# Proposed Build to Rent Development at Former Blakes Site
# Energy Statement - Commercial

Cairn Homes Properties Ltd

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ethos ENGINEERING

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| **CURRENT ISSUE** | | | |
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| **PREVIOUS ISSUES (Type Names)** | | | | |
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# Executive Summary

This report prepared by Ethos Engineering demonstrates how the energy performance and the sustainability of construction of the proposed mixed-use development meets or exceeds legislative/planning requirements.

The energy strategy has been approached in a holistic manner using the energy hierarchy "Be Lean, Be Clean, Be Green" in order to comply with Part L 2021 requirements for energy performance and greenhouse gas emissions. The development is targeting a BER certification of at least A3.

The targeted BER certification will ultimately drive the energy strategy for the development. The proposed energy strategy as detailed in this report is compliant with the requirements of Part L 2021 and achieves a provisional BER certification of "A3". The proposed development BER rating of "A3" has been assessed using the SBEM interface VE Compliance 7.0.12.0 in the IES software version 2019.1.0.0 which demonstrates Part L compliance in accordance with NEAP. (BERs could change in the future with updates to software due to improvements in methodology and revised Electricity Primary Energy Factor).

Refer to Appendix 1 for detail of SBEM inputs for NEAP calculation.

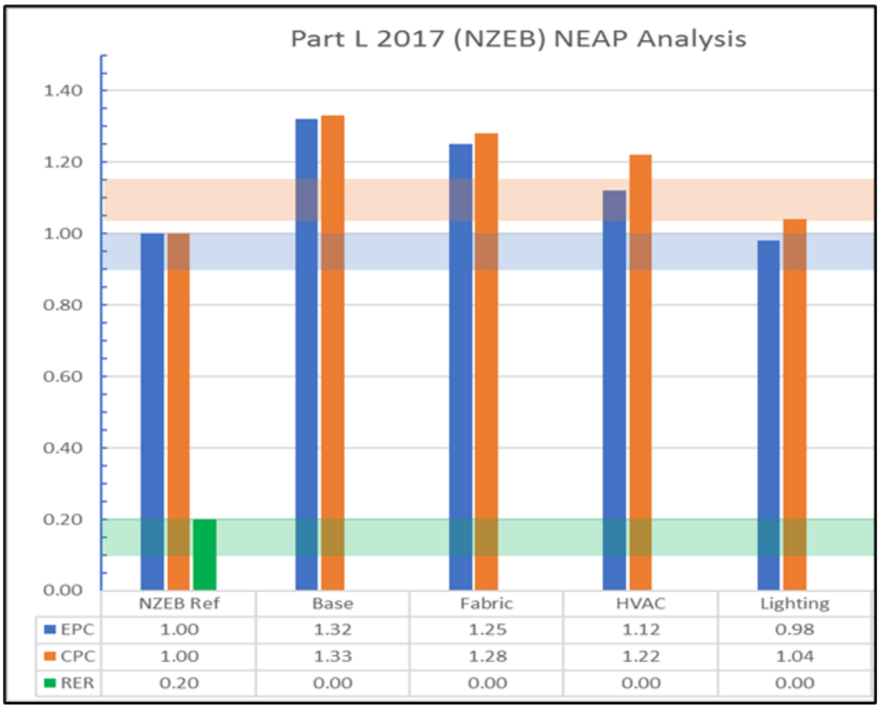


*Figure 1: EPC and CPC NZEB target to meet*

Sustainable design features of the Stillorgan mixed use development include enhanced building fabric performance, high efficiency HVAC systems and high efficacy lighting with occupancy and daylight control where applicable. These improvements result in a better building energy performance than the minimum required by TGD Part L 2021.

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# 1. Introduction

This report prepared by Ethos Engineering demonstrates how the energy performance and the sustainability of construction of the proposed mixed use development at the former Blakes and Esmonde Motors site, Stillorgan, Co. Dublin will meet or exceed legislative/planning requirements. This report is to form part of the planning submission documentation to An Bord Pleanála.

The proposed design must comply with national building regulations for energy performance and carbon dioxide ($CO_2$) emissions set out in 'Technical Guidance Document Part L - Conservation of Fuel and Energy 2021 - Buildings other than Dwellings'. Additionally, a provisional Building Energy Rating (BER) must also be produced in line with the EU Directive on Energy Performance in Buildings (EPBD). The proposed building design is targeting a minimum BER certification of 'A3' at detailed design stage; 'A3' is the minimum requirement for a property to be eligible for public sector leasing. The proposed retail units are assessed separately for BER certification with no target rating as there is no services design proposed; as this will be determined by future tenants.  (Note that the BER has been calculated using IES VE Compliance 7.0.12.0 or iSBEM v5.5.h.  BERs could change in the future with updates to software due to improvements in methodology and revised Electricity Primary Energy Factor)

Located at the address The Hill, Stillorgan, Co. Dublin, the development is subject to the planning requirements applicable to the Dun Laoghaire Rathdown County Development Plan 2016-2022 and draft DLR development plan 2022-2028.

In order to meet the legislative and planning requirements the overall energy strategy of the proposed design has been approached in a holistic manner using the adopted energy hierarchy "Be Lean, Be Clean, Be Green". Energy performance has been assessed in accordance with the Non-Domestic Energy Assessment Procedure (NEAP) methodology to demonstrate the systematic improvement in energy performance.

Assessments carried out in this report are based on latest floor plans and elevations received from the architect and all design parameter figures and assumptions stated are based on the current preliminary design received from the design team; these are subject to change during detailed design.

## 1.1. Site and Development Summary

The development will consist of the construction of a mixed use scheme of 377 no. "Built to Rent" BTR apartments, Community Sports Hall (933 sq. m), along with 5 no. restaurant/cafés (c. 841.2 sq.m), creche (c. 215 sq. m), office hub (195.3 sq. m) and ancillary residents' support facilities/services (1,016 sq. m) laid out in 6 no. blocks ranging in height from 3-9 storeys (over basement) comprising  21 no. studio apartments, 189 no. 1 bedroom apartments, 159 no. 2 bedroom apartments & 8 no. 3 bedroom apartments, and public realm upgrades on a site of c. 1.41 hectares.

*Figure 2: Blake's Stillorgan Site location and floor plan layout (outlined in red)*

# 2. Legislative/Planning Requirements

## 2.1. Part L / Nearly Zero Energy Buildings (NZEB)

The European Energy Performance of Buildings Directive Recast (EPBD) requires all new buildings to be Nearly Zero – Energy Buildings (NZEB) by 31st December 2020 and all buildings acquired by public bodies by 31st December 2018.

'Nearly Zero – Energy Buildings' means a building that has a very high energy performance, Annex 1 of the Directive and in which "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".

The European Commission issued recommendations on 29th July 2016 (EU 2016/1318) on guidelines for the promotion of nearly zero-energy buildings and best practices to ensure that, by 2020, all new buildings are nearly zero-energy buildings.

Specifically, for the Oceanic zone which applies to Ireland the guidance proposes the following recommendation. There is no guidance specifically for commercial developments with the exception of office buildings.

- Offices: 40-55 kWh/m$^2$/a of net primary energy with, typically, 85-100 kWh/m$^2$/a of primary energy use covered by 45 kWh/m$^2$/a of on-site renewable sources.
- New single family house: 15-30 kWh/(m$^2$.y) of net primary energy with, typically, 50-65 kWh/(m$^2$.y) of primary energy use covered by 35 kWh/(m$^2$.y) of on-site renewable sources;

A combination of some of the following will likely be needed to achieve a 60% improvement.

- Building insulation levels will be greatly improved
- Glazing ratios may need to be considered
- Insulation value of the glazing itself will be considerably improved
- Airtightness standards will be introduced including mandatory airtightness test on every building
- Enhanced calculation of linear thermal bridging probably required particularly for the 60% improvement
- The use of renewables and free cooling will be required
- The use of solar shading will need to be considered
- Renewables will need to cover a substantial part of energy use
- Much more efficient lighting and services will be needed

Article 9(1) of the EPBD requires Member States to ensure that by the relevant dates, 'all new buildings are NZEBs'. As a result, citizens buying newly constructed buildings or apartments in 2021 would expect the market to have evolved in line with these targets, and buildings to be NZEBs.

The construction sector shows that the timing of the end of construction or completion of a building might be uncertain and may suffer delays. Member States would need to factor in the period of validity of building permits, the length of construction and completion of building works and the targets in Article 9(1) of the EPBD to avoid falling short of the obligation to ensure that 'by January 2021 all new buildings are NZEBs'.

