Energy & Sustainability Report

Rosemount Development

Project No. W340

29th July 2022

OCSC
O'CONNOR | SUTTON | CRONIN
Multidisciplinary Consulting Engineers

Energy & Sustainability Report

NOTICE

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 Rosemount 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 Rosemount development located at Rosemount House, Northern Cross, Malahide Road, Dublin 17, on a site of 0.6782 ha.

The proposed residential aspects of the development will comply with Part L 2021 (Dwellings), and Part L 2021 (Buildings Other Than Dwellings) for non-residential areas. As part of the development's efforts to further reduce energy consumption, the project is targeting a minimum A3 BER (Building Energy Rating) across the development.

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

Energy Performance Targets		
Standard / Rating	**Mandatory**	**Target**
Part L Residential	Yes	2021 (Dwellings)
Part L Non-residential	Yes	2021 (Buildings Other Than Dwellings)
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 Rosemount development.

2. PROPOSED DEVELOPMENT

The proposed Rosemount SHD development shall consist of:

• Demolition of existing c. 3,315 sq.m, 3 storey office building on site and existing ancillary facilities and the construction of a single mixed-use block (Block A) of up to 9 storeys (over basement), consisting of a 4-sided structure based around a central courtyard area.

• c. 1,060 sq.m. of office space at ground floor level with own door access and associated infrastructure including staff kitchen, meeting rooms and designated car parking (7 spaces) at basement level.

• A café unit of c. 143.7 sq.m at ground floor level with own door access to the south and east, accessed via proposed public open space.

• 176 no. residential units from 1st to 8th floor level comprising 72 no. 1 bed units (41%), 57 no. 2 bed units (32%) and 47 no. 3 bed units (27%) [each with private amenity space in the form of balcony or terrace], with separate access to the proposed commercial uses at ground floor level.

• c. 1,846 sq. m. of communal open space at ground floor, first floor podium, 4th floor and 7th floor level, and public open space of c. 1,577 sq.m. at ground floor level, including a public courtyard area located to the southeast of the proposed block.

• Resident amenity and support services are proposed at ground floor level to include a cinema room, post room, games room, co-working spaces, gym and concierge services.

• 134 no. car parking spaces, 7 of which are accessible, and 6 no. motorcycle parking spaces, located at basement level and accessed by a vehicular ramp via Mayne River Avenue to the west (with a vehicular set down areas fronting Mayne River Avenue), in addition to 2 no. car club spaces at the southern boundary.

• 424 no. bicycle parking spaces, 416 of which at ground floor and at surface level and 8 no. spaces at basement level.

• All associated vehicular and pedestrian access routes (including links to the adjoining site to the north), external communal play facilities, E.S.B substation, Meter rooms, foul and surface water drainage, hard and soft landscaping, lighting, plant at basement level, bin stores, PV panels and green roof, telecommunications infrastructure all associated and ancillary site works.

The application contains a statement setting out how the proposal will be consistent with the objectives of the relevant development plan and local area plan. 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, as amended, 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.

