

Energy & Sustainability Report

Clonkeen Development

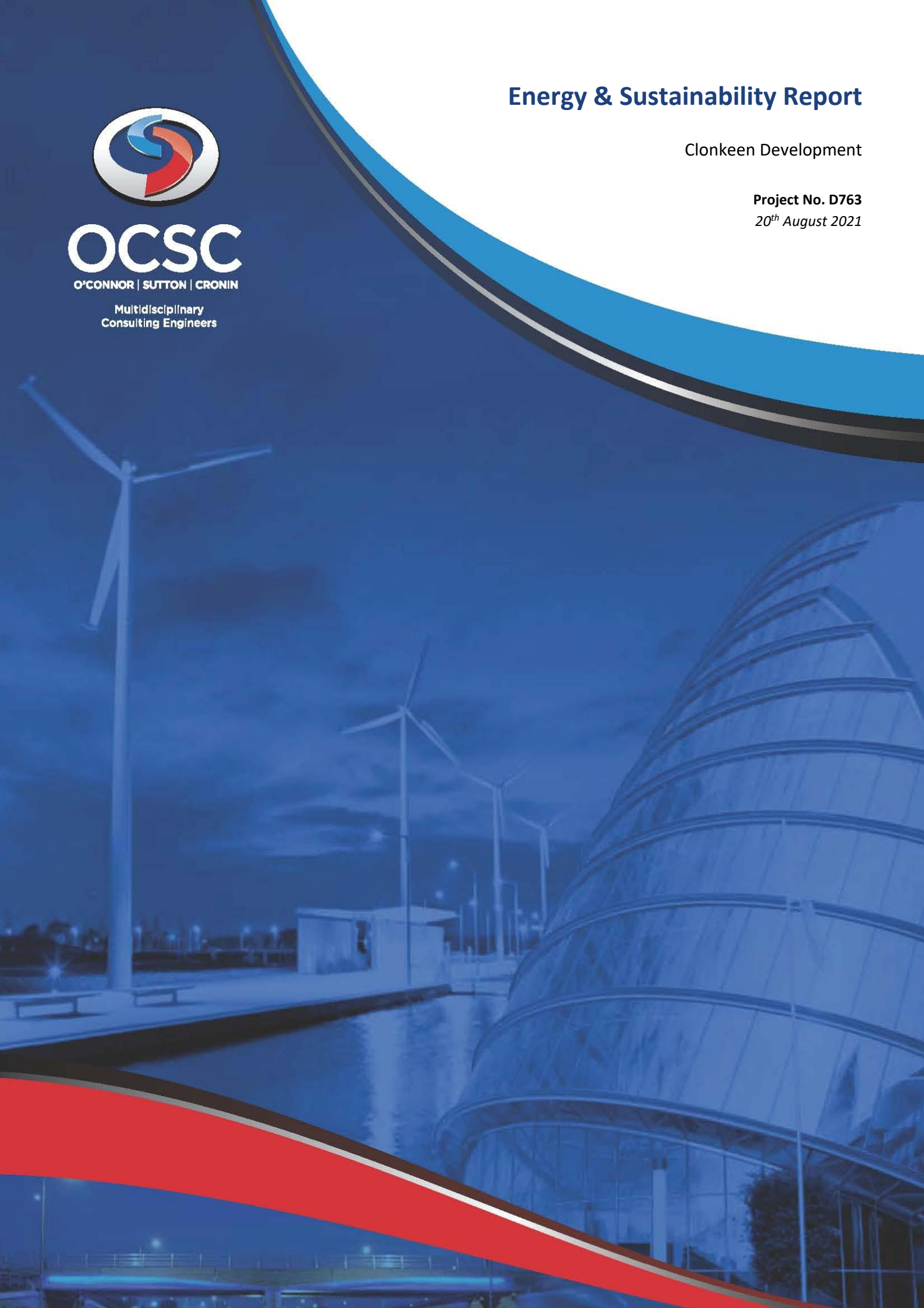
Project No. D763
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DOCUMENT CONTROL & HISTORY

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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 building'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 demand relating to items such as heating, ventilation, hot water, lighting 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 the 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 the 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 Clonkeen Development will achieve all energy and sustainability targets.

ENERGY & SUSTAINABILITY REPORT

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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 Clonkeen Development located in Blackrock, Co. Dublin.