## 2.2. DLRCOCO County Development Plan 2016-2022

The energy strategy will consider the following council policies and objectives as outlined in the DLRCOCO County Development Plan 2016-2022 which was adopted on 17th February 2016. The DLRCOCO require applications to meet the highest standards of sustainable design and construction and conform in full with the sustainable energy policies set out in Chapter 5 of the County Development Plan 2016-2022 (Physical Infrastructure Strategy). For major developments an Energy Statement should accompany the planning application. The following council policies have been considered as part of the Energy strategy:

- **Policy CC6: Energy Performance in Existing Buildings**
  - It is Council policy to promote innovative building design that demonstrates a high level of energy conservation, energy efficiency and use of renewable energy sources in existing buildings
- **Policy CC7: Energy Performance in New Buildings.**
  - It is Council policy that all new buildings will be required to meet the passive house standard or equivalent, where reasonably practicable. By equivalent we mean approaches supported by robust evidence (such as monitoring studies) to demonstrate their efficacy, with particular regard to indoor air quality, energy performance, comfort, and the prevention of surface/interstitial condensation. Buildings specifically exempted from BER ratings as set out in S.I. No 666 of 2006 are also exempted from the requirements of CC7. These requirements are in addition to the statutory requirement to comply fully with Parts A-M of Building Regulations.
- **Policy CC8: Excellence in the Built Environment**
  - It is Council policy to lead by example by developing a strategy for effective climate protection within its building stock.

## 2.3. DLRCOCO County draft Development Plan 2022-2028

As part of the Dun Laoghaire Rathdown draft development plan the development is also subject to the outlined requirements. The energy strategy will consider the following draft planning Policies and objectives.

- **Policy CA7: Construction Materials**
  - It is the policy of Dun Laoghaire Rathdown Council to support the use of structural materials in the construction industry that have low to zero embodied energy and CO2 emissions.
  - It is an objective of Dun Laoghaire Rathdown Council to follow the National Climate Action Plan 2019 which addresses the need to "work with industry stakeholders to increase the use of low carbon materials, taking into account international best practice".
- **Policy CA13 – Solar Energy Infrastructure**
  - It is the policy of Dun Laoghaire Rathdown Council to encourage and support the development of solar energy infrastructure, including photo voltaic (PV) and solar thermal and seasonal storage facilities infrastructure in appropriate locations.
  - It is an objective of Dun Laoghaire Rathdown Council to support Ireland's renewable energy commitments by facilitating utility scale PV installations for the production of electricity. It is an objective of Dun Laoghaire Rathdown Council to support the growth in solar photovoltaics and solar thermal use in the County.

## 2.4. EU Legislative Initiatives

The Directive on Energy Performance in Buildings (EPBD), adopted in 2002, primarily affects energy use and efficiency in the building sector in the EU. Ireland transposed the EPBD through the Energy Performance of Buildings Regulations 2003 (S.I. 666 of 2006) which provided for the Building Energy Rating (BER) system to be administered and enforced by the Sustainable Energy Authority of Ireland (SEAI).

The Recast EPBD, adopted in May 2010, states that reduction of energy consumption and the use of energy from renewable sources in the buildings sector constitute important measures needed to reduce the EU's energy dependency and greenhouse-gas emissions. The directive aims to have the energy performance of buildings calculated on the basis of a cost-optimal methodology. Member states may set minimum requirements for the energy performance of buildings. The directive was transposed by the European Union (Energy Performance of Buildings) Regulations 2012 (S.I. 243 2012).

The recast EPBD requires Ireland to ensure, among other obligations, that:

- Building energy ratings are included in all advertisements for the sale or lease of buildings;
- Display Energy Certificates (DECs) are displayed in public and privately owned buildings frequently visited by the public;
- Heating and air-conditioning systems are inspected;
- Consumers are advised on the optimal use of appliances, their operation and replacement;
- Energy Performance Certificates and inspection reports are of a good quality, prepared by suitable qualified persons acting in an independent manner, and are underpinned by a robust regime of verification; and
- A national plan is developed to increase the number of low or nearly zero energy buildings (NZEB), with the public sector leading by example.

Part 2 of the EPBD deals with Alternative Energy Systems and applies to the design of any large new building, where a planning application is made, or a planning notice is published, on or after 1st of January 2007. This calls for a report into the economic feasibility of installing alternative energy systems to be carried out during the design of the building. Systems considered as alternative energy systems are as follows:

- Decentralised energy supply systems based on energy from renewables
- Cogeneration i.e. Combined heat and power systems
- District or block heating or cooling, if available, particularly where it is based entirely or partially on energy from renewable sources
- Heat pumps

# 3. Energy Strategy Methodology

The aspirations of the developer can be summed up as follows:

- Achieve (as a minimum) Building Regulations (Part L) compliance
- Further reduce, as far as is feasible and reasonable, the primary energy consumption and $CO_2$ emissions of the proposed development through design measures; to achieve a BER of A3 (VE Compliance 7.0.12.0 or iSBEM V5.5.h)
- Consider the potential to make use of decentralised and/or renewable energy resources
- Maximise energy performance points achieved if Sustainability Accreditation Scheme is pursued

## 3.1. Energy Hierarchy

In order to achieve these objectives, the following energy hierarchy (referred to as "Be Lean, Be Clean & Be Green") was used to identify and prioritise effective means of reducing carbon emissions:

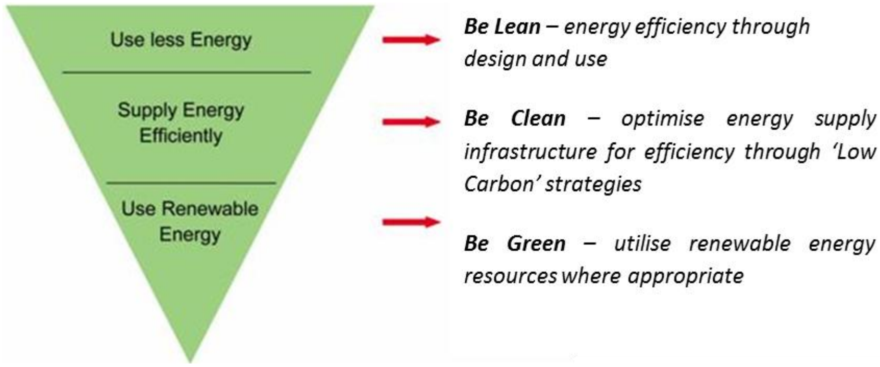


*Figure 3: Energy Hierarchy*

Ethos Engineering considers this hierarchy - a hierarchy proposed and/or endorsed internationally by many local authorities - to be well considered and an appropriate set of principles to adhere to in tackling climate change. In adopting the hierarchy, the primary energy use and $CO_2$ emissions reduction at each stage are maximised before strategies at the next stage are considered.

## 3.2. NEAP

The primary energy consumption and carbon dioxide (CO2) emissions of the proposed development, including the services design, will be calculated using the NEAP (Non-Domestic Energy Assessment Procedure) methodology. The NEAP methodology sets out the procedures to reflect specialist processes when calculating the 'Energy Performance Coefficient' (EPC), 'Carbon Performance Coefficient' (CPC) and 'Renewable Energy Ratio' (RER).

Under Part L 2021, an NZEB Reference building has been specified which defines the 'Maximum Permitted Energy Performance Coefficient' (MPEPC) and 'Maximum Permitted Carbon Performance Coefficient' (MPCPC). The Reference building is a high-performance building based on the same geometry as the actual design with 20% of its primary energy use met by renewables i.e. (Photovoltaic)

In order to demonstrate that an acceptable primary energy consumption rate has been achieved, the calculated EPC will be no greater than the MPEPC of 1.0. Similarly, to demonstrate that an acceptable CO2 emission rate has been achieved, the calculated CPC will be no greater than the MPCPC of 1.15.

The RER requires that 20% of the building primary energy use is met via renewable energy technologies. However, for higher performing buildings that achieve EPCs and CPCs ≤ 0.9 and 1.04 respectively, the RER is reduced to 10%.

## 3.3. SBEM

The Simplified Building Energy Model (SBEM) is a calculation engine designed for the purpose of indicating compliance with building regulations Part L in regards primary energy usage from buildings other than dwellings. SBEM has certain limitations and is explicitly for benchmarking purposes, not a design tool.

Integrated Environmental Solutions (IES) Virtual Environment (VE) software provides an SBEM interface and has been used for the Part L and BER assessments conducted in this report. A detailed 3D model was constructed based on latest floor plans and elevations received from the architect and all building fabric and M&E inputs (detailed later in this report) are based on the current preliminary design received from the design team; these are subject to change during detailed design.