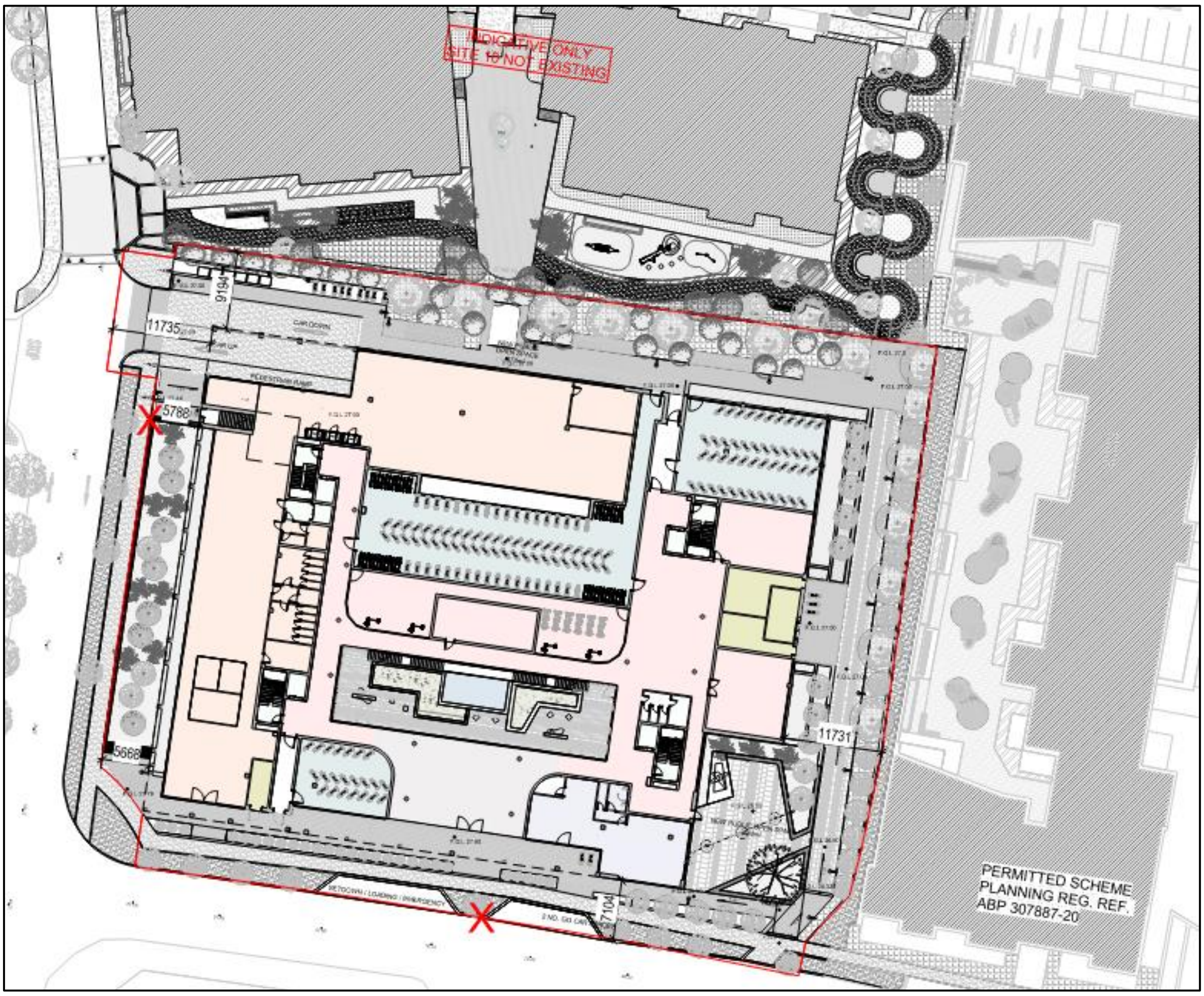

Figure 1 - Proposed Site Plan

3. DRAFT DUBLIN CITY DEVELOPMENT PLAN 2022 - 2028

The Draft Dublin City Development Plan 2022-2028 sets out how the Council will improve energy efficiency and reduce greenhouse gas emissions in its own buildings and operations, while making Dublin a more climate-resilient City with engaged and informed citizens. This will be achieved by a range of ongoing and planned actions in five key areas, which will be continuously monitored, evaluated, and updated to 2030 and beyond.

The plan contains 219 actions that cover five key areas – Energy and Buildings, Transport, Flood Resilience, Nature-Based Solutions and Resource Management (waste and water) and has four key targets:

1. 33% better energy use by the Council by 2020.
2. 40% reduction in the Council's greenhouse gas emissions by 2030.
3. To make Dublin a climate resilient region, by reducing the impacts of future (and current) climate change-related events.
4. To actively engage and inform citizens on climate change.

A number of important policies related to energy efficient design are outlined within the plan which are addressed as follows:

3.1. POLICY CA1: NATIONAL CLIMATE ACTION POLICY

"It is the Policy of Dublin City Council to support the implementation of national objectives on climate change including the 'Climate Action Plan 2019 to Tackle Climate Breakdown', the 'National Adaptation Framework' 2018 and the 'National Energy and Climate Plan for Ireland 2021-2030' and other relevant policy and legislation."

