PROGRESSIVE ENGINEERING

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1 INTRODUCTION

The intention of this report is to identify the energy efficiency measures associated with the design, construction and building service of the proposed development at Dundrum Central, Dundrum Road, Dublin 14.

The proposed development will comply with Part L of the Second Schedule to the Building Regulations as inserted by the European Union (Energy Performance of Buildings) Regulations (S.I. No. 292 of 2019 and S.I. No. 393 of 2021) (Nearly Zero-Energy Building).

The following sections identify a range of energy efficient measures that have been considered for the proposed apartment development at Sommerville, Dundrum Central, Dundrum Road, Dublin 14.

2 PROPOSED DEVELOPMENT

The proposed development will consist of:

- Demolition of all structures on the site and site clearance works.
- The construction of 2 no. apartment blocks (Blocks A and B) providing 111 no. apartments in total (comprising 3 no. studios, 51 no. one bedroom units, 46 no. 2 bedroom / 4 person units and 11 no. 2 bedroom / 3 person units. Block A (Western block, fronting Dundrum Road) comprises a 6-storey block (5 levels over lower ground level / semi-basement) stepping down to the east to 4-storeys in height. Block B (Eastern block, towards the rear (east) of the site) is of part 2-, and part 3-storey height. The proposed development has a total gross floor area of 10,291 sq.m and provides; internal communal ancillary residential services / amenities to include a post room at lower ground floor level within Block A; a shared amenity / lounge (17.5 sq.m) and a storage room (11.8 sq.m) at second floor level within Block B.
- A semi-basement / lower ground floor level is provided in Block A that will be accessed via a vehicular ramped access/egress onto/off Sommerville Road to the north. This semi-basement provides two refuse stores; 39 no. car parking spaces (of which 10 no. spaces are fitted for Electric Vehicles and including 3 no. car club spaces); secure bicycle parking / storage in the form of 82 no. double stacked bicycle storage spaces providing 164 no. residents cycle parking spaces; 2 no. cargo bike storage areas; 3 no. motorcycle spaces; plant room (75 sq.m) and an ESB substation/switch room.
- At ground / surface level provision is made for 2 no. disabled car parking spaces (both fitted for Electric Vehicles) together with 56 no. short stay bicycle storage spaces in the form of 28 no. Sheffield stands and a further 3 no. Sheffield stands providing 6 no. long stay bicycle spaces plus 2 no cargo storage bike spaces. An enclosed bin store is also provided at surface level to the north of Block B.
- Communal Outdoor Amenity space is provided for residents in the form of rooftop terraces located at 2nd floor level within Block A and B, respectively (totalling 361 sq.m in area), and communal courtyard spaces at ground floor level between blocks (totalling 1,418 sq.m in area).
- Private amenity spaces are proposed in the form of patios / terraces at lower ground and ground floor levels with balconies serving apartments at the upper levels.
- Hard and soft landscaping works are proposed at ground floor level which includes the provision of footpaths; fire tender access and an informal play area for children.
- Provision of 4 no. rooftop telecommunications antennae (Block A) and an associated base station / cabinet that will be located within a designated comms room (approximately 13.6 sq.m) that is situated at lower ground floor level within Block A.

3 PART L BUILDING REGULATIONS

Part L 2019 Technical Guidance Document has been recently published by the Department of Housing, Planning & Local Government. Part L 2019 Regulations set energy performance requirements to achieve NZEB performance as required by Article 4(1) of Directive 2010/31/EU of the European Parliament and of the Council of 19 May 2010 on the energy performance of buildings, as amended by Directive (EU) 2018/844 (together "the Directive").

The key issues to be addressed are:

a) Providing that, the energy performance of the building is such as to limit the calculated primary energy consumption and related carbon dioxide (CO2) to that of a nearly zero energy building within the meaning of the Directive insofar as is reasonably practicable, when both energy consumption and carbon dioxide (CO2) emissions are calculated using the Dwelling Energy Assessment Procedure (DEAP) published by Sustainable Energy Authority of Ireland.
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 including energy from renewable sources produced on-site or nearby.
c) Limiting the heat loss and, where appropriate, availing of heat gain through the fabric of the building.
d) Providing and commissioning energy efficient space and water heating systems with efficient heat sources and effective controls.
e) Providing to the dwelling owner 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.