The proposed development has been assessed using the SBEM interface VE Compliance 7.0.12.0 in the IES software version 2019.1.0.0 which demonstrates Part L compliance in accordance with NEAP. SBEM inputs are detailed in Appendix 1 of this report, and the provisional BRIRL and BER are given in Appendix 2 & 3.

# 4. Be Lean: Demand Reduction

## 4.1. Passive Solar Design

Passive solar design is of upmost importance in large commercial buildings where cooling constitutes a significant portion of the energy demand. Minimising unnecessary/unwanted solar gains is one of the most effective ways to reduce cooling energy requirements. The building will be designed in line with section 1.3.5 of Part L 2021 "Limiting the effects of solar gain in summer" which requires that;

- Buildings should be designed and constructed so that:
  - those occupied spaces that rely on natural ventilation do not risk unacceptable levels of thermal discomfort due to overheating caused by solar gain, and
  - those spaces that incorporate mechanical ventilation or cooling do not require excessive plant capacity to maintain the desired space conditions.
- For the purposes of Part L, reasonable provision for limiting solar gain through the building fabric would be demonstrated by showing that for each space in the building that is either occupied or mechanically cooled, the solar gains through the glazing aggregated over the period from **April to September** inclusive are no greater than would occur through one of the following glazing systems with a defined total solar energy transmittance (g-value) calculated according to I.S. EN 410: 2011.
  - For side lit spaces, an east-facing façade with full width glazing to a height of 1.0m. having a framing factor of 10% and a G-value of 0.68.
  - For top lit spaces, a horizontal roof of the same total area that is 10% glazed (based on internal roof area) with roof lights having a 25% framing factor and a G-value of 0.68.

Meeting the solar gain criteria in Section 1.3.5 is not an assessment of the internal comfort condition of the building as many other factors have a bearing on comfort e.g. internal heat gains, occupancy level, thermal capacity and ventilation. For this reason, Section 1.3.6 of Part L 2021 "Limiting Overheating" recommends that the design should comply with the thermal comfort criteria set out in CIBSE TM52 to ensure overheating is avoided for normally occupied naturally ventilated spaces. A thermal comfort analysis for proposed naturally ventilated design will be carried out to demonstrate compliance with CIBSE TM52 as per solar part L report.

To achieve the criteria set out in sections 1.3.5 and 1.3.6 of Part L 2021 it is recommended that a glazing G-value in the range of 12% to 28% as outlined with blinds as per the solar Part L report is specified while glazing VLT (Visible Light Transmittance) should be kept above 70%. This is to ensure that the reduction in solar heat gain has a minimal impact on daylight entering occupied spaces; as the design intent is to achieve adequate daylighting in perimeter zones. Thus, electric lighting will be a supplementary lighting source, reducing both the electricity demand for lighting and the associated internal heat gain from lighting, which further reduces the risk of overheating.

## 4.2. Building Fabric

The new development will be designed and constructed to limit heat loss and where appropriate, limit heat gains through the fabric of the building. In order to limit the heat loss through the building fabric the thermal insulation for each of the plane elements of the development will meet or exceed the area weighted average elemental U-Values as specified in Part L, Table 1, Column 1.

Table 1, Column 2, lists the targeted U-Values of the proposed design.

**Table 1: Fabric U-Values**

| Element | Part L 2021 U values ($W/m^2K$) | Targeted U values ($W/m^2K$) |
|---|---|---|
| Flat roof | 0.20 | 0.10 |
| Walls | 0.21 | 0.18 |
| Ground floors | 0.21 | 0.15 |
| Exposed floors | 0.21 | 0.15 |
| Curtain Wall | 1.6 | 1.2 |
| External personnel doors and windows | 1.6 | 1.2 |
| g' value (EN410) | 0.4 | 0.35 (TBD) |
| Light transmittance | 71% | 71% |

## 4.3. Building Envelope Air Permeability

In addition to fabric heat loss/gain, reasonable care will be taken during the design and construction to limit the air permeability (or Infiltration). High levels of infiltration can contribute to uncontrolled ventilation. Part L requires an air permeability level no greater than $5m^3/m^2/hr$ @50Pa for new buildings. The design intent will be to achieve an air permeability of $4m^3/m^2/hr$ @50Pa which represents a reasonable upper limit of air tightness.

## 4.4. Thermal Bridging

To avoid excessive heat losses and local condensation problems, consideration will be given to ensure continuity of insulation and to limit local thermal bridging, e.g. around windows, doors and other wall openings, at junctions between elements and other locations. Heat loss associated with thermal bridges is taken into account in calculating energy use and $CO_2$ emissions using the NEAP methodology.

Acceptable Construction Details will be adopted for all key junctions where appropriate (i.e. typical/standard junctions). For all bespoke key junctions certified details which have been certified by a third party certification body will be used. The default values for thermal bridging in accordance with Appendix D of TGD - Part L 2021, will be used or the certified details for any bespoke key junctions.

## 4.5. Natural Ventilation

With a suitable window design, the sports hall will be naturally ventilated. The retail areas, creche and amenity spaces may require mechanical ventilation when fitted out.

## 4.6. High Efficiency and Condensing Gas Boilers

Use of Condensing Boilers achieves higher efficiencies than standard boilers when condensing temperatures are achieved by utilising latent heat from the combustion gases which is normally wasted. We will be assessing the use of condensing gas boilers for low return temperature loads, 100% resilience load and peak lopping load. We would recommend a cascade arrangement of boilers which will allow for very low modulation ranges. An example of a cascaded boiler system is the Remeha Quinta Pro Plus. This can achieve up to 48% lower carbon emissions and fuel savings than typical 'best practice' systems, delivering an overall system efficiency of 98.1% GCV at 50/30°C.

By incorporating Passive Flue Gas Heat Recovery technology, the Quinta Eco Plus recovers normally wasted energy equivalent to around 15% of the gross input energy. The full time condensing environment is irrespective of primary circuit temperatures, making it the perfect solution for a wide range of commercial heating requirements.

## 4.7. 70°C-40°C Low Carbon System Design

The main characteristic of a "70/40" system is a large Delta T and a low system return temperature. CIBSE AM12:2013 (9.16, p 49) states:

*"It is recommended that, for new systems, radiator circuit temperatures of 70ºC (flow) and 40°C (return) are used with a maximum return temperature of 25°C from instantaneous domestic hot water heat exchangers."*

To achieve 70°C flow and 40°C return temperatures calls for a 'whole system approach' by the specifier. Properly designed and commissioned CHP Heating schemes have the potential to significantly reduce energy consumption and carbon emissions. However, traditional design practices are often based on flow/return temperatures of 80/60°C. A return temperature of 60°C is sufficiently high to prevent the Combined Heating and Power system from delivering maximum cost-savings, as this temperature only allows limited cooling of the generator and can result in the CHP shutting down.

If system circulating temperatures of 80/60 are used instead of 70/40, heat losses from the distribution system can only increase. The most effective way to reduce return water temperatures is to reduce water flow rates. The latest version of CIBSE AM12 'Combined Heat and Power for Buildings' is designed to address these issues and provides new best practice guidance for communal heating systems. A project that does not achieve recommended return water temperature, therefore, does not follow best practice. This can have serious implications for the system designer in terms of overall efficiency.

CIBSE have recommended the following operating temperatures in the document "Heat Networks: Code of Practice UK 2015".

**Table 2: Preferred Operating Temperatures for new building services systems**

| Circuit | Flow Temperature °C | Return Temperature °C |
|---|---|---|
| Radiators | Max 70 | Max 40 |
| Fan-coil units | Max 60 | Max 40 |
| Air Handling Unit | Max70 | Max 40 |
| Underfloor heating | See Note | See Note |
| Domestic DHWS instantaneous heat exchanger on load | Min 65 | Max 25 |
| Domestic DHWS cylinder with coil heat up from cold | Min 70 | Max 45 |
| DHWS calorifier with external plate heat exchanger | Min 70 | Max 25 |

Note: Underfloor heating systems will typically operate with floor temperatures below 35°C and typically flow temperatures of 45°C which is advantageous for heat networks as this will result in low return temperatures.

### 4.7.1. Specific Fan Power Reduction

All ductwork will be generously sized and service routes optimised so as to minimise fan power requirements. All SFPs will be in compliance with the draft Building Regulations Part L 2021. For new buildings with a centralised air distribution system the recommended SFP is 1.6W/l/s, with an additional allowance of 0.3W/l/s for heat recovery and 1.0W/l/s for HEPA filters where applicable.

