Energy & Sustainability Report

The Grange,
Stillorgan,
Co. Dublin.

Project No. K416
02nd September 2019

OCSC
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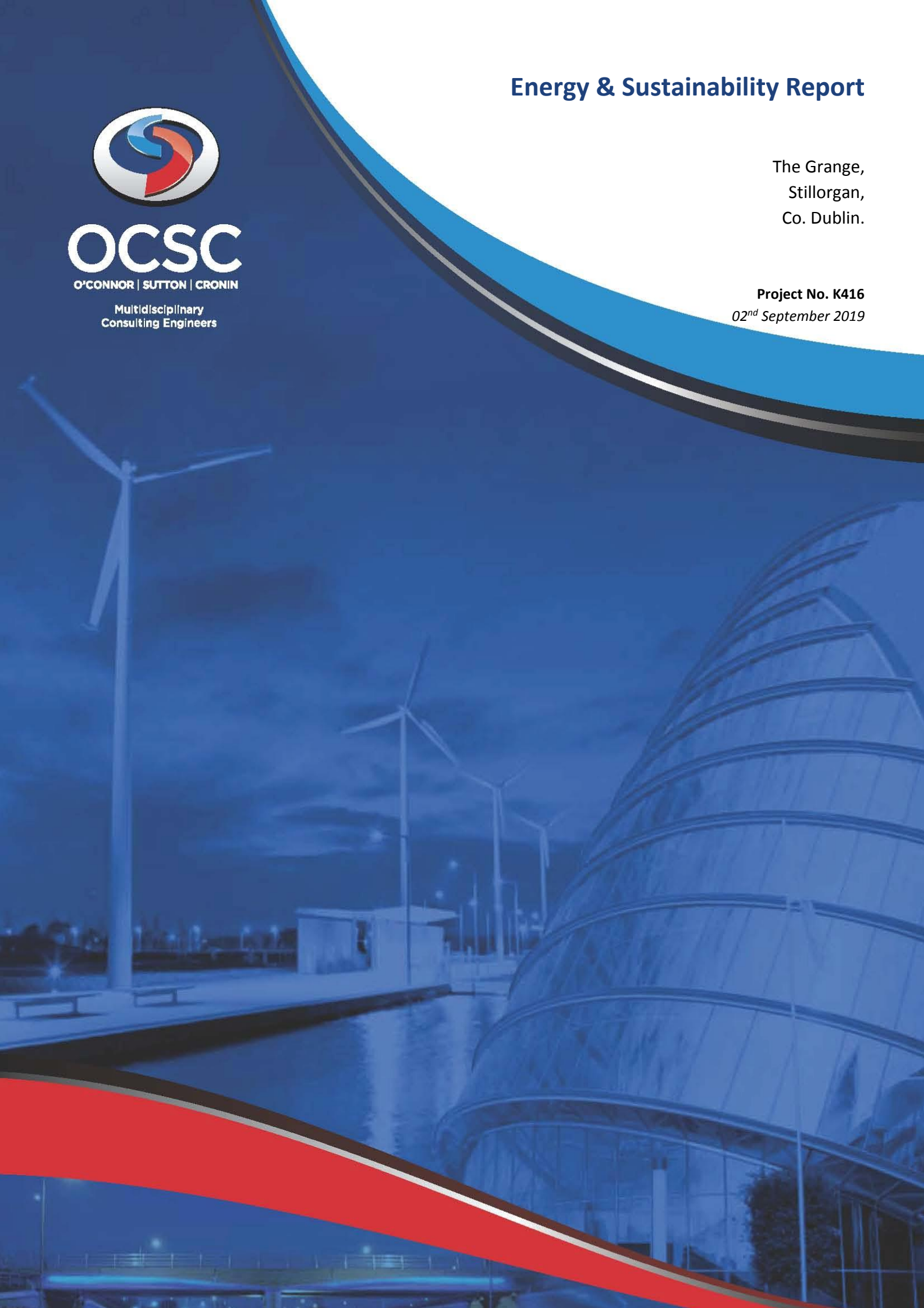
Multidisciplinary
Consulting Engineers



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NOTICE

OCSC Job No.: K416	Project Code	Originator Code	Zone Code	Level Code	File Type	Role Type	Number Series	Status/ Suitability Code	Revision
	K416	OCSC	XX	XX	RP	YS	0001	S4	P04