4 BUILDING ENERGY RATING (BER)

As of 1st July 2009, all buildings that were newly built 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.

The sample of BER certificate is illustrated below.

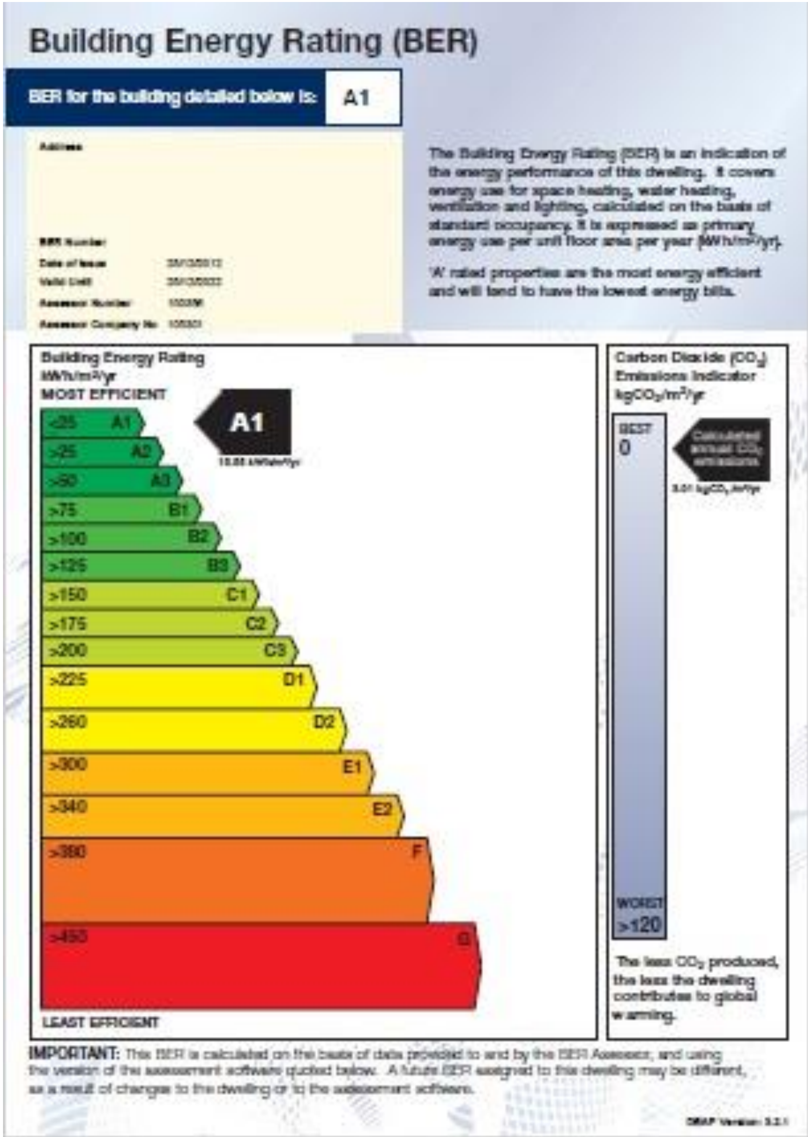

Figure 1: BER Certificate

5 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:

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

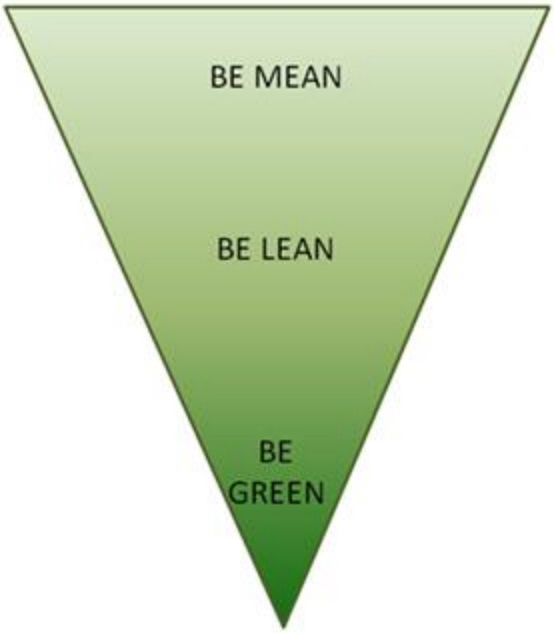

Figure 2: Energy Hierarchy Plan

5.1 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.