3.2. POLICY CA2: MITIGATION AND ADAPTATION

''It is the Policy of Dublin City Council To prioritise measures to address climate change by way of both effective mitigation and adaptation responses in accordance with available guidance and best practice.''

3.3. POLICY CA4: CLIMATE MITIGATION AND ADAPTATION IN STRATEGIC GROWTH AREAS

''It is the Policy of Dublin City Council To ensure that new development in strategic growth areas (including Strategic Development and Regeneration Areas) integrates appropriate climate mitigation and adaptation measures.''

The proposed development will comply with this policy through the following:

- The proposed development will facilitate a good quality of life for all occupants and also ensure this carries through to any future occupants in the development using excellent construction methods;
- Adaptability of design is integrated from early design stages.

3.4. POLICY CA7: CLIMATE MITIGATION ACTIONS IN THE BUILT ENVIRONMENT

"To promote low carbon development in the city which will seek to reduce carbon dioxide emissions and which will meet the highest feasible environmental standards during construction and occupation. New development should generally demonstrate/provide for:

a. building layout and design which maximises daylight, natural ventilation, active transport and public transport use;

b. sustainable building/services/site design to maximise energy efficiency;

c. sensitive energy efficiency improvements to existing buildings;

d. energy efficiency, energy conservation, and the increased use of renewable energy in existing and new developments;

e. on-site renewable energy infrastructure and renewable energy;

f. minimising the generation of site and construction waste and maximising reuse or recycling;

g. the use of construction materials that have low to zero embodied energy and CO2 emissions; band

h. connection to (existing and planned) decentralised energy networks including the Dublin District Heating System where feasible."

3.5. POLICY CA8: CLIMATE ADAPTATION ACTIONS IN THE BUILT ENVIRONMENT

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

a. measures such as green roofs and green walls to reduce internal overheating and the urban heat island effect;

b. ensuring the efficient use of natural resources (including water) and making the most of natural systems both within and around buildings;

c. minimising pollution by reducing surface water runoff through increasing permeable surfaces and use of Sustainable Drainage Systems (SuDS);

d. reducing flood risk, damage to property from extreme events– residential, public and commercial;

e. reducing risks from temperature extremes and extreme weather events to critical infrastructure such as roads, communication networks, the water/drainage network, and energy supply;

f. promoting and protecting biodiversity and green infrastructure.''

3.6. POLICY CA9: CLIMATE ACTION ENERGY STATEMENTS

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

3.7. POLICY CA10: ENERGY FROM RENEWABLE SOURCES

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

3.8. POLICY CA24: ELECTRIC VEHICLES

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

The proposed Rosemount SHD development will comply with this policy through the following:

- The implementation of renewable energy systems to meet the heating and domestic hot water demands for the development in a sustainable manner;
- The proposed site is within close proximity of Luas and Dublin bus stops, cycle networks and green spaces as well as main routes into the City centre. This allows for greater opportunities for the building occupants to utilise sustainable modes of transport;
- Minimise heat loss through the building fabric by utilising a high-performance thermal envelope;
- Install high efficiency heating systems in order to reduce running costs while also being considerate to the environment through harmful emission reductions;
- Utilise a high efficiency ventilation system to supply clean, fresh air into each dwelling;
- Offset the energy consumption of the development through the use of renewable energy sources such as heat pumps and solar PV panels.

These systems will aid in the development in achieving compliance with Part L NZEB legislation while also keeping in line with all policies laid out in the Dublin City Climate Change development plan 2022-2028.

4. PART L CONSERVATION OF FUEL & ENERGY – DWELLINGS

4.1. PART L 2021 (DWELLINGS)

Part L 2021 (Dwellings) of the Technical Guidance Document has been issued by the Minister for Housing, Local Government and Heritage. This document is the new standard for dwellings constructed from 27th July 2021.

The Part L 2021 (Dwellings) regulations set energy performance requirements to achieve Nearly Zero Energy Buildings performance as required by Article 4 (1) of the Directive for new buildings.

The definition of Nearly Zero Energy Buildings is defined as:

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

For the Part L 2021 (Dwellings) 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).

