19th June 2020

Balrath Engineering Consultants

ENERGY AND SUSTAINABILITY REPORT

DANESWELL PLACE, FORMER PRINTWORKS / SMURFIT SITE,
BOTANIC ROAD, GLASNEVIN,

DUBLIN 9

Year of Construction: 2020

Document Compiled by : Adam Rogers C.Eng. MIEI & Joseph Kearney C.Eng. MIEI (BER Certs)

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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 development

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 development.

2. Proposed Development

The development, which will have a Gross Floor Area of 23,859 sq m (excluding 3,800 sq m basement carparking) will principally consist of the construction of a residential development comprising 240 No. apartments (97 No. one bed apartments, 137 No. two bed apartments and 6 No. three bed apartments) in 5 No. blocks as follows: Block A (36 No. apartments) is part 3 to part 5 No. storeys; Block B (44 No. apartments) is part 5 to part 6 No. storeys over basement; Block C (54 No. apartments) is part 5 No. storeys to part 7 No. storeys over basement; Block D (54 No. apartments) is part 5 to part 7 No. storeys over basement; and Block E (52 No. apartments) is part 5 No. storeys to part 6 No. storeys over basement. Balconies and Winter Gardens are provided to all blocks, facing north, south, east, and west.

The development provides resident amenity spaces (727 sq m) including gymnasium, swimming pool, cinema and flexi space at basement level and a concierge (82 sq m) at ground floor level in Block B. There are 4 No. commercial units proposed including a creche (197 sq m); café (234 sq m), management suite (76 sq m) and medical consulting unit (119 sq m) at ground floor level in Block A.

The proposed development also comprises the: extinguishment of the existing secondary vehicular access to Botanic Road at the south-west corner; 148 No. car parking spaces (140 No. at basement level and 8 No. at ground level); 8 No. motorcycle spaces (at basement level); bicycle parking; bin storage; boundary treatments; hard and soft landscaping; lighting; plant; ESB substations and switchrooms; photovoltaic panels; green roofs; and all other associated site works above and below ground..

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) has replaced the current Part L (2011) renewable requirements. The RER of 20% is now in place.

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).

Energy Performance Coefficient (EPC)

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)

Carbon Performance Coefficient (CPC)

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 came 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, this 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. This 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 fabric eg walls, roofs, floor etc)

Air permeability (the level air infiltrates into the building)

Heating systems (what type of system used and how efficient it is)

Cooling systems (what type of system is used and how efficient it is)

Ventilation (what form of ventilation is used eg natural ventilation, mechanical ventilation)

Fan and pump efficiency (how efficient are the pumps and fans)

Domestic hot water generation (what type of system is used and how efficient it is)

Lighting systems (how efficient is the lighting)

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 the latest Part F (Ventilation) of the Technical Guidance Documents (TGD). Please refer to the Part F section for more information.

4.1. FABRIC FIRST APPROACH

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

- High performance U-values in the fabric and windows etc
- Improved air tightness; (< 5.0 m3/m2/hr@50Pa)
- Improved thermal bridging design; (factor of 0.08 or less to be used)

4.1.1. HIGH PERFORMANCE U-VALUES

To limit the heat loss through the fabric, careful consideration must be demonstrated when designing the external fabric. 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 the Table below and demonstrates how the proposed development will comply with Part L (2019) performance requirements.

The high-performance glazing limits the direct heat transfer into the internal spaces. Aside from the reduction in heating and cooling energy consumption and carbon emissions, the reduction in loads results in reduced central plant capacity and size. This has the net effect of reducing embodied energy consumption associated with manufacture and transportation associated with the plant.

	Part L (2019) Maximum Average Elemental U-value (W/m2.K)	Proposed Elemental U-value (W/m2.K)
External Walls	0.18	0.18
Flat Roof	0.2	0.2
Ground & Exposed Floor	0.18	0.15
External Windows & Doors	1.4	1.2 (Double Glazing)
Air Permeability ($m^3/hr/m^2$@50Pa)	5	3

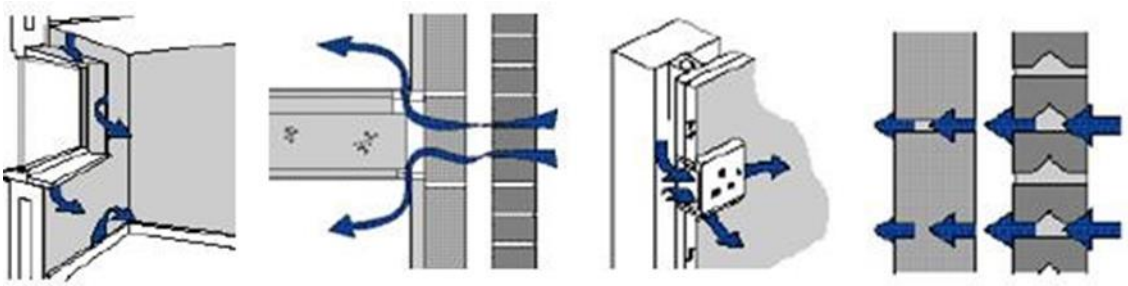
4.1.2. AIR TIGHTNESS

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 m3/hr/m2 @ 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.