5.1.1 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 maximum average elemental U-values from Part L 2019 (NZEB) are outlined in Table 1 below.

Fabric Element	Part L 2019 (NZEB) Maximum Average Elemental U-value ($W/m^2.K$)
External walls	0.18
Flat Roof	0.20
Ground Contact & Exposed Floor	0.18
External Windows	1.40
External Solid Doors	1.40

Table 1: Residential Building Envelope Thermal Performance Requirements

5.1.2 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 the Part L 2019 (NZEB) a performance level of 5 m3/hr/m2 @ 50Pa represents a reasonable upper limit for air permeability. It is intended that the new build elements of the residential development will target an air permeability rate of 5 $m^3/hr/m^2$ @ 50 Pa.

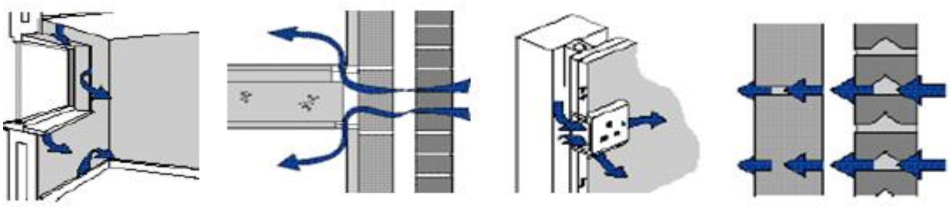

Figure 3: Typical Air Leakage Paths

5.1.3 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. Where an existing construction element to be retained shows a risk of thermal bridging, every effort will be made to reduce the risk by upgrading the façade to ensure continuity of insulation to limit local thermal bridging as much as practically possible.

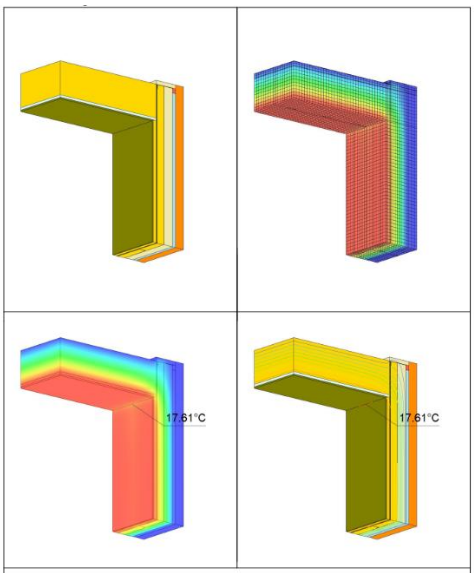

Figure 4: Typical Thermal Bridging Details

5.2 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.

The National Development Plan (NDP) was published in 2018, according to the projections which reflect plans to bring Ireland onto a lower carbon trajectory in the longer term, Ireland still faces significant challenges in meeting EU 2030 and national 2050 carbon reduction targets. The use of high-efficient energy plant in the Dundrum Central Strategic Housing Development makes all efforts to contribute into the implementation of achieving the national energy targets in the next 10-30 years.

5.2.1 HVAC

The proposed development will have three options as follows:

Option 1: Exhaust Air Heat Pump (EAHP)

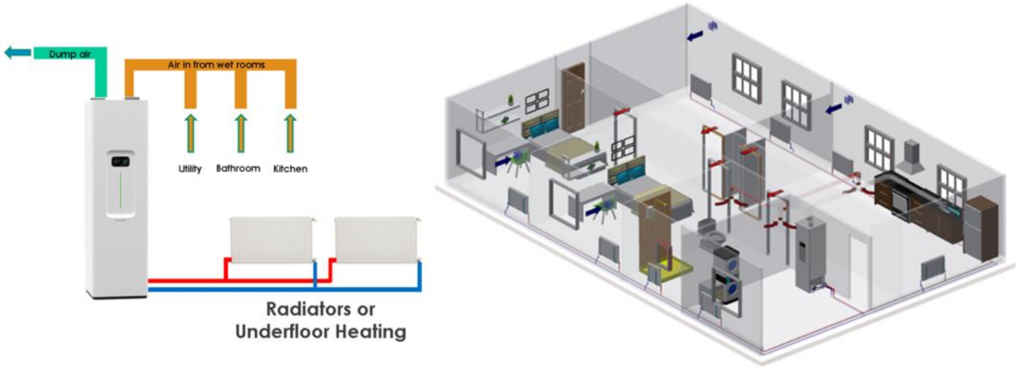

Figure 5: Exhaust Air Heat Pump (EAHP)