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

5.1. PART L 2021 (BUILDINGS OTHER THAN DWELLINGS)

The Part L 2021 (Buildings Other Than Dwellings) building regulations is the new standard for all buildings other than dwellings constructed after 27th July 2021. The Part L 2021 (Buildings Other Than Dwellings) regulations set energy performance requirements to achieve Nearly Zero Energy Buildings performance as required by Article 4 (1) of the Directive for new buildings.

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 (Buildings Other Than Dwellings) 'L1' requirements shall be met by:

a) providing that the energy performance of the building is such as to limit the calculated primary energy consumption and related Carbon Dioxide (CO_2) emissions to a Nearly Zero Energy Building level insofar as is reasonably practicable, when both energy consumption and Carbon Dioxide emissions are calculated using the Non-domestic Energy Assessment Procedure (NEAP) published by Sustainable Energy Authority of Ireland (1.0 for EPC and 1.15 for CPC);
b) providing that, the nearly zero or very low amount of energy required is covered to a very significant extent by energy from renewable sources produced on-site or nearby;
c) limiting the heat loss and, where appropriate, availing of the heat gains through the fabric of the building;
d) providing and commissioning energy efficient space heating and cooling systems, heating and cooling equipment, water heating systems, and ventilation systems, with effective controls;
e) ensuring that the building is appropriately designed to limit need for cooling and, where air-conditioning or mechanical ventilation is installed, that installed systems are energy efficient, appropriately sized and adequately controlled;
f) limiting the heat loss from pipes, ducts and vessels used for the transport or storage of heated water or air;

g) limiting the heat gains by chilled water and refrigerant vessels, and by pipes and ducts that serve air conditioning systems;
h) providing energy efficient artificial lighting systems and adequate control of these systems;
i) providing to the building owner or occupants sufficient information about the building, the fixed building services, controls and their maintenance requirements so that the building can be operated in such a manner as to use no more fuel and energy than is reasonable.

However, Part L (2021) – Buildings Other Than Dwellings now has additional requirements relating to self-regulating devices and electric vehicle charging.

For both new and existing buildings other than dwellings, the Part L 2021 (Buildings Other Than Dwellings) '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 (Buildings Other Than Dwellings) 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.

6. 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.

7. 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.

8. 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.

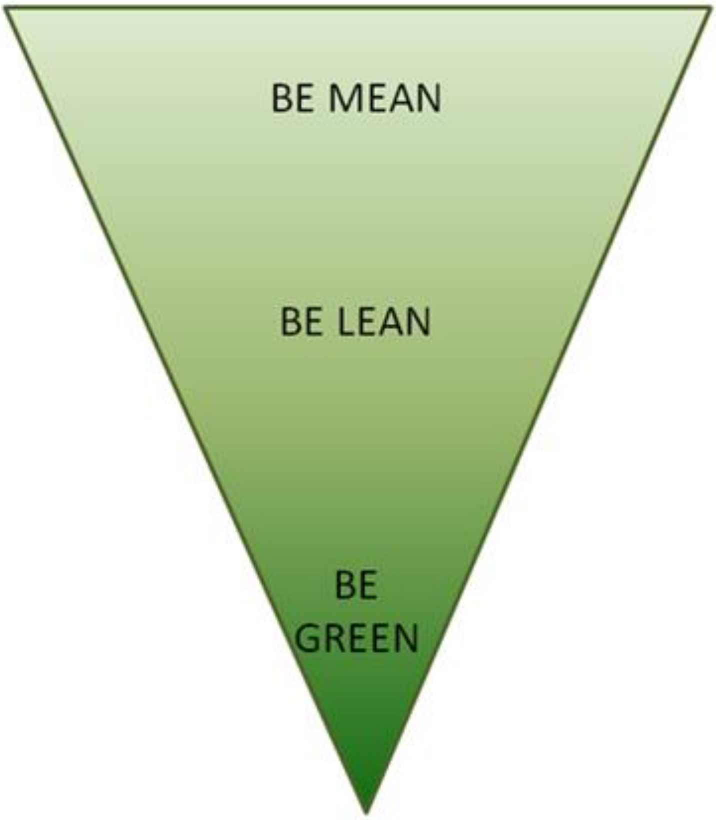

Figure 2: Energy Hierarchy Plan

8.1. 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.

