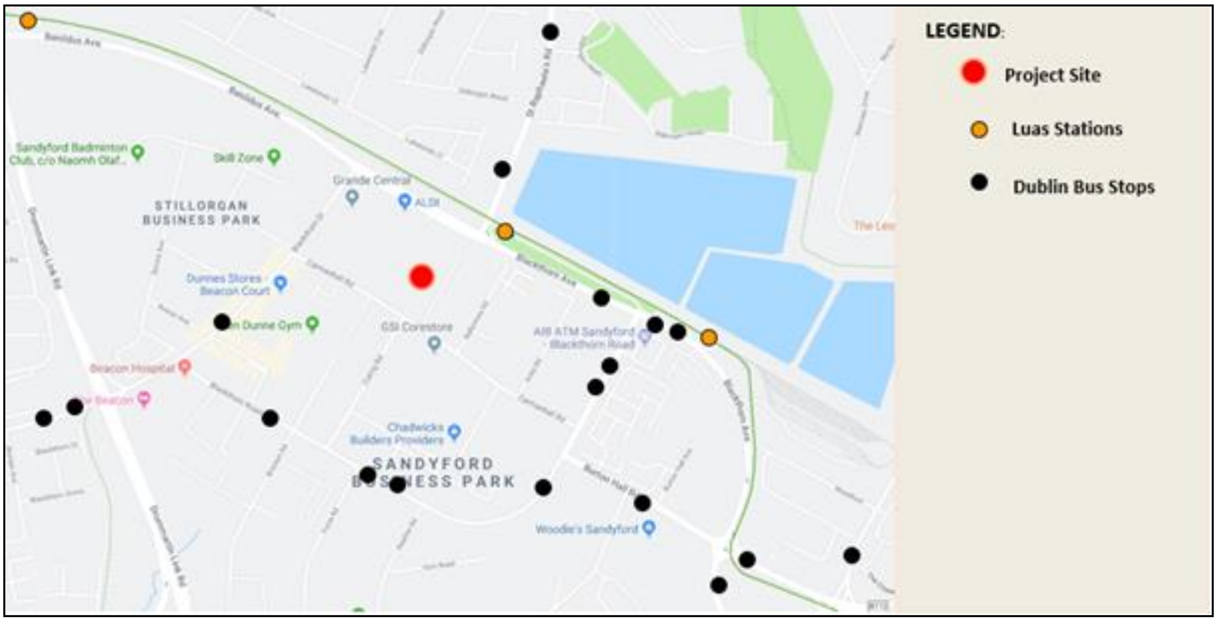

Figure 10: Local Luas and Bus Stops

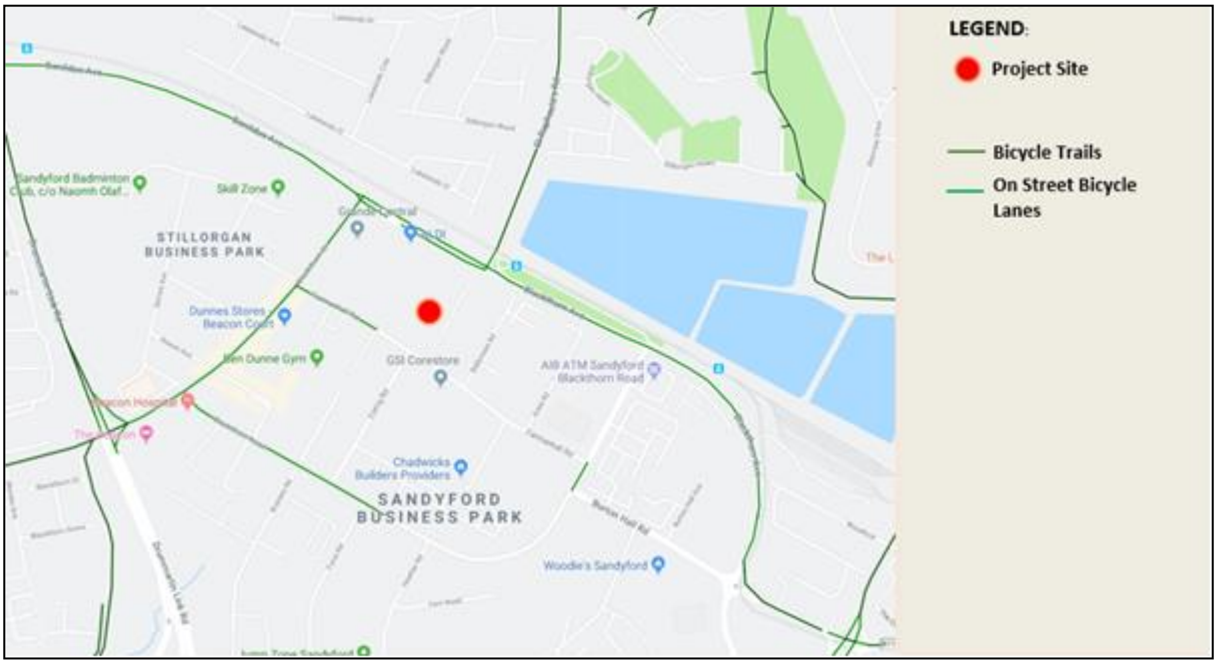

Figure 11: Local Bicycle Trails and Lanes

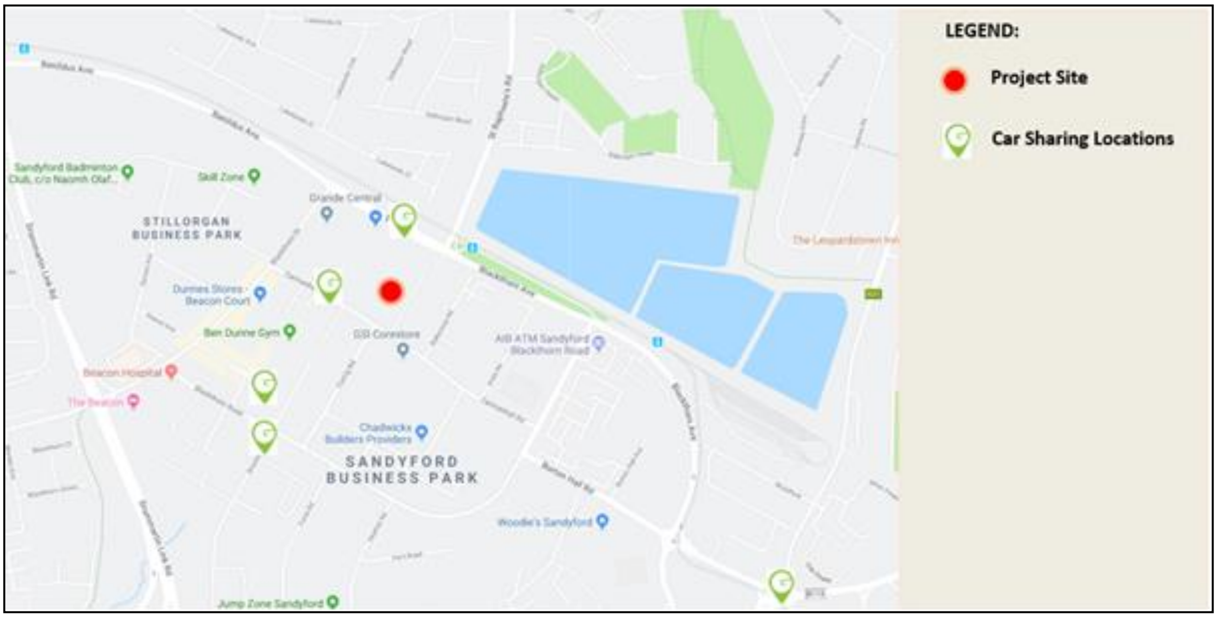

Figure 12: Local Car Sharing Locations

8.2. COMMISSIONING

To ensure efficient operation all systems will be commissioned. Commissioning of a building's 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 building will be designed and operated with the aim of reducing waste generation through construction and operation. Where possible, waste streams will be separated on site and recycled or re-used, local materials will be specified, and materials that contain recycled content will be preferred.

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 as well as public bicycle spaces for visitors to the site.

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.

9. CONCLUSION

A sustainable approach been adopted by the design team for the proposed Sandyford Central development at the former Aldi site, Carmanhall Road, Sandyford Business District Dublin 18. Through detailed design, a number of sustainability and efficiency features have been considered throughout.

The proposed residential development will comply with Part L 2019 (NZEB) for residential, as well as targeting an A2/A3 BER, while the proposed commercial development will comply with Part L 2017 (NZEB) for commercial, as well as targeting an A3 BER throughout.

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.

Be Green

- Renewable energy technologies such as Exhaust Air Heat Pump, Air Source Heat Pump (ASHP), Combined Heat and Power (CHP), Solar PV and Variable Refrigerant Flow are being considered for implementation.

A number of sustainable design features have been considered within the design to achieve the sustainability targets of the proposed refurbishment. 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 Sandyford Central development will satisfy all Part L and BER requirements.

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