4.1.3. THERMAL TRANSMITTANCE / THERMAL BRIDGING

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 ≤0.08 W/m2.k is to be achieved, in accordance with Part L (2019) stipulations and acceptable construction details.



4.2. LOW ENERGY INPUTS.

To maximise the effectiveness of changes to the construction, it is important to use the energy sources within the building as efficiently as possible.
To improve the building's overall energy efficiency, all plant has been selected based on performance and energy efficiency. A number of system will be employed to ensure compliance to the renewable energy requirement is met.
Find below a list of the proposed systems;

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

Domestic Hot Water: It is proposed to satisfy the domestic hot water requirements of the development air to water heat pump and/or gas boiler and / or CHP.

Demand Control Ventilation: Demand Control Ventilation (DCV) is being proposed and / or MVHR.

Heat Recovery mechanical ventilation (MVHR) system: The inclusion of heat recovery unit into the ventilation system allows for heat transfer between exhaust and supply air before the heating and cooling coils thus reducing heating and cooling load. Effect: Reduction in energy consumption and carbon emission.

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.

Internal lighting

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

Natural daylight

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.

Provision of natural daylight in buildings creates a positive environment by providing connectivity with the outside world, and assisting in the well-being of the building inhabitants. Daylight also represents an energy source - reducing the reliance on artificial lighting. The provision of full-height glazing on the elevations maximise the use of natural daylight to enhance visual comfort, without compromising thermal performance.

Hot Water appliances – Flow restrictor

All hot water shower head fitting in the apartments are to be fitted with water flow regulators for full water flow until the discharge rate reaches six litres per minute, to allow for the conservation of water uses well as energy used to heat hot water.

Effect: Minimise hot water usage, thus reducing heating energy load and increasing system operating performance and reducing the cost.

District Heating

Heating systems have been designed to facilitate a District Heating (DH) system. The design philosophy includes the following provisions:

- Space allocations for heat exchanging plant.
- Centralised primary/secondary heating systems with low loss headers to facilitate integration of DH services.
- Space allocation provision in service risers heating pipework.

District heating offers many benefits and real cost-saving advantages. It will allow users to decide when, where and how much energy they need, ensuing maximum comfort, whilst providing hot water on demand.

Central BMS – check metering (heating/cooling/power) of all individual floors and wings to monitor & optimise substantive energy use. The energy management system will continuously review and fine-tune the operational efficiencies and strategy for the various building services, significantly reducing clients' overall energy consumption and carbon footprint, and reducing energy costs by up to 25%.

5. Part F Building Regulations

The new Part F 2019 standard came 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:

o Where work has started on or before 31st October 2019, or

o 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, this development will be targeting compliance under Part F 2019. 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 through the use of mechanical systems.

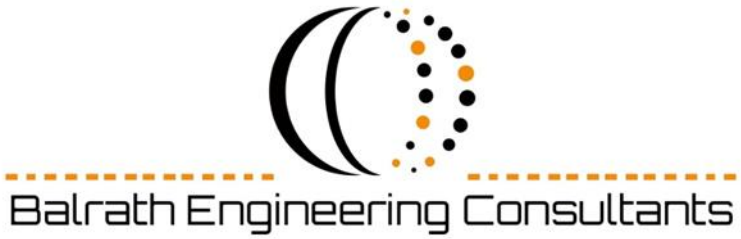
In relation to F2, all roof systems throughout will be effectively ventilated in order to avoid condensation.

6. Conclusion

The sustainable design elements of the proposed Daneswell Place, Botanic Road Dublin 9, contributes to a scheme that significantly exceeds the Building Regulations in terms of primary energy consumption and carbon dioxide emissions.

The preliminary building energy ratings for the residential elements of the scheme are consistent with those achieved for comparable high specification developments in Dublin.

The passive measures included in the design, such as maximising the use of daylight and minimising solar gain (glazing selection), reducing fabric heat loss through the building envelope and improving the air tightness significantly contribute towards reducing the loads on the active systems within the building Blocks.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