Option 2: Nilan Unit

Figure 6: Nilan Unit

Option 3: Dimplex Unit

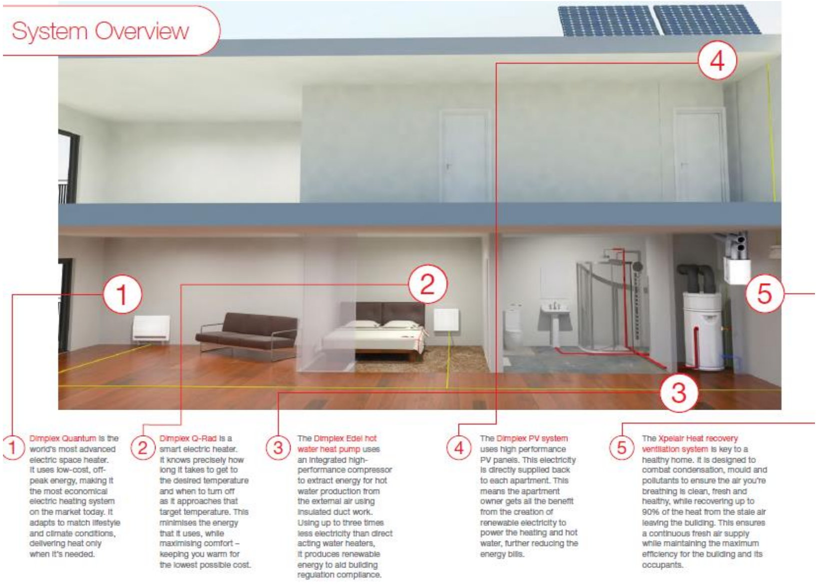

Figure 7: Dimplex Unit

5.2.2 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.

5.3 STEP 3 (BE GREEN) – USE OF RENEWABLE TECHNOLOGIES

The following renewable technologies will be considered for implementation, in so far as is practical and feasibly possible.

5.3.1 Solar Photovoltaics

Photovoltaic (PV) Panels convert the solar radiation into electricity, which can be connected to the mains supply of a dwelling. Panels are typically arranged in arrays on building roofs, with the produced electricity fed directly into the building. Rooftop solar PV is being proposed for incorporation into the design of the landlord and non-residential areas in the proposed apartment development at Sommerville Dundrum.

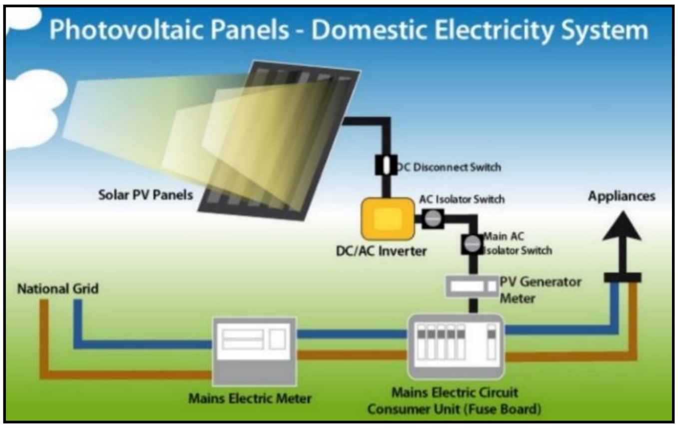

Figure 8: Solar PV Diagram

6 CONCLUSION

A holistic sustainable approach has been adopted by the design team for the proposed apartment development at Sommerville Dundrum. Through detailed design, a number of sustainability and efficiency features have been considered throughout.

The optimised approach is based on the Energy Hierarchy Plan - Be Mean, Be Lean, Be Green.

Be Mean

- For the building elements, the façade performance specification has been optimised to limit heat loss, improve air tightness and thermal transmittance, reduce mechanical cooling requirements 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

A number of sustainable design features have been considered within the design to achieve the sustainability targets of the proposed refurbishment. These include:

- Renewable energy technologies such as Exhaust Air Heat Pump, Air Source Heat Pump and Solar PV will be considered for implementation.

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

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