The proposed development will comply with Part L 2021 (NZEB) for residential and Part L 2021 (NZEB) for non-residential. 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	2021 (NZEB)
BER	Yes	A2/A3

Table 1 – Residential Energy Performance Targets

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

Table 2 – Non-Residential Energy Performance Targets

The following sections identify a range of energy efficient measures that have been considered for the proposed Clonkeen Development.

2. PROPOSED DEVELOPMENT

Clonkeen Investments DAC intend to apply to An Bord Pleanála (the Board) for permission for a Strategic Housing Development with a total application site area of c. 3.3 ha, on a site located at Lands Adjoining Clonkeen College, Clonkeen Road, Blackrock, Co. Dublin. The development, with a total gross floor area of c 33,851 sq m, will provide 299 no. residential units and a 1 no. storey 353 sq m childcare facility with dedicated play area 231 sq m. The development will consist of 18 no. ground floor 3 bedroom duplex apartments and 18 no. 2 bedroom apartments above and 12 no. ground floor 2 bedroom apartments with 12 no. 3 bedroom duplex apartments above. The 60 no. duplex units are arranged in 6 no. three storey blocks. The development will also consist of 239 no. apartment units (111 no. 1 bedroom apartments, 120 no. 2 bedroom apartments and 8 no. 3 bed apartments) arranged in 4 no. 6 storey blocks over 1 no. storey basement; public open space, communal open space and private open space (including all balconies, terraces and individual unit gardens at all levels); 614 sq m communal resident facilities including concierge and welcome area (195 sq m), residents' flexible work facility (219 sq m), residents' lounge (100 sq m) and residents' gym area (100 sq m).

The development will also provide for the demolition of the 2 no. storey office building ('St. Helen's', Meadow Vale - 470 sq m) to facilitate new vehicular, pedestrian and cyclist access to the site, to the north of the proposed development via Meadow Vale.

The development will also include the provision of 2 no. designated play areas; internal roads and pathways; bin stores; 248 no. car parking spaces, including 167 no. at basement level and 2 no. shared vehicle (GoCar) spaces, 388 no. bicycle parking spaces, and 10 no. motorcycle parking spaces at basement and surface level; hard and soft landscaping; plant; boundary treatments including the repair and replacement of some existing boundary treatments; the provision of new surface water and foul drainage pipes and any required pipe diversion works or build over works; internal foul pumping station; a new internal access road and paths; changes in level; services provision and related pipework, ducting and cabling; electric vehicle charging points; 4 no. stormwater attenuation tanks; 1 no. ESB substation; photovoltaic panels; SUDS including green roof provision; signage; provision for future pedestrian access to Monaloe Park to the east of the development, including the provision of a pedestrian bridge, extending over the drainage ditch; public lighting and all site development and excavation works above and below ground. The application contains a statement

setting out how the proposal will be consistent with the objectives of the Dún Laoghaire-Rathdown County Development Plan 2016-2022. The application contains a statement indicating why permission should be granted for the proposed development, having regard to a consideration specified in section 37(2)(b) of the Planning and Development Act 2000, notwithstanding that the proposed development materially contravenes a relevant development plan or local area plan other than in relation to the zoning of the land.