8.1.1. HIGH PERFORMANCE U-VALUES

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

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

Fabric Element	Rosemount 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, Roof-lights & Doors	1.40

Table 2: Residential Building Envelope Thermal Performance Targets

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

Table 3: Non-Residential Building Envelope Thermal Performance Targets

8.1.2. 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 $m^3/hr/m^2$ @50 Pa.

Figure 3: Air Tightness Testing Examples

8.1.3. THERMAL TRANSMITTANCE

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

Residential:

A Y value of ≤ 0.08 $W/m^2.K$ is being targeted for the residential side of the development, in accordance with Part L (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 Psi value targets required for the non-domestic elements of the development. However, the risks relating to mould growth/ condensation risks will still have to be assessed, in accordance with Part L (2021) – Buildings Other Than Dwellings.

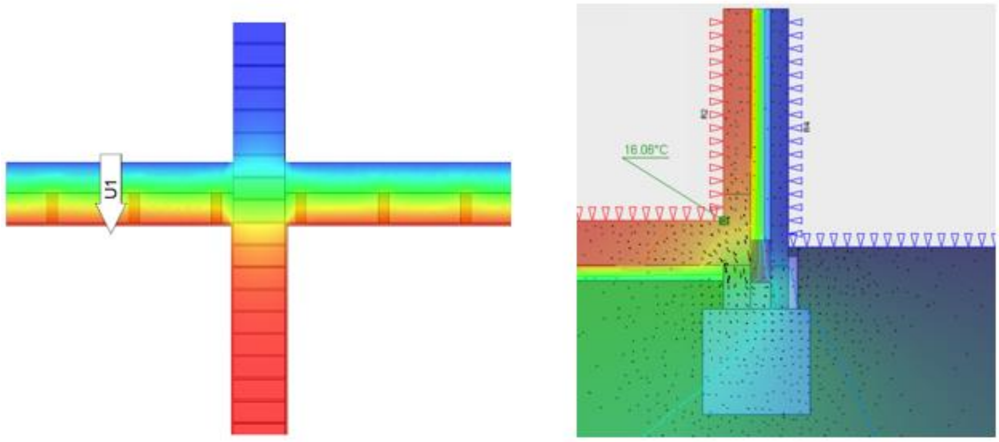

Figure 4: Thermal Bridge Assessment Examples

8.1.4. 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 Rosemount residential development will be evaluated and analysed with respect to overheating as outlined in Part L 2021 (Dwellings) and CIBSE TM59 (Design Methodology for the Assessment of Overheating Risk in Homes).

Non-residential:

The non-residential aspects of the proposed Rosemount development will be evaluated and analysed with respect to overheating as outlined in Part L 2021 (Buildings Other Than Dwellings) and CIBSE TM52 (Limits of Thermal Comfort: Avoiding Overheating in European Buildings).

8.1.5. DAYLIGHT

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

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

Calculations and methodology used are in accordance with BRE Guidelines for daylight and sunlight and based on the British Research Establishments "Site Layout Planning for Daylight and Sunlight: A Good Practice Guide" by PJ Littlefair, 2011 Second Edition.

8.1.6. PASSIVE DESIGN

An extensive analysis was carried out on the proposed façade to limit the effects of unnecessary solar gains during the summer time period. The image below illustrates the design intent to provide local shading utilising the building structure which allows glazing areas to be maximised, where required. This balance of shading and maximised glazing areas provides both enjoyable and interesting workspaces, full of natural light and without undue solar gains in summertime. The shading coefficient of the glazing units has also been optimised to limit unnecessary solar gains, while allowing as much natural daylight to enter the workspace as possible.

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.

8.2. STEP 2 (BE LEAN) – USE RESOURCES EFFICIENTLY

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

8.2.1. 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 plant options for space heating are:

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

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

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

Ventilation: The plant options for ventilation are:

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

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

8.2.2. 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 plant options for space heating are:

- Electric Panel Heaters, or
- Air Source Heat Pumps (ASHP), or
- Variable Refrigerant Flow (VRF) Heat Pumps.