Rev.	Status	Authors	Checked	Authorised	Issue Date
4	For Planning	DM	MT	MT	02/09/2019
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2	Draft for Comment	DM	DOC	DOC	04/04/2019
1	Draft for Comment	DM	PF	PF	13/03/2019

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PROJECT NO. K416

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 Grange', Brewery Road/Stillorgan Road, Blackrock, Co. Dublin

The proposed development will comply with Part L (2019). As part of the development's efforts to reduce energy consumption, the project is targeting an A2 BER (Building Energy Rating) throughout. 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.

Target Energy Performance		
Standard/Rating	**Mandatory**	**Target**
Part L	**Yes**	**2019 (NZEB)**
BER	**Yes**	**A2**

Table 1: Energy Performance Target

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

2. PROPOSED DEVELOPMENT

The proposed development shall provide for the demolition (total c. 1, 398 GFA) of 'The Grange Select Marketing Suite' (1 storey), 'Oaktree Business Centre' (2 storeys) and 'The Lodge' (2 storeys); and the construction of a new residential scheme of 287 residential units; residential tenant amenity space of 961.5 sq m; a crèche facility of 658 sq m; and a substation of 111.5 sq m in the form of 6 new blocks (Blocks H, J, M, N, P and Q) ranging in height from 1 - 11 storeys as follows:
The residential development provides for 287 no. units (19 no. studio units, 125 no. 1 bed units and 143 no. 2 bed units) in Blocks H, J, M and N as follows:

- Block H (7 - 11 storeys from Brewery Road) comprising 99 no. apartments (6 no. studios, 50 no. 1 bed units and 43 no. 2 beds);
- Block J (5 - 10 storeys from Brewery Road) comprising 75 no. apartments (36 no. 1 bed units and 39 no. 2 bed units);
- Block M (4 - 9 storeys from podium) comprising 73 no. apartments (38 no. 1 bed units and 35 no. 2 bed units); and
- Block N (6 - 7 storeys from Brewery Road) comprising 40 no. apartments (13 no. studios, 1 no. 1 bed units and 26 no. 2 bed units).

Each residential unit has associated private open space in the form of a balcony/terrace/roof terrace.
The following residential tenant amenity space, crèche facility and substation proposals are also delivered:

- Blocks H (7 - 11 storeys) also contains a Tenant Amenity Space of 961.5 sq m. This area includes a gym space, male and female changing areas, accessible changing areas, a cinema room, entrance lobby, lounge areas, kitchen/dining areas, games area, management suite, 4 no. meeting rooms, co-working space, security/parcels area, storage areas, tea station, toilets, letter box area and all associated extraneous areas, all of which are areas dedicated to use by future tenants.
- Block P (3 storeys) provides for a crèche facility of c.658 sq m and associated outdoor play area in the form of a roof terrace of c.222.9 sq m.
- Block Q (1 storey at basement level/level 00) provides for an ESB substation of 111.5 sq m.

A basement area (total c. 3,317.9 sq m) is also proposed below Blocks H, J & M at Level 00. A total of 100 car parking spaces (16 at surface level and 84 at basement level), 596 bicycle spaces (518 at basement level and 78 at surface level) and 5 motorcycle spaces (all at basement level) are proposed. Waste Management areas and plant areas are also located at basement level.

Public open space is also proposed in the form of external residential amenity spaces, play areas, courtyards, gardens and trim trails (c.10,465 sq m). Provision is also made for pedestrian connections to the adjoining park to the south west and the existing 'The Grange' development to the south east.

Nos. 2 and 3 The Grange Cottages (single storey) are retained within the current proposal and works to these residential dwellings relate solely to landscape proposals. No works are proposed to the structure or layout of these units.

Figure 1: Site Location Plan (Phase 1)

3. PART L BUILDING REGULATIONS

3.1. PART L (2019)

The new Part L (2019) of the 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) 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 Part L (2019) NZEB requirements, a Renewable Energy Ratio (RER) is to replace the current Part L (2011) renewable requirements. A RER of 20% is currently being proposed.

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:

- Heat Pumps.
- Solar Photo-Voltaic Systems;
- Wind Power;
- Solar Thermal System;
- CHP Units (Combined Heat & Power);
- Biomass Systems (using Biofuels).