### 4.7.2. Variable Speed Pumps and Ventilation Fans

All pumps and fans will be specified with variable speed drives and constant pressure control. This means that these items of mechanical plant will run at partial load most of the year rather than at the peak design load. This has obvious energy savings. Pumps will comply with the Energy related Products (ErP) Directive. All electric drives will be classed as IE3 'Premium efficiency' under EN60034-30:2009 which is a legal requirement since 1st January 2017. IE4 'Super Premium efficiency' motors will be considered during detailed design and may be used if they are deemed to be technically, functionally and economically feasible.

### 4.7.3. Metering and Sub Metering

Metering is an effective way to raise awareness of energy use and to bring about behavioural change by the building owners and occupiers. Sub metering of all major HVAC energy uses will be integrated with the Building Management System (BMS). Metering will include automatic monitoring and targeting with alarms for out of range values. All individual units will have dedicated utility supplied electricity meters. As regards landlord areas metering should be specified on all major loads and sub-mains cabling.

### 4.7.4. Insulation of Hot Water Storage Vessels, Pipes and Ducts

All hot water storage vessels, pipes and ducts (where applicable) will be insulated to prevent heat loss. Adequate insulation of hot water storage vessels will be achieved by the use of a storage vessel with factory applied insulation tested to BS 1566, part 1:2002 Appendix B. Water pipes and storage vessels in unheated areas will be insulated for the purpose of protecting against freezing. Technical Guidance Document G and Risk report BR 262, Thermal insulation avoiding risks, published by the BRE will be followed.

## 4.8. Small Power Items and Site Wide Energy Efficiency Drive

All small power items will be reviewed for increased energy efficiency. Feature lighting if installed will be designed for improved energy efficiency or removed completely. Sub metering of electricity will be installed across the site and a site Energy Manager should be tasked with monitoring out-of-range values so that any increased energy consumption due to faults can be investigated and remedied.

## 4.9. Energy Efficient Systems

### 4.9.5. Central Heating using water: convectors

The heating system proposed for this building will utilise low temperature hot water (LTHW) to transfer heat energy throughout the development. LTHW will be generated centrally and distributed to each cluster using the principles of a heat network. This district heating system will also be used to serve the Sports Hall.

### 4.9.6. Heat Recovery Thermal Wheels

Thermal wheel technology offers the greatest heat recovery within an air system. A thermal wheel, also known as a 'rotary' or 'regenerative' heat exchanger, is a system of heat transfer which involves a single rotating wheel with high thermal capacity located within the supply and exhaust air streams of an Air Handling Unit (AHU). Its rotation allows the recovery of energy from air that would otherwise be lost to the atmosphere, and the energy is used to pre-heat (or cool) the incoming fresh air. Any AHU specified will have thermal wheel heat recovery units with a targeted heat recovery efficiency of 82%. Some retail areas may require heat recovery mechanical ventilation.

## 4.10. Energy Efficient Electrical Systems

### 4.10.1. Low Energy Lighting Solutions

Energy efficient lighting should maximise the use of natural daylight, avoid unnecessarily high illuminance, incorporate the most efficient luminaires, control gear and include effective lighting controls. These good practice design principles will be followed during the detailed design stage of the proposed development.

LED lighting will be considered for all building areas as the most energy efficient and practical solution, offering the lowest achievable Lighting Power Density (LPD). Table 3 indicates the LPDs that will be targeted by the design.

PIR occupancy control will be used for lighting in areas that will have intermittent occupancy. Daylight sensors will be applied to perimeter zones with high lux levels and generous glazing e.g. Reception. All lighting control will target a parasitic energy demand no greater than 0.05W/m$^2$.

The lighting system will have provision for metering with a warning for 'out of range' values.

**Table 3: Lighting Power Densities and Control**

| Element | LPD (W/m$^2$ per 100lux) | Control | Parasitic Load (W/m$^2$) |
|---|---|---|---|
| Retail | 2.2 | Auto On – Auto Off | 0.05 |
| Reception | 2.2 | Auto On – Auto Off | |
| Corridors, Stores, etc. | 2.8 | Auto On – Auto Off | |
| Storage | 2.4 | Auto On – Auto Off | |
| Sports Hall | 2.2 | Man On – Auto Off + Daylight Dimming (Standalone sensor) | |
| Plant | 2.4 | Manual On / Off | |

## 4.10.2. Power Factor Correction

Most electrical equipment creates an inductive load on the supply which requires a magnetic field to operate, and when this magnetic field is created, the electricity current will lag the electricity voltage, i.e. the current will not be in phase with the voltage. Power Factor Correction compensates for the lagging current by applying a leading current, reducing the power factor to close to unity. Power factor correction >0.95 will be installed on the incoming electricity supply.

# 5. Be Clean: Heating Infrastructure including CHP

Combined heat and power (CHP), also known as co-generation, is the simultaneous generation of both useable heat and electrical power from the same source. CHP systems can be used in applications where there is a significant year-round demand for heating in addition to the electricity generated.

A CHP unit comprises of an engine (referred to as the prime mover) in which fuel is combusted. The mechanical power produced by the engine is used to generate electricity using an integral electrical generator. The heat emitted from the engine (waste heat) is used to provide space heating and domestic hot water. In order for CHP engines to be economic they must run for between 4,500 and 5,000 hours per annum therefore are usually sized on or below the base loads.

There is currently no district heating and cooling network existing or proposed in the vicinity of the site which the proposed building could utilise.

There are site opportunities for the implementation of CHP due in part to the large number of bedrooms which will generate a constant year-round demand for Domestic Hot Water.

The new NZEB guidance no longer deems heat from CHP to be renewable, with only electricity accounted for in NZEB calculation. Biogas would need to be used in order for both heat and power to be accounted for in NZEB.

As a centralised water based heating system will be installed for Domestic Hot Water production, then there is scope of incorporate a CHP. In this case we would propose a CHP which has a heat capacity of 40kW with an electrical output of 20kW and a Heat to Power ratio of 2.0.

An A3 BER is achieved with the addition of the micro CHP to this new development when using central heating using water via convectors.

# 6. Be Green: Low or Zero Carbon Technologies

Following a Low or Zero Carbon (LZC) technologies feasibility study, it has been concluded that air source heat pumps (ASHP) and solar Photovoltaic (PV) are the most suitable renewable energy technologies to the proposed development.

**Table 4: LZC Feasibility**

| Technology | Feasibility | | | Comments |
|---|---|---|---|---|
| | H | M | L | |
| Micro Wind<br> | | | √ | Micro wind turbines can be fitted to the roof of a building but would contribute a negligible amount of energy to the development.<br><br>Due to the urban nature of the site, these have been deemed unviable for this site. Vertical axis wind turbines may be more suited to this building, but there would be the obvious aesthetic and potential noise issues. |
| Wind Power<br> | | | √ | Mast-mounted wind turbines can be located in an open area away from obstructions such as buildings and tall trees.<br><br>Due to the urban location of the site, and its location close to other tall buildings it is deemed that a large wind turbine installation is not feasible. |
| Solar Photovoltaic (roof mounted)<br> | √ | | | Photovoltaic (PV) Cell technology involves the conversion of the sun's energy into electricity. PV panels can be discrete roof-mounted units or embedded in conventional windows, skylights, atrium glazing, façade cladding etc.<br><br>PV is easily applicable to most developments pending adequate area availability at roof level, or potentially integrated into the building façade (Building Integrated PV, BIPV). Due to the additional cost and reduced output of BIPV system they are typically considered complementary to a primary renewable energy installation.<br><br>Photovoltaics are deemed to be well suited to this development. A feasibly study into capacity will be undertaken at detailed design stage. |

| Technology | Feasibility | | | Comments |
|---|---|---|---|---|
| | H | M | L | |
| Solar hot water systems  | | √ | | Active solar hot water technology uses the sun's thermal radiation energy to heat fluid through a collector in an active process.<br><br>Solar thermal could be considered feasible due to the constant demand for Domestic Hot Water is these facilities.<br>However, the payback on these systems tend to be greater than 10 years which puts this technology at a disadvantage when compared to CHP which is the preferred solution for this site.<br><br>Solar thermal systems also require regular maintenance.<br><br>As CHP is the preferred solution, solar thermal has been discounted as an option. |
| Biomass Heating  | | | √ | Biomass boilers work on the principle that the combustion of wood chip or pellets can create heat for space heating and hot water loads.<br><br>This technology requires space allowance in a boiler room, access for delivery trucks, a thermal accumulator tank and considerable space for fuel storage of wood chips or pellets. The system also requires regular maintenance to remove ash etc.<br><br>The use of biomass calls for a continuous local supply of suitable fuel to be truly sustainable.<br><br>Concerns exist over the level of NOx and particulate emissions from biomass boiler installations, particularly in urban areas.<br><br>Moreover, such a system is most suitable as an alternative to oil or solid fuels where natural gas is not available. The high efficiency of the proposed condensing gas boiler system means biomass boilers are not a feasible option for the development. |
| Ground source heat pump (GSHP) Closed loop | | | √ | GSHP technologies exploit seasonal temperature differences between ground and air temperatures to provide heating in the winter and cooling in the summer. GSHP systems use some electricity to run the heat pump, but as most of the energy is taken from the ground, they produce less greenhouse gas than conventional heating systems. |