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

- Air Source Heat Pumps (ASHP), or
- Instantaneous 'Under-sink' Water Heaters.

Space Cooling: The plant options for space cooling are:

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

Ventilation: The proposed ventilation strategy for the non-residential areas 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 CO_2 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.

8.2.3. 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 developments façades also allows high levels of natural daylight to enter into occupied zones.

8.2.4. 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.

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

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

8.3.1. AIR SOURCE HEAT PUMP - RESIDENTIAL

Air source heat pumps convert energy from the air to provide heat and hot water for buildings. They are powered by electricity and are highly efficient. The air source heat pump is located outside in the open air and it uses a fan to draw air across it. This air then flows over a heat exchanger, which contains a refrigerant liquid. An evaporator uses the 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 a building.

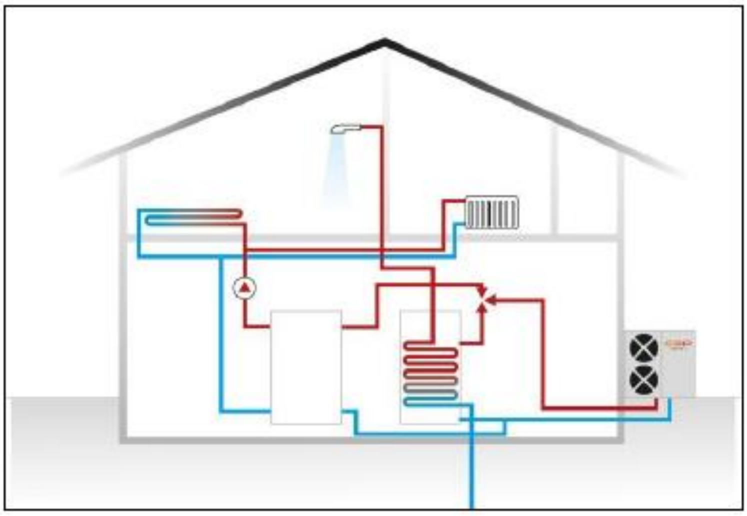