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 CO2 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)

3.2. TRANSITIONAL ARRANGEMENTS:

The new Part L 2019 (NZEB) standard will come into effect with the following transitional arrangements:

- Part L 2011 will cease to have effect from 31st October 2019.
- However, the 2011 document may continue to be used in the case of:
    - Where work has started on or before 31st October 2019, or
    - Where planning approval has been applied for on or before 31st October 2019 and substantial work** has been completed by 31st October 2020.

** "Substantial work" means that:

''For apartments, the structure of the roof deck has been completed.''

Due to the timeline for completion, The Grange development will be targeting compliance under Part L 2019 (NZEB).

4. BUILDING ENERGY RATING (BER)

As of 1st July 2009, all newly built domestic buildings and existing buildings that are for sale or rent require a BER (Building Energy Rating) certificate. The Grange development is targeting an A2 BER.

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 variables determines the extent of primary energy consumption within the building:

- Building type (office, retail, dwelling)
- 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)
- Lighting systems (how efficient is the lighting)

The variables 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.

5. 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 (TGD).

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.

The new Part F 2019 standard will come into effect with the following transitional arrangements:

- Part F 2009 will cease to have effect from 31st October 2019.
- However, the 2009 document may continue to be used in the case of:
  - Where work has started on or before 31st October 2019, or
  - Where planning approval has been applied for on or before 31st October 2019 and substantial work** has been completed by 31st October 2020.

Due to the timeline for completion, the Grange development will be targeting compliance under Part F 2019.

6. 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.

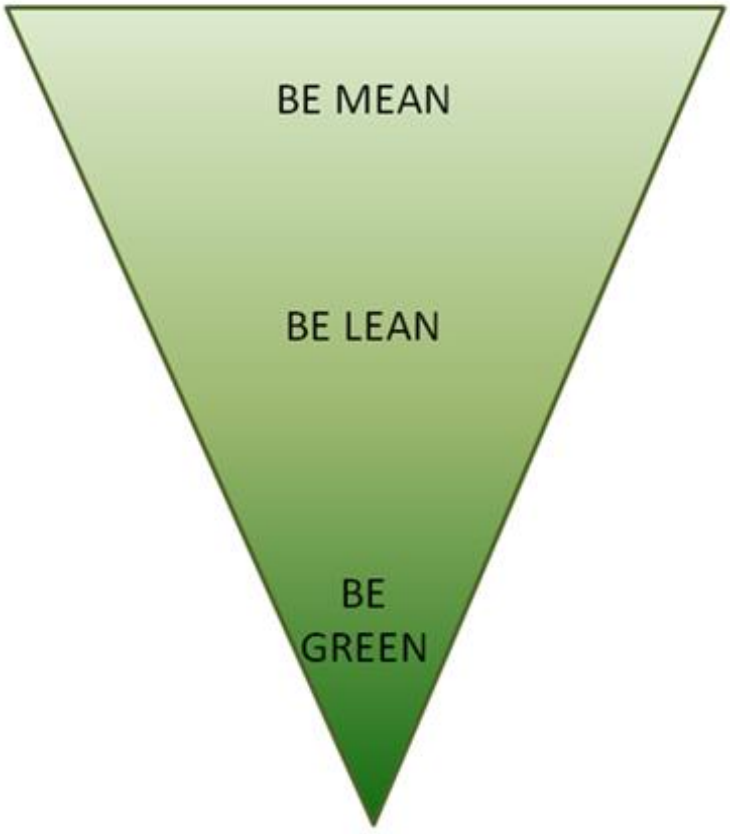

Figure 2: Energy Hierarchy Plan

6.1. 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;
- Improved thermal transmittance and thermal bridging design;
- Passive design measures.

6.1.1. HIGH PERFORMANCE U-VALUES

To limit the heat loss through the façade, careful consideration must be demonstrated 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 target average elemental U-Values for the new build elements are set out in Table 2 below and demonstrates how the proposed development will comply with Part L (2019) performance requirements.