| Technology | Feasibility | | | Comments |
|---|---|---|---|---|
| | H | M | L | |
|  | | | | Ground source heat systems deliver low temperature heat and high temperature cooling, suitable for underfloor heating or chilled beams.<br><br>Site restrictions would require the use of vertical boreholes as opposed to horizontal ground loops. GSHP technology would need further investigation during detailed design and will depend on a favourable ground Thermal Response Test.<br><br>Additionally capital costs are high and ideally, there should be a good balance between heating and cooling loads to allow for high COPs and reasonable capital payback. While a well-designed GSHP system operating under favourable conditions can achieve better efficiencies than the proposed system, the capital cost difference may lead to an unacceptable payback period. |
| Air source heat pump (ASHP)<br> | √ | | | ASHP technologies exploit seasonal temperature differences between external air and refrigerant temperatures to provide heating in the winter and cooling in the summer. ASHP systems use more electricity to run the heat pump when compared to GSHP, but as most of the energy is taken from the air, they produce less greenhouse gas than conventional heating systems over the heating season.<br><br>Their COP can reduce to below 2.0 when outside air temperatures are ≤0°C and they can require additional energy for a defrost cycle.<br><br>Heat Pump Boilers (HPB) will be examined during detailed design as the technology now allows for generation of higher water temperatures without the need for back-up electrical heaters.<br><br>These offer an alternative to fossil fuel gas boilers and may contribute towards reaching NZEB targets. They would be sized to provide baseload heating with gas boiler back up. However, they would require access to outdoor air and would need to be located either at ground or roof level.<br>Due to the sensitive nature of the site, it is unlikely that these can be located at roof level. |


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# 7. NEAP Calculation

A number of NEAP calculations have been carried out based on the adopted energy hierarchy in order to demonstrate compliance with Part L and to guide the design towards achieving the targeted BER certification.

In order to establish a reference point by which to measure the improvement of proposed design measures, a basecase scenario was first assessed. The basecase scenario uses the same building geometry with building fabric and M&E services meeting the minimum requirements stated by Part L.

## 7.1. SBEM Outputs

Appendix 2 contains the NEAP output which demonstrates Part L compliance (BRIRL) for the proposed design. Appendix 3 contains the Provisional BER demonstrating the achievement of an "A3" rating. (Note that the BER has been calculated using IES VE Compliance 7.0.12.0 or iSBEM v5.5.h. BERs could change in the future with updates to software due to improvements in methodology and revised Electricity Primary Energy Factor).

# 8. Sustainability and Accreditation

The proposed development will meet the highest standards of sustainable design and construction solutions were possible. During design and construction the following sustainability considerations will be inherently addressed to ensure the overall development;

- Makes most efficient use of land and existing buildings
- Reduces carbon dioxide and other emissions that contribute to climate change
- Is designed for flexible use throughout its lifetime
- Minimises energy use, including by passive solar design, natural ventilation, and vegetation (green roofs etc.) on buildings
- Minimises energy use, including passive solar design and natural ventilation
- Supplies energy efficiently and incorporates decentralised energy systems such as District Heating and uses renewable energy where feasible
- Manages flood risk, including application of sustainable drainage systems (SuDS) and flood resilient design for infrastructure and property
- Reduces air and water pollution
- Is comfortable and secure for its users
- Conserves and enhances the natural environment, particularly in relation to biodiversity, and enables ready access to open spaces
- Avoids the creation of adverse local climatic conditions
- Promotes sustainable waste behaviour
- Reduces adverse noise impacts internally and externally

# Appendix 1: SBEM INPUTS

The NEAP calculations are based on the following provisional inputs:

- Building Fabric Performance
  - External Wall U-value = 0.18 $W/m^2K$
  - Ground/Exposed Floor U-value = 0.15 $W/m^2K$
  - Flat Roof U-value = 0.10 $W/m^2K$
  - Curtain Wall U-value = 1.2 $W/m^2K$
  - Glazing U-value = 1.2 $W/m^2K$
  - Glazing G-value = 0.35 (35%)*
  - Glazing G-value - Sports Hall = 0.23 (23%)*
- Air permeability = 4.0 $m^3/m^2/hr$ at 50 Pa

- Ventilation
  - Lossnay Heat Recovery Unit = 1.5 W/l/s
  - Heat Exchanger Efficiency = 80%
  - Extract rate Toilets/Changing = 10 ACH
  - Extract SFP = 0.4 W/l/s
  - Fan within zone = Yes

- HVAC system in building
  - Central heating using water convectors
  - Boiler seasonal efficiency = 95.5%
  - ASHP SCOP = 4.05
  - Variable speed pumping = Yes

- HVAC system in Restaurant / Cafe / Crèche / Amenity Spaces
  - VRF
  - VRF SEER = 9.68
  - VRF SCOP = 4.30

- Renewables to meet NZEB requirements
    - PV - Amenity Spaces = $100m^2$
- Domestic Hot Water Heating
  - serviced via central heating boiler
    - Storage volume = 6,500ltr
    - Storage losses = 0.004kWh/(ltr*24hr)
    - Secondary circ. losses = 8.7W/m
    - Secondary circ. Pump Power = 0.2kW
- Lighting
  - Sports Hall = 3 $W/m^2$/100lux (LED)
    - PIRs in all zones
    - Photoelectric dimming
  - Commercial units = 2 $W/m^2$/100lux (LED)
    - PIRs in all zones
    - Photoelectric dimming
  - Landlord core areas = 2.5 $W/m^2$/100lux
    - PIRs in all applicable zones
    - Energy efficient display lamps = Yes (22lumen per circuit Watt)

- Sub metering of major M&E systems = Yes**
- Lighting systems have provision for metering = No
- Lighting metering warns "out of range" values = No
- Power Factor correction = Yes (>0.95)

**Subject to refined Solar Gain Assessment results.*

***Energy Monitoring and Targeting system (M&T)*

# Appendix 2: BRIRL Compliance Reports

# BRIRL Output Document

Compliance Assessment with the Building Regulations (Ireland) TGD-Part L 2017

**This report demonstrates compliance with specific aspects of Part L of the Building Regulations. Compliance with all aspects of Part L is a legal requirement. Demonstration of how compliance with every aspect is achieved may be sought from the Building Control Authority.**

# [2019] 20_D037 Blake's St

**Date:** Fri May 29 19:43:37 2020

## Administrative information

### Building Details

**Address:** Address 1, Address 2, Address 3, Address 4, Co. Carlow, Eircode

### NEAP

**Calculation engine:** SBEMIE

**Calculation engine version:** v5.5.h.1

**Interface to calculation engine:** Virtual Environment

**Interface to calculation engine version:** 7.0.12

**BRIRL compliance check version:** v5.5.h.0

### Client Details

**Name:** Name

**Telephone number:** Phone

**Address:** Street Address, Co. Carlow, Eircode

### Energy Assessor Details

**Name:** Name

**Telephone number:** Phone

**Email:** you@yourISP

**Address:** Street Address, Co. Carlow, Eircode

## Primary Energy Consumption, CO2 Emissions, and Renewable Energy Ratio

The compliance criteria in the TGD-L have been met.

| | |
|---|---|
| Calculated CO2 emission rate from Reference building | 52 kgCO2/m2.annum |
| Calculated CO2 emission rate from Actual building | 53.3 kgCO2/m2.annum |
| **Carbon Performance Coefficient (CPC)** | 1.03 |
| **Maximum Permitted Carbon Performance Coefficient (MPCPC)** | **1.15** |
| Calculated primary energy consumption rate from Reference building | 282 kWh/m2.annum |
| Calculated primary energy consumption rate from Actual building | 279.8 kWh/m2.annum |
| **Energy Performance Coefficient (EPC)** | 0.99 |
| **Maximum Permitted Energy Performance Coefficient (MPEPC)** | **1** |
| **Renewable Energy Ratio (RER)** | 0.22 |
| **Minimum Renewable Energy Ratio** | **0.2** |