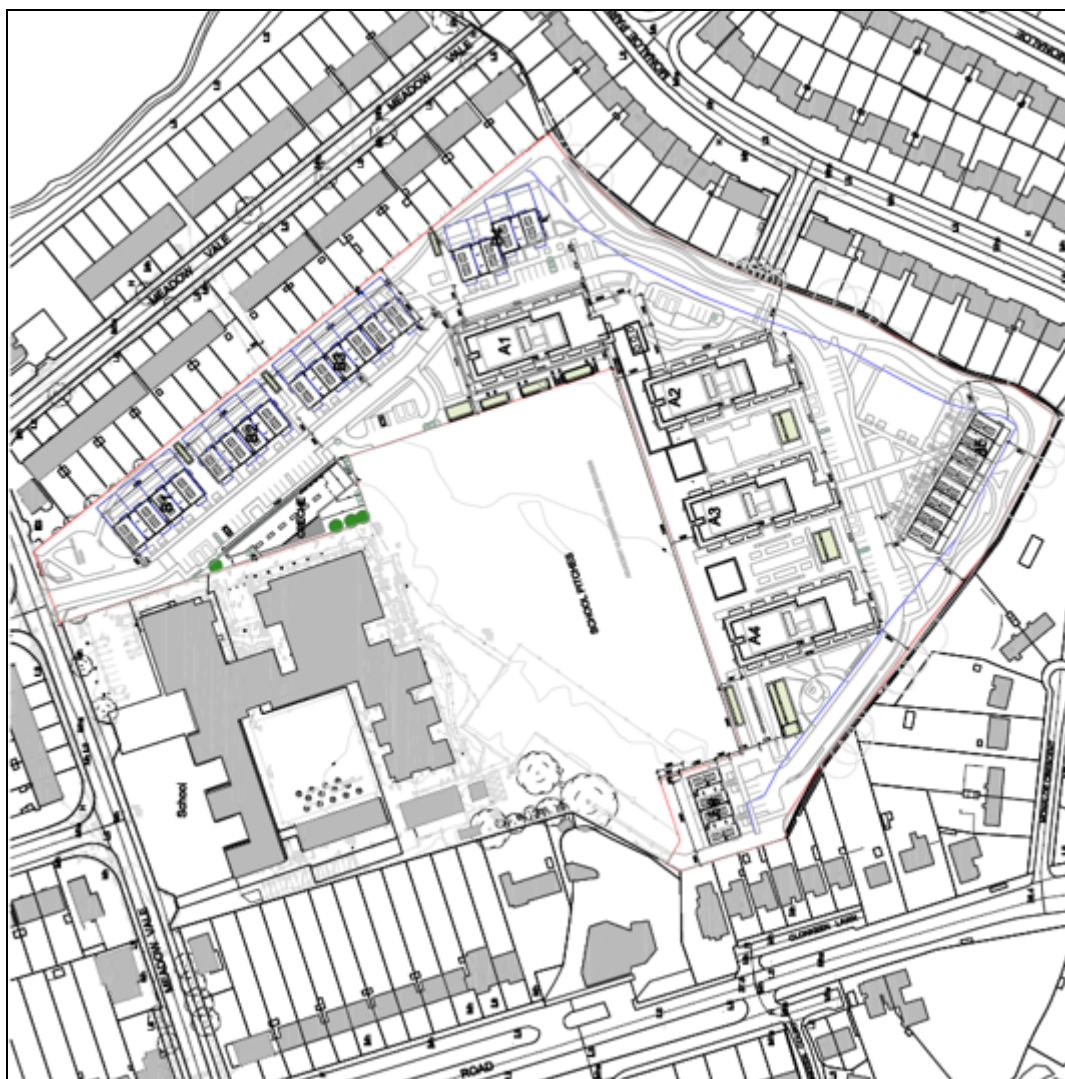


Figure 1 – Proposed Site Plan

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 a childcare facility and communal resident facilities including concierge and welcome area, residents' flexible work facility, residents' lounge and residents' gym area.

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 through 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 (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.

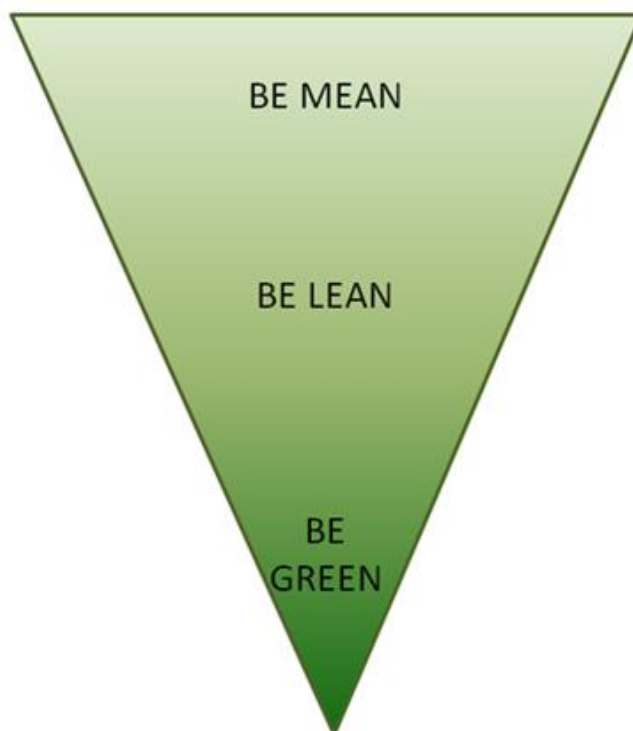


Figure 2 – Energy Hierarchy Plan

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

The following measures will be implemented to reduce the energy consumption of the proposed 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 non-residential aspects of the proposed development are outlined in Table 3 and Table 4 below.