Figure 5: Air-Source Heat Pump Diagram

Or

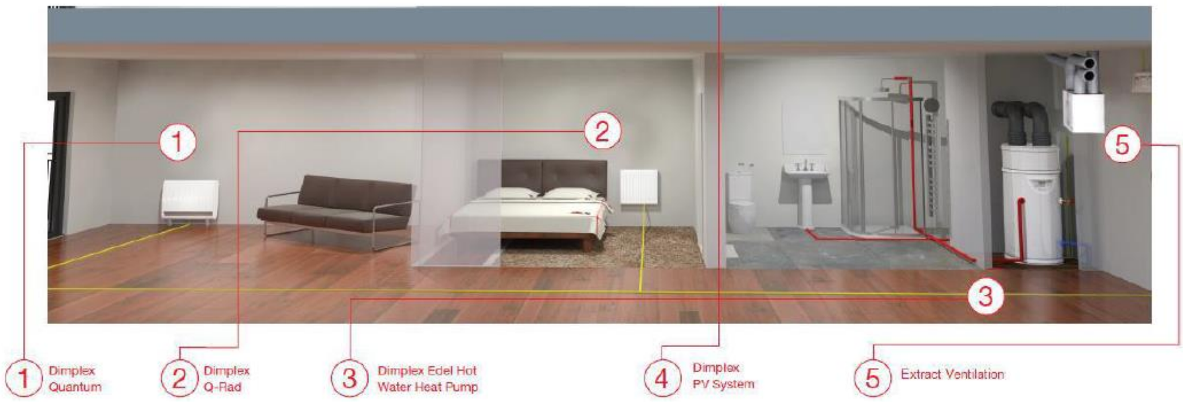

Figure 6: GlenDimplex System Heat Pump Diagram

8.3.2. EXHAUST AIR HEAT PUMP

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

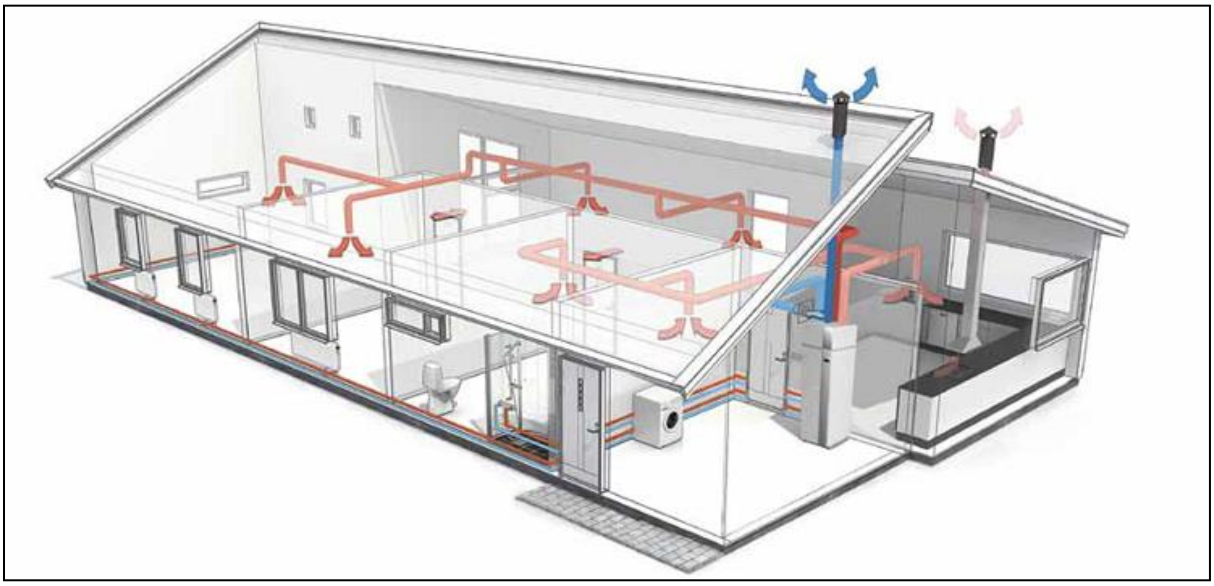

Figure 7: Example Diagram of Typical Exhaust Air Heat Pump Layout

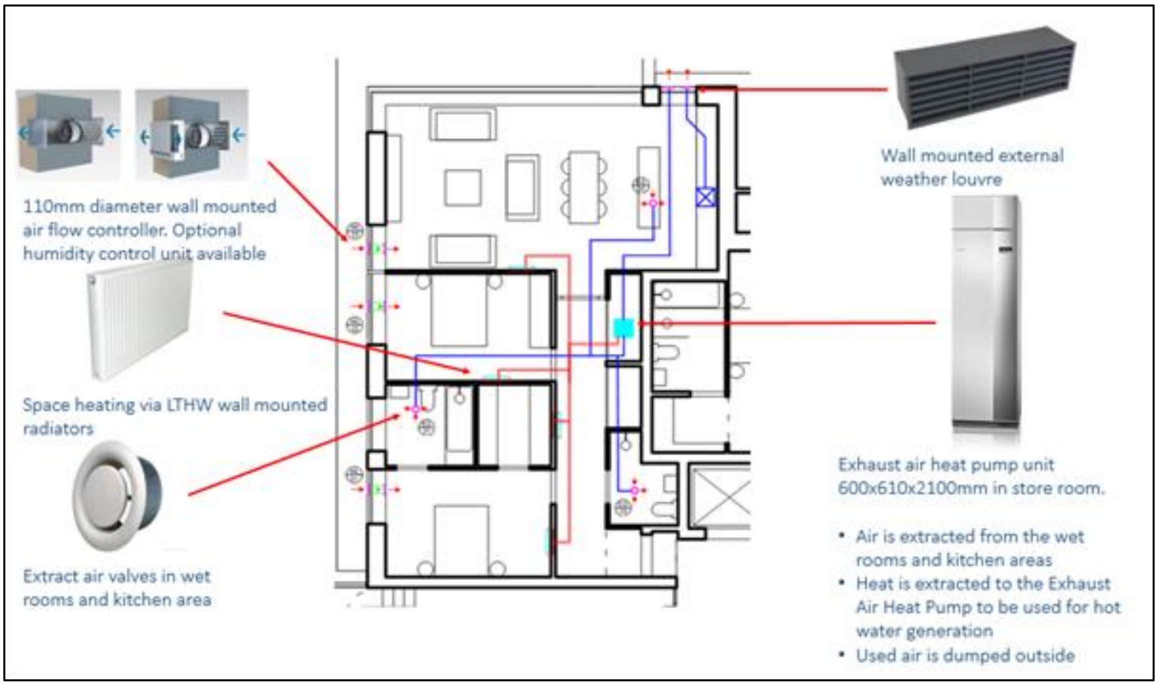

Figure 8: Example Diagram of Typical Exhaust Air Heat Pump Layout

8.3.3. 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, office or into the landlord's supply.

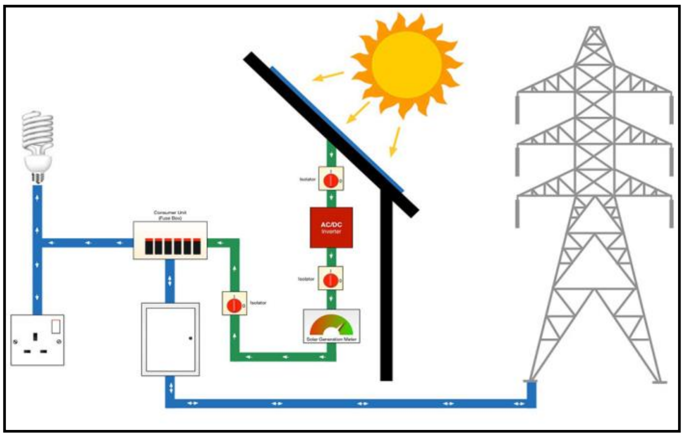

Figure 9: Solar PV Diagram

8.3.4. 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.

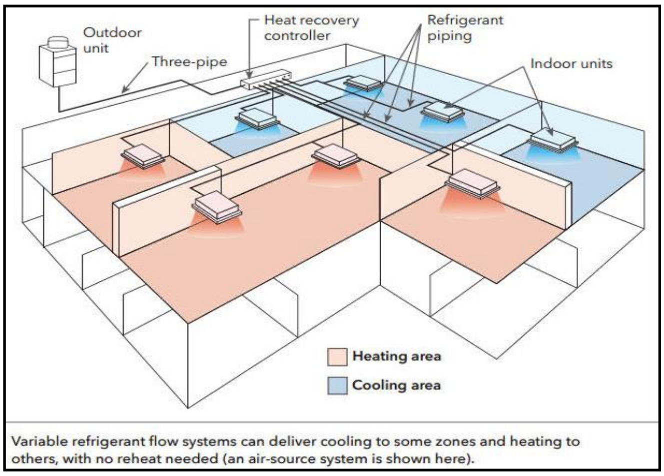

Figure 10: Typical VRF Schematic Diagram

8.3.5. AIR SOURCE HEAT PUMP – NON-RESIDENTIAL

Air-Source Heat Pumps (ASHP) are deemed a renewable energy technology under Part L 2021 (Buildings Other Than dwellings).

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 11: Air-Source Heat Pump

9. KEY SUSTAINABLE FEATURES

The location of the Rosemount 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.

9.1. LOCATION AND TRANSPORTATION

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

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

Bus:

Figure 12: Dublin Bus Stops

On Street Bicycle Lanes:

Figure 13: Local on street Bicycle Lanes

Go-Car:

Figure 14: Local Car Sharing Locations

9.2. COMMISSIONING

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

9.3. 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.

9.4. 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.

9.5. 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.

9.6. 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.

9.7. 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.

10. CONCLUSION

A holistic sustainable approach been adopted by the design team for the proposed Rosemount development located at Rosemount House, Northern Cross, Malahide Road, Dublin 17. 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 (Dwellings), as well as targeting an A2/A3 BER, while the proposed non-residential development will comply with non-residential Part L 2021 (Buildings other Than Dwellings), 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 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 Pump (EAHP), Air Source Heat Pumps (ASHP), 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.

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

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