## Heat Transmission through Building Fabric

| Element | $U_{a\text{-}Limit}$ | $U_{a\text{-}Calc}$ | $U_{i\text{-}Limit}$ | $U_{i\text{-}Calc}$ | Surface with maximum U-value* |
|---|---|---|---|---|---|
| Walls** | 0.21 | 0.18 | 0.6 | 0.18 | B500000B_W-1 |
| Floors (ground and exposed) | 0.21 | 0.47 | 0.6 | 0.47 | B500000D_F |
| Pitched roofs | 0.16 | - | 0.3 | - | "No heat loss pitched roofs" |
| Flat roofs | 0.2 | - | 0.3 | - | "No heat loss flat roofs" |
| Windows, roof windows, and rooflights | 1.6 | 1.2 | 3 | 1.2 | B5000008_W0_O0 |
| Personnel doors | 1.6 | 1.2 | 3 | 1.2 | B500000B_W-1_O0 |
| Vehicle access & similar large doors | 1.5 | - | 3 | - | "No ext. vehicle access doors" |
| High usage entrance doors | 3 | - | 3 | - | "No ext. high usage entrance doors" |

$U_{a\text{-}Limit}$ = Limiting area-weighted average U-values [W/(m2K)]
$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [W/(m2K)]
$U_{i\text{-}Limit}$ = Limiting individual element U-values [W/(m2K)]
$U_{i\text{-}Calc}$ = Calculated individual element U-values [W/(m2K)]

* There might be more than one surface with the maximum U-value. ** Automatic U-value check by the tool does not apply to curtain walls whose area-weighted average and individual limiting standards are 1.8 and 3 W/m2K, respectively.

| Air Permeability | Upper Limit | This Building's Value |
|---|---|---|
| m3/(h.m2) at 50 Pa | 5 | 3 |

*Figure 4: Sports Hall BRIRL*

# BRIRL Output Document

Compliance Assessment with the Building Regulations (Ireland) TGD-Part L 2017

**This report demonstrates compliance with specific aspects of Part L of the Building Regulations. Compliance with all aspects of Part L is a legal requirement. Demonstration of how compliance with every aspect is achieved may be sought from the Building Control Authority.**

# [2019] 20_D037 Blake's St

**Date:** Fri May 29 17:25:18 2020

## Administrative information

### Building Details

**Address:** Address 1, Address 2, Address 3, Address 4, Co. Carlow, Eircode

### NEAP

**Calculation engine:** SBEMIE

**Calculation engine version:** v5.5.h.1

**Interface to calculation engine:** Virtual Environment

**Interface to calculation engine version:** 7.0.12

**BRIRL compliance check version:** v5.5.h.0

### Client Details

**Name:** Name

**Telephone number:** Phone

**Address:** Street Address, Co. Carlow, Eircode

### Energy Assessor Details

**Name:** Name

**Telephone number:** Phone

**Email:** you@yourISP

**Address:** Street Address, Co. Carlow, Eircode

## Primary Energy Consumption, CO2 Emissions, and Renewable Energy Ratio

The compliance criteria in the TGD-L have been met.

| | |
|---|---|
| Calculated CO2 emission rate from Reference building | 42.1 kgCO2/m2.annum |
| Calculated CO2 emission rate from Actual building | 41.7 kgCO2/m2.annum |
| **Carbon Performance Coefficient (CPC)** | **0.99** |
| **Maximum Permitted Carbon Performance Coefficient (MPCPC)** | **1.15** |
| Calculated primary energy consumption rate from Reference building | 217.7 kWh/m2.annum |
| Calculated primary energy consumption rate from Actual building | 216.4 kWh/m2.annum |
| **Energy Performance Coefficient (EPC)** | **0.99** |
| **Maximum Permitted Energy Performance Coefficient (MPEPC)** | **1** |
| **Renewable Energy Ratio (RER)** | **0.36** |
| **Minimum Renewable Energy Ratio** | **0.2** |

## Heat Transmission through Building Fabric

| Element | $U_{a\text{-}Limit}$ | $U_{a\text{-}Calc}$ | $U_{i\text{-}Limit}$ | $U_{i\text{-}Calc}$ | Surface with maximum U-value* |
|---|---|---|---|---|---|
| Walls** | 0.21 | 0.18 | 0.6 | 0.18 | B6000002_W1 |
| Floors (ground and exposed) | 0.21 | 0.47 | 0.6 | 0.47 | B6000002_F |
| Pitched roofs | 0.16 | - | 0.3 | - | "No heat loss pitched roofs" |
| Flat roofs | 0.2 | - | 0.3 | - | "No heat loss flat roofs" |
| Windows, roof windows, and rooflights | 1.6 | 1.2 | 3 | 1.2 | B6000002_W1_O0 |
| Personnel doors | 1.6 | 1.2 | 3 | 1.2 | B6000002_W1_O2 |
| Vehicle access & similar large doors | 1.5 | - | 3 | - | "No ext. vehicle access doors" |
| High usage entrance doors | 3 | - | 3 | - | "No ext. high usage entrance doors" |

$U_{a\text{-}Limit}$ = Limiting area-weighted average U-values [W/(m2K)]
$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [W/(m2K)]
$U_{i\text{-}Limit}$ = Limiting individual element U-values [W/(m2K)]
$U_{i\text{-}Calc}$ = Calculated individual element U-values [W/(m2K)]

* There might be more than one surface with the maximum U-value. ** Automatic U-value check by the tool does not apply to curtain walls whose area-weighted average and individual limiting standards are 1.8 and 3 W/m2K, respectively.

| Air Permeability | Upper Limit | This Building's Value |
|---|---|---|
| m3/(h.m2) at 50 Pa | 5 | 3 |

*Figure 5: Commercial Unit BRIRL*

# BRIRL Output Document

Compliance Assessment with the Building Regulations (Ireland) TGD-Part L 2017

**This report demonstrates compliance with specific aspects of Part L of the Building Regulations. Compliance with all aspects of Part L is a legal requirement. Demonstration of how compliance with every aspect is achieved may be sought from the Building Control Authority.**

# [2019] 20_D037 Blake's St

**Date:** Fri Jan 29 20:16:42 2021

## Administrative information

### Building Details

**Address:** Address 1, Address 2, Address 3, Address 4, Co. Carlow, Eircode

### NEAP

**Calculation engine:** SBEMIE

**Calculation engine version:** v5.5.h.2

**Interface to calculation engine:** Virtual Environment

**Interface to calculation engine version:** 7.0.13

**BRIRL compliance check version:** v5.5.h.2

### Client Details

**Name:** Name

**Telephone number:** Phone

**Address:** Street Address, Co. Carlow, Eircode

### Energy Assessor Details

**Name:** Name

**Telephone number:** Phone

**Email:** you@yourISP

**Address:** Street Address, Co. Carlow, Eircode

## Primary Energy Consumption, CO2 Emissions, and Renewable Energy Ratio

The compliance criteria in the TGD-L have been met.

| | |
|---|---|
| Calculated CO2 emission rate from Reference building | 8.5 kgCO2/m2.annum |
| Calculated CO2 emission rate from Actual building | 7.7 kgCO2/m2.annum |
| **Carbon Performance Coefficient (CPC)** | **0.91** |
| **Maximum Permitted Carbon Performance Coefficient (MPCPC)** | **1.15** |
| Calculated primary energy consumption rate from Reference building | 44.3 kWh/m2.annum |
| Calculated primary energy consumption rate from Actual building | 39.5 kWh/m2.annum |
| **Energy Performance Coefficient (EPC)** | **0.89** |
| **Maximum Permitted Energy Performance Coefficient (MPEPC)** | **1** |
| **Renewable Energy Ratio (RER)** | **0.17** |
| **Minimum Renewable Energy Ratio** | **0.1** |

## Heat Transmission through Building Fabric

| **Element** | **$U_{a\text{-}Limit}$** | **$U_{a\text{-}Calc}$** | **$U_{i\text{-}Limit}$** | **$U_{i\text{-}Calc}$** | **Surface with maximum U-value*** |
|---|---|---|---|---|---|
| Walls** | 0.21 | 0.12 | 0.6 | 0.18 | B100001C_W1 |
| Floors (ground and exposed) | 0.21 | 0.16 | 0.6 | 1.09 | B1000016_F_A1 |
| Pitched roofs | 0.16 | - | 0.3 | - | "No heat loss pitched roofs" |
| Flat roofs | 0.2 | 0.11 | 0.3 | 1.09 | L000000A_C_A2 |
| Windows, roof windows, and rooflights | 1.6 | 1.2 | 3 | 1.2 | B100000A_W1_O0 |
| Personnel doors | 1.6 | 1.2 | 3 | 1.2 | B1000001_W2_O0 |
| Vehicle access & similar large doors | 1.5 | - | 3 | - | "No ext. vehicle access doors" |
| High usage entrance doors | 3 | - | 3 | - | "No ext. high usage entrance doors" |