Fabric Element	Clonkeen - 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
External Windows & Doors	1.40

Table 3 – Residential Building Envelope Thermal Performance Targets

Fabric Element	Clonkeen - Non-Residential Maximum Average Elemental U-value (W/m ² .K)
Above & Below Grade External Walls	0.20
Flat Roof	0.18
Ground Contact & Exposed Floor	0.20
External Windows & Doors	1.40

Table 4 – Non-residential Building Envelope 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 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 – 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. The development will be designed to achieve low thermal bridging values throughout. A Y value of $\leq 0.08 \text{ W}/\text{m}^2\text{K}$ is being targeted for the residential development to comply with the Part L 2021 (NZEB) requirements.

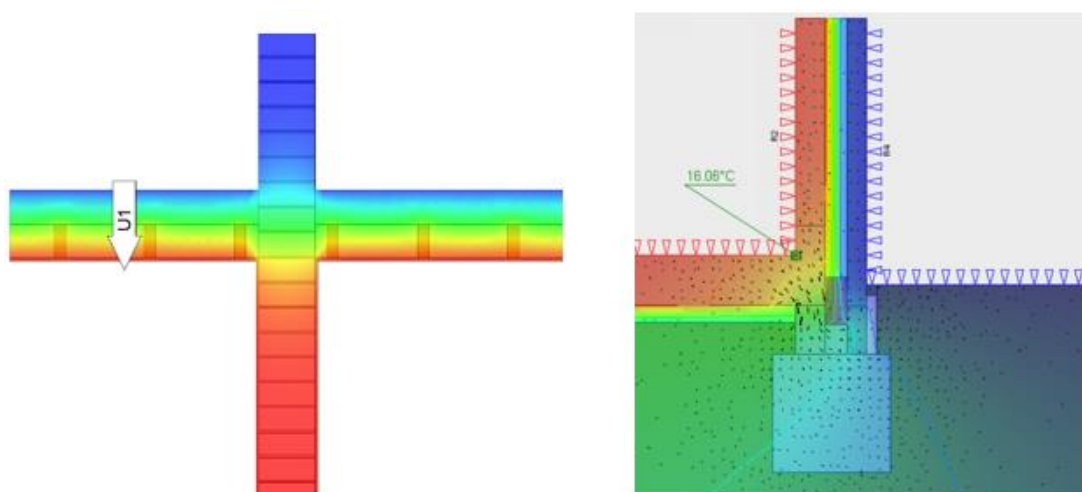


Figure 4 – Typical Thermal Bridging Details

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 Clonkeen 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 Clonkeen 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).

7.1.5. DAYLIGHTING

The proposed Clonkeen development will be evaluated and analysed with respect to daylight/sunlight/overshadowing, in order to determine the following:

- The daylight levels within the living, kitchen and bedroom areas of selected apartments and duplexes, 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;
- Any potential daylight or sunlight impact the proposed development may have on the adjacent playing pitches.

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.

7.1.6. PASSIVE DESIGN

The proposed façade has been designed to limit the effects of unnecessary solar gains during the summer-time period. 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 building as possible.

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.

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.

Duplexes & Apartments

Space Heating: The plant options for space heating are:

- Air Source Heat Pumps (ASHP) and/or
- Exhaust Air Heat Pumps (EAHP)

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

- Air Source Heat Pumps (ASHP) and/or
- Exhaust Air Heat Pumps (EAHP)

Ventilation: The plant options for ventilation are:

- Mechanical ventilation and heat recovery and/or
- Whole house extract via the EAHP

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 plant will serve space heating requirements:

- Air Source Heat Pumps (ASHP), or
- Variable Refrigerant Flow (VRF)

Domestic Hot Water: The following plant will serve DHW requirements:

- Instantaneous Electric Hot Water, or
- Air Source Heat Pumps (ASHP)

Ventilation: The proposed ventilation strategy for the building will naturally ventilated where possible. Any mechanical ventilation systems will be high efficiency, variable speed drive systems that also incorporate 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 Clonkeen Development.