Fabric Element	Part L (2019) Maximum Average Elemental U-value ($W/m^2.K$)	Proposed Elemental U-value ($W/m^2.K$) The Grange
External Walls	0.18	0.18
Flat Roof	0.20	0.20
Ground Contact & Exposed Floor	0.18	0.15
External Windows & Doors	1.4	1.30 (Double Glazing)
	Air Permeability	
($m^3/hr/m^2$@50Pa)	5	3

Table 2: Building Envelope Thermal Performance Requirements

6.1.2. 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.

Under Part L (2019), a performance level of 5 $m^3/hr/m^2$ @ 50 Pa represents a reasonable upper limit for air permeability.

It is intended the proposed development will target an air permeability rate of 3 $m^3/hr/m^2$ @ 50 Pa.

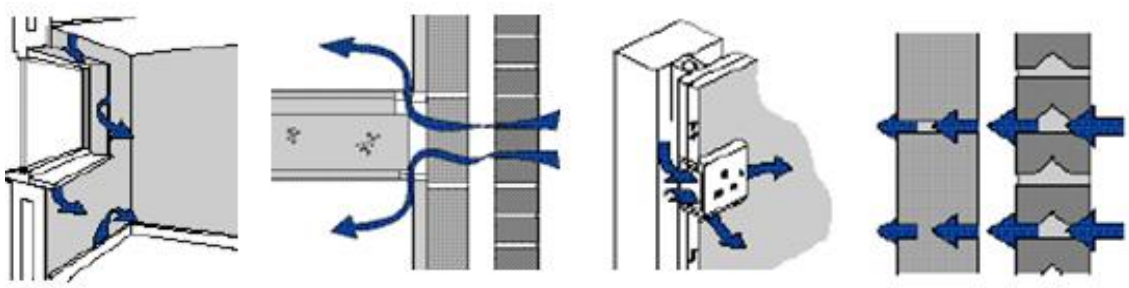

Figure 3: Typical Air Leakage Paths

6.1.3. 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 where possible. A Y value of ≤0.05 $W/m^2.k$ is to be achieved, in accordance with Part L (2019) stipulations.

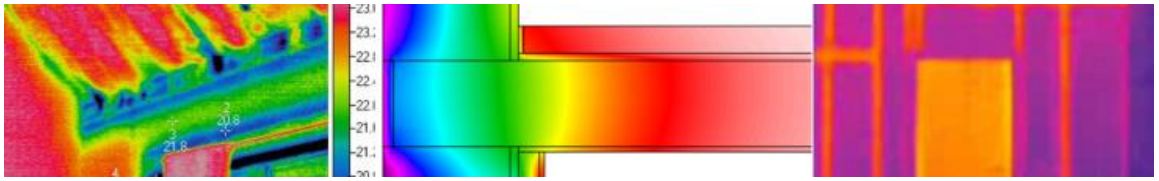

Figure 4: Typical Thermal Bridging Details

6.2. 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.

6.2.1. LOW ENERGY PLANT

To improve the building's overall energy efficiency, all HVAC plant has been selected based on performance and energy efficiency.

Space Heating: It is proposed to satisfy the space heating requirements of the development through radiators using an Exhaust Air Heat Pump (EAHP).

Domestic Hot Water: It is proposed to satisfy the domestic hot water requirements of the development through an Exhaust Air Heat Pump (EAHP).

Ventilation: Demand Control Ventilation (DCV) is being proposed to work alongside the integrated Exhaust Air Heat Pump (EAHP). DCV works with the EAHP to control the volume of outside air entering the internal space.

Variable Speed Drives (VSDs): Variable speed drive motors are to be fitted to all fans and pumps servicing all 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.

6.2.2. LIGHTING

The design intent for internal lighting design is to introduce high efficiency LED artificial lighting to all applicable areas.

The design of the building façade has been significantly influenced to maximise potential levels of natural daylight within occupied zones, while reducing the impact of unnecessary solar gains.

6.3. STEP 3 (BE GREEN) – USE OF LOW OR ZERO CARBON (LZC) TECHNOLOGY

The main zero carbon technology that is being considered is an Exhaust Air Heat Pump for use within The Grange development. These are deemed renewable energy technologies under Part L 2019 (NZEB). Integration of these technologies will also help meet the Developments sustainability targets.