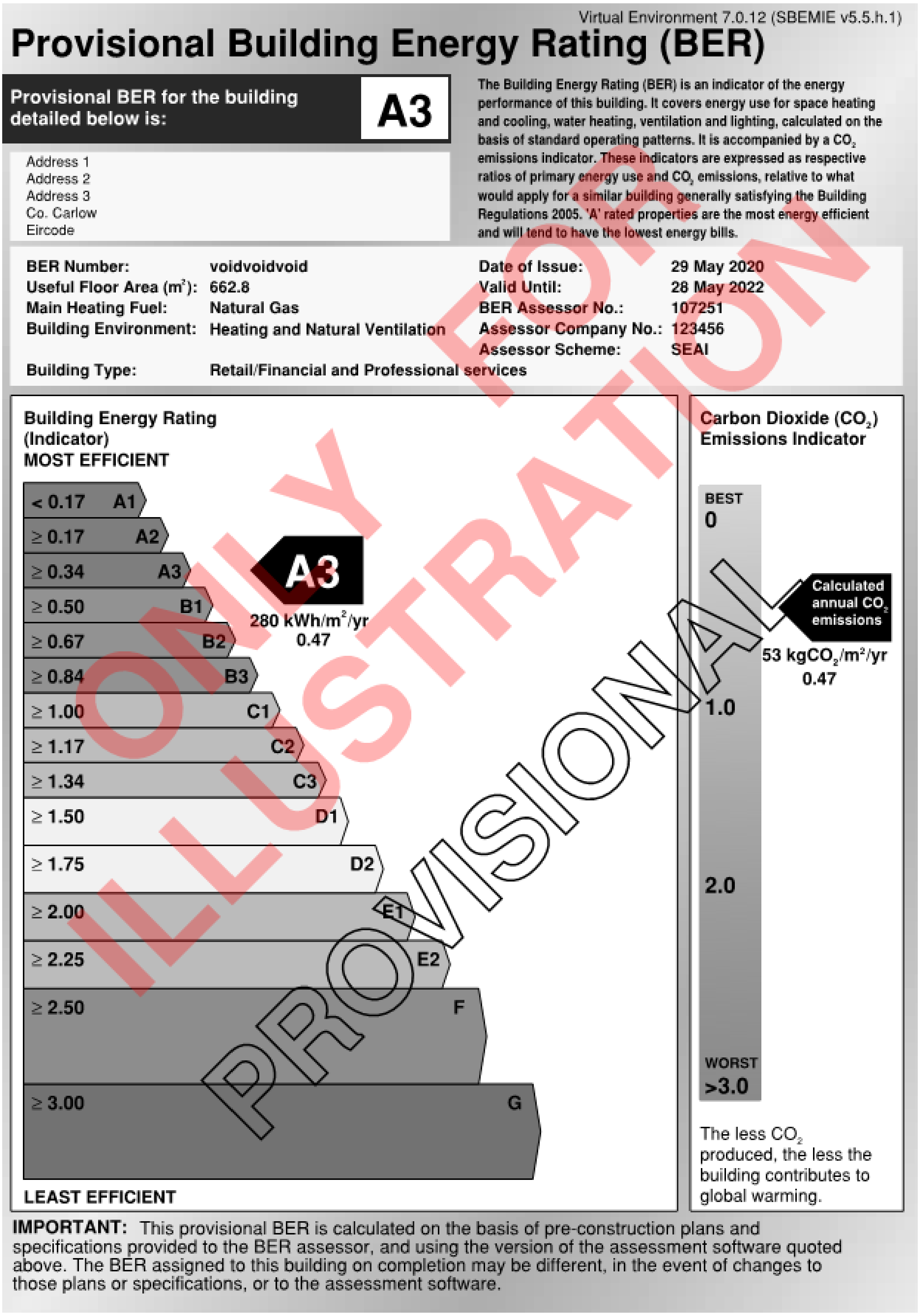
$U_{a\text{-}Limit}$ = Limiting area-weighted average U-values [W/(m2K)]
$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [W/(m2K)]
$U_{i\text{-}Limit}$ = Limiting individual element U-values [W/(m2K)]
$U_{i\text{-}Calc}$ = Calculated individual element U-values [W/(m2K)]

* There might be more than one surface with the maximum U-value. ** Automatic U-value check by the tool does not apply to curtain walls whose area-weighted average and individual limiting standards are 1.8 and 3 W/m2K, respectively.

| **Air Permeability** | **Upper Limit** | **This Building's Value** |
|---|---|---|
| m3/(h.m2) at 50 Pa | 5 | 4 |

*Figure 7: Communal areas BRIRL*

# Appendix 3: Provisional BER



Virtual Environment 7.0.12 (SBEMIE v5.5.h.1)

**Provisional Building Energy Rating (BER)**

**Provisional BER for the building detailed below is: A3**

The Building Energy Rating (BER) is an indicator of the energy performance of this building. It covers energy use for space heating and cooling, water heating, ventilation and lighting, calculated on the basis of standard operating patterns. It is accompanied by a $CO_2$ emissions indicator. These indicators are expressed as respective ratios of primary energy use and $CO_2$ emissions, relative to what would apply for a similar building generally satisfying the Building Regulations 2005. 'A' rated properties are the most energy efficient and will tend to have the lowest energy bills.

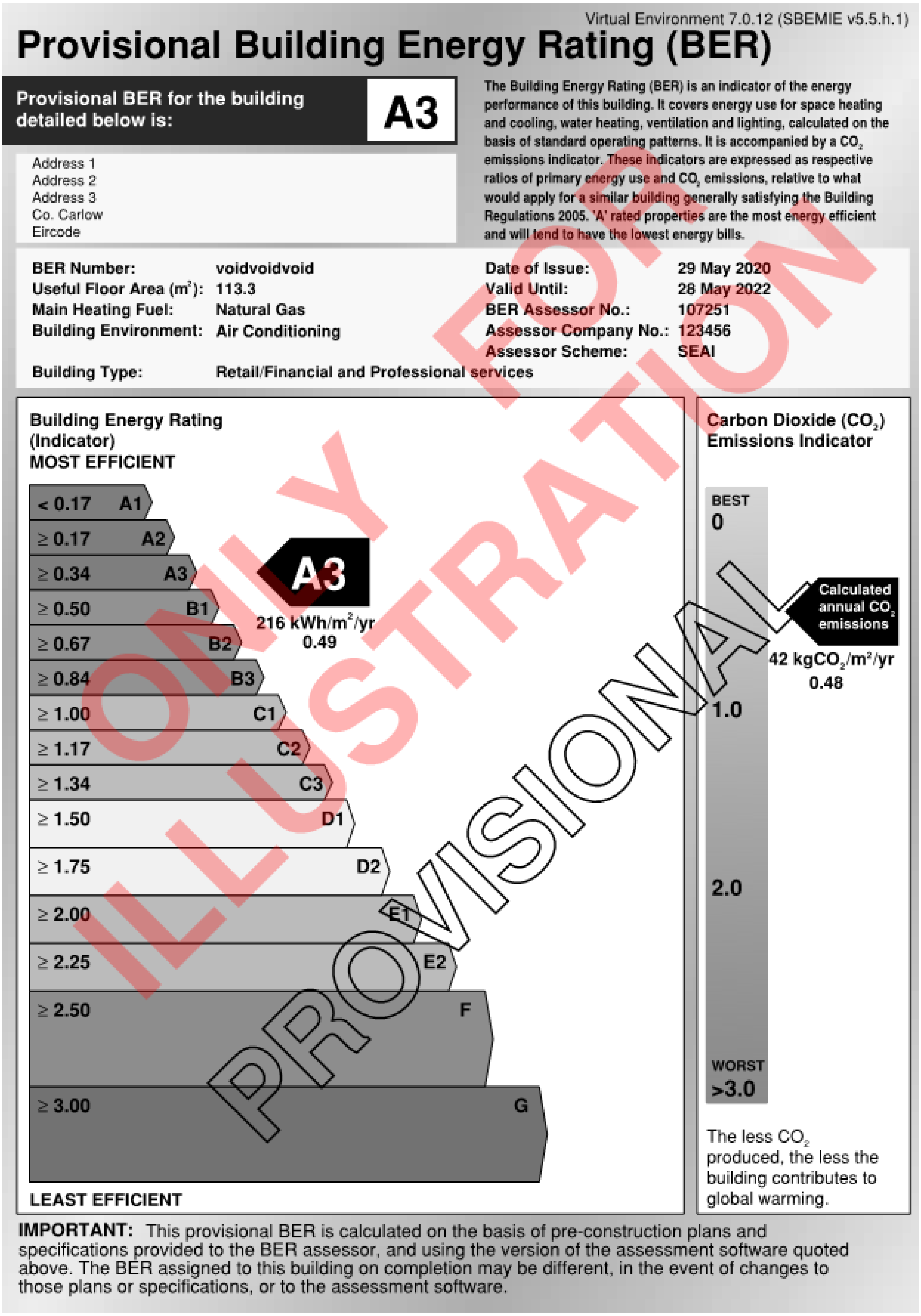
Address 1
Address 2
Address 3
Co. Carlow
Eircode