7.3.1. AIR SOURCE HEAT PUMP

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 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 as useful heat within the dwelling.

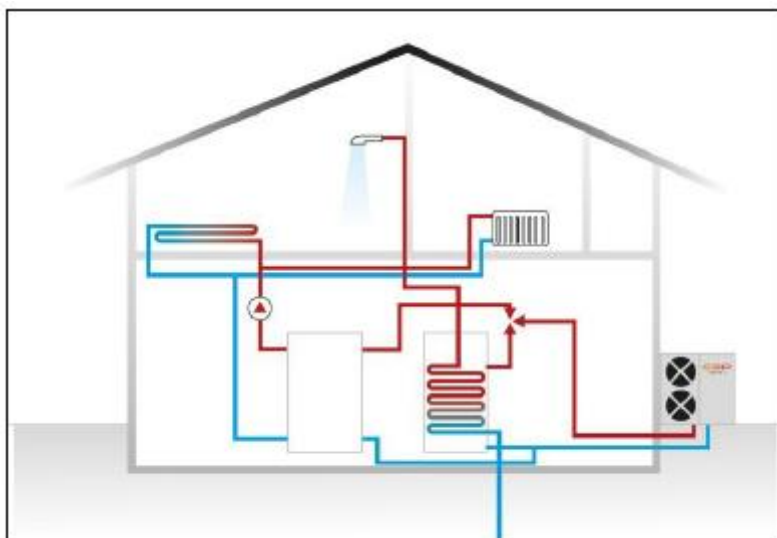


Figure 5 – Air-Source Heat Pump Diagram

7.3.2. 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.

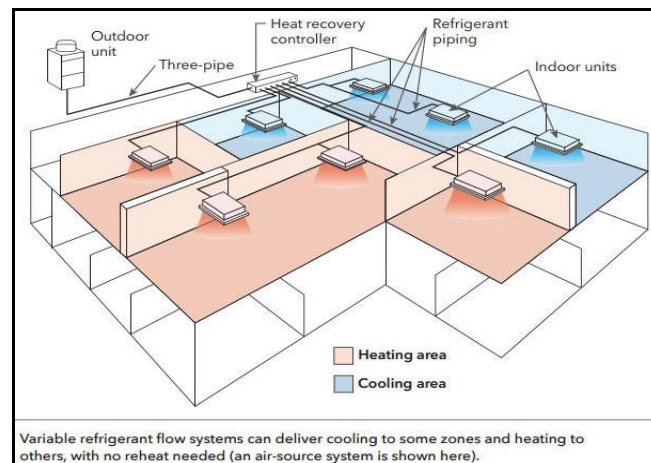


Figure 7 – Typical VRF Schematic Diagram

8. KEY SUSTAINABLE FEATURES

The location of the Clonkeen 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.

8.2. INCOMING UTILITIES

Natural Gas

Due to the change in Government Policy to not allow new residential schemes utilise natural gas, there is no intention to bring a supply of Natural gas onto the site.

Electricity

In order to meet the electrical load of the development, the proposed design includes for the use of a Substation and Unit substations inline with ESB requirements. The application and agreement on chosen routes will be agreed with the ESB as part of detailed design.

Communications

We note that the application site is currently surrounded by EIR network supplies. A high speed fibre supply will be brought in from the existing EIR infrastructure network at the main entrance to the site. This planning application has regard to the impact of the proposed development upon the existing telecommunication network. It notes that whilst the construction works have the potential to temporarily impact the underground telecommunication network, measures are proposed to prevent compression/ damage to underground ducts.

8.3. COMMISSIONING

To ensure efficient operation of the building 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.

8.4. MATERIALS AND RESOURCES

The building 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.

8.5. 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.

8.6. 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.

8.7. 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 holistic sustainable approach been adopted by the design team for the proposed Clonkeen Development located in Blackrock, Co. Dublin. Through detailed design, a number of sustainability and efficiency features have been considered throughout.

The proposed residential development will comply with Part L 2021 (NZEB), as well as targeting an A2/A3 BER, while the proposed non-residential development will comply with 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 where applicable 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 and Variable Refrigerant Flow 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 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 Clonkeen Development will satisfy all Part L and BER requirements.



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