6.3.1. EXHAUST AIR HEAT PUMP

Exhaust Air Heat Pumps operate on a similar basis of other heat pumps, such as air source heat pump and ground source heat pump. It collect's warm air as it leaves a building via the ventilation system. It then reuses this warm air that would otherwise be lost to the outside environment. The combination of heating this warm air as well as fresh air is used for space heating and to heat water.

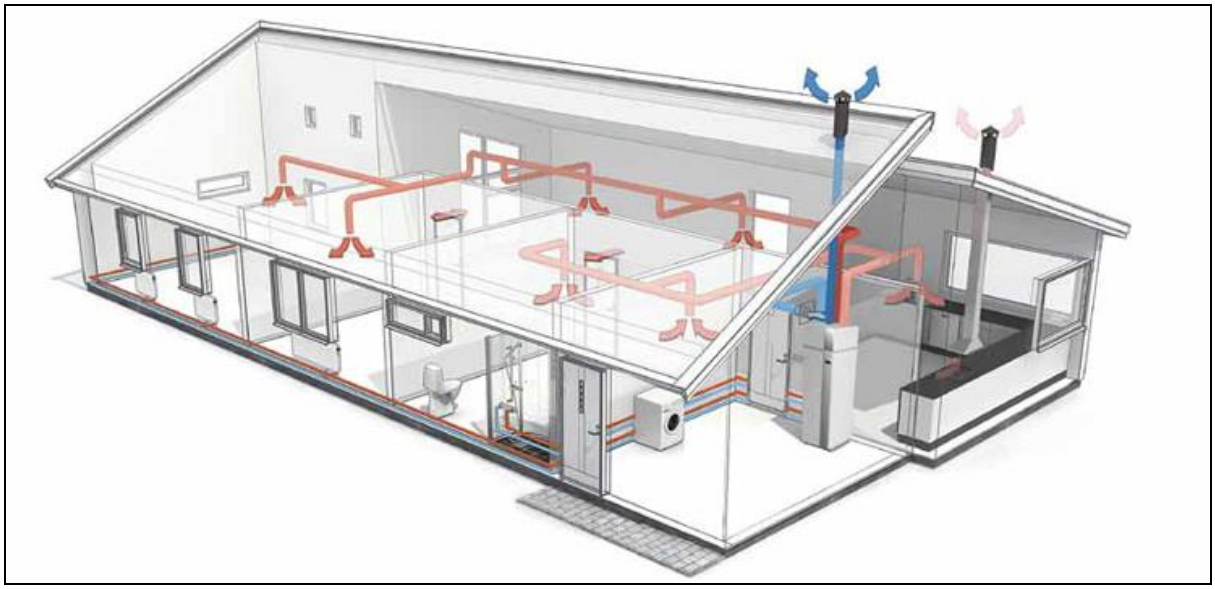

Figure 5: Typical Exhaust Air Heat Pump Layout

7. KEY SUSTAINABLE FEATURES

The location of The Grange 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.

7.1. 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.

7.2. WATER EFFICIENCY

With increasing costs associated with potable water use in commercial buildings, 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.

7.3. BICYCLE FACILITIES

Cycling offers a sustainable alternative to personal vehicle use, which reduces gas and particulate emissions, noise pollution and congestion in busy urban areas. The proposed development will provide private bicycle spaces for tenants/occupants. There are also bike-charging facilities being considered for the development.

7.4. CAR CHARGING

There grange development has been designed to facilitate the installation of E-charge car facilities.

7.5. AMENITY SPACE

There is a communal area for occupants use in the building for both recreational and social activities.

8. CONCLUSION

The proposed development will comply with Part L (2019), as well as achieving an A2 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

- A low energy lighting design will be utilised to further reduce energy consumption and increase occupant thermal comfort.

Be Green

- Exhaust Air Heat Pumps (EAHP) are proposed for use within the development.

The Grange residential development will meet or exceed the requirements of the Part L (2019) standard, which stipulates requirements on minimum renewable contributions, minimum fabric and air permeability requirements, and the maximum energy use and carbon dioxide emissions allowable.

This report confirms that if the strategy is adopted as suggested and properly implemented, then all apartments in The Grange development will comply with Part L (Conservation of Fuel and Energy) of the Technical Guidance Documents and will also achieve a targeted BER rating of A2 throughout.

A number of sustainable design features have also 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;
- Bicycle facilities;
- Car charging facilities;
- Amenity spaces.

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