| | | | |
|---|---|---|---|
| BER Number: | voidvoidvoid | Date of Issue: | 29 May 2020 |
| Useful Floor Area ($m^2$): | 662.8 | Valid Until: | 28 May 2022 |
| Main Heating Fuel: | Natural Gas | BER Assessor No.: | 107251 |
| Building Environment: | Heating and Natural Ventilation | Assessor Company No.: | 123456 |
| | | Assessor Scheme: | SEAI |
| Building Type: | Retail/Financial and Professional services | | |



**IMPORTANT:** This provisional BER is calculated on the basis of pre-construction plans and specifications provided to the BER assessor, and using the version of the assessment software quoted above. The BER assigned to this building on completion may be different, in the event of changes to those plans or specifications, or to the assessment software.

*Figure 6: Sports Hall BER*



Virtual Environment 7.0.12 (SBEMIE v5.5.h.1)

# Provisional Building Energy Rating (BER)

**Provisional BER for the building detailed below is:** **A3**

Address 1
Address 2
Address 3
Co. Carlow
Eircode

The Building Energy Rating (BER) is an indicator of the energy performance of this building. It covers energy use for space heating and cooling, water heating, ventilation and lighting, calculated on the basis of standard operating patterns. It is accompanied by a $CO_2$ emissions indicator. These indicators are expressed as respective ratios of primary energy use and $CO_2$ emissions, relative to what would apply for a similar building generally satisfying the Building Regulations 2005. 'A' rated properties are the most energy efficient and will tend to have the lowest energy bills.

| | | | |
|---|---|---|---|
| **BER Number:** | voidvoidvoid | **Date of Issue:** | 29 May 2020 |
| **Useful Floor Area ($m^2$):** | 113.3 | **Valid Until:** | 28 May 2022 |
| **Main Heating Fuel:** | Natural Gas | **BER Assessor No.:** | 107251 |
| **Building Environment:** | Air Conditioning | **Assessor Company No.:** | 123456 |
| | | **Assessor Scheme:** | SEAI |
| **Building Type:** | Retail/Financial and Professional services | | |

**Building Energy Rating (Indicator)**
**MOST EFFICIENT**

| | |
|---|---|
| < 0.17 | A1 |
| ≥ 0.17 | A2 |
| ≥ 0.34 | A3 |
| ≥ 0.50 | B1 |
| ≥ 0.67 | B2 |
| ≥ 0.84 | B3 |
| ≥ 1.00 | C1 |
| ≥ 1.17 | C2 |
| ≥ 1.34 | C3 |
| ≥ 1.50 | D1 |
| ≥ 1.75 | D2 |
| ≥ 2.00 | E1 |
| ≥ 2.25 | E2 |
| ≥ 2.50 | F |
| ≥ 3.00 | G |

A3
216 kWh/$m^2$/yr
0.49

**LEAST EFFICIENT**

**Carbon Dioxide ($CO_2$) Emissions Indicator**

BEST
0
1.0
2.0
WORST
>3.0

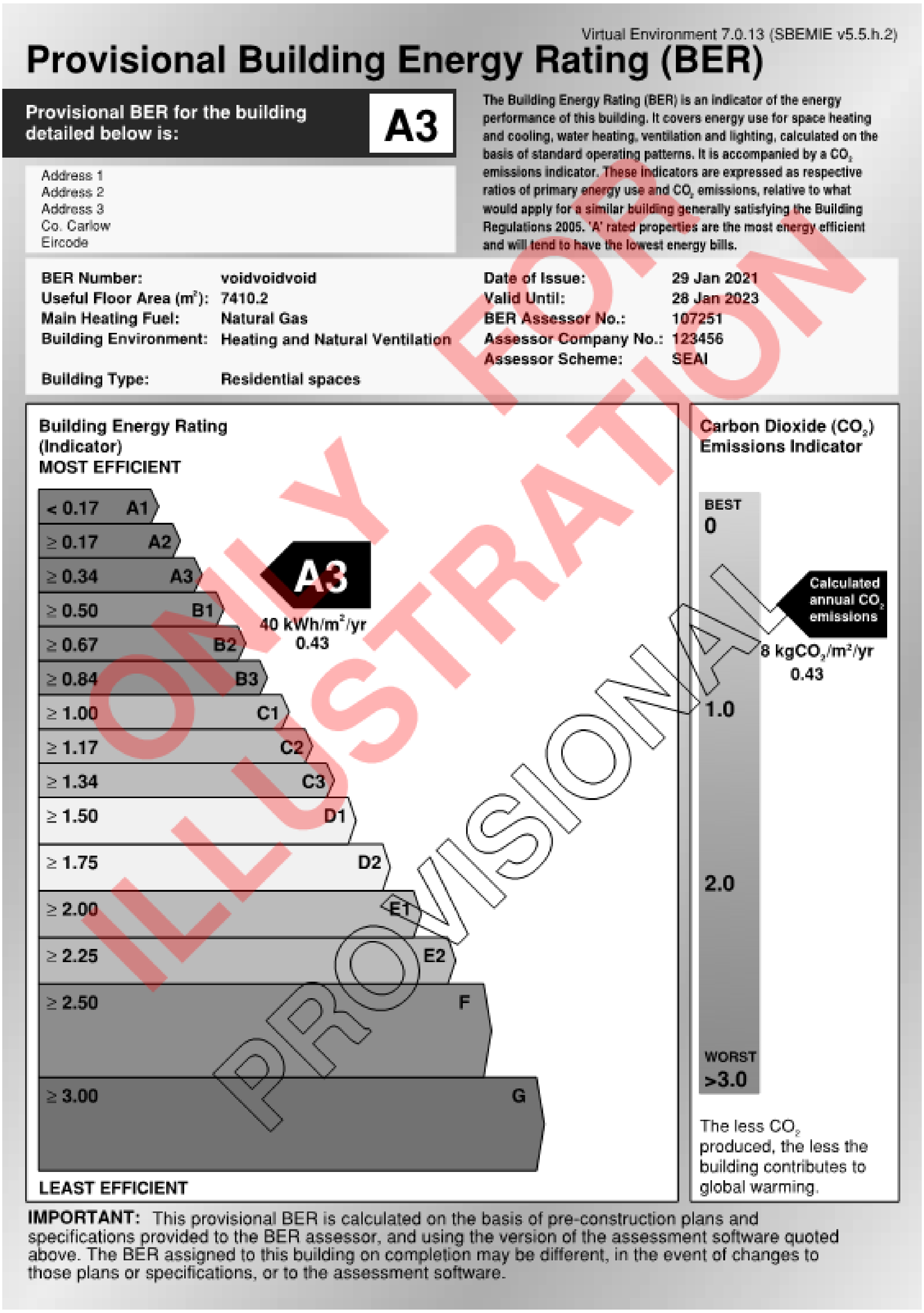
Calculated annual $CO_2$ emissions
42 $kgCO_2/m^2/yr$
0.48

The less $CO_2$ produced, the less the building contributes to global warming.

**IMPORTANT:** This provisional BER is calculated on the basis of pre-construction plans and specifications provided to the BER assessor, and using the version of the assessment software quoted above. The BER assigned to this building on completion may be different, in the event of changes to those plans or specifications, or to the assessment software.



*Figure 7:Commercial Unit BER*



Virtual Environment 7.0.13 (SBEMIE v5.5.h.2)

# Provisional Building Energy Rating (BER)

**Provisional BER for the building detailed below is:** **A3**

The Building Energy Rating (BER) is an indicator of the energy performance of this building. It covers energy use for space heating and cooling, water heating, ventilation and lighting, calculated on the basis of standard operating patterns. It is accompanied by a $CO_2$ emissions indicator. These indicators are expressed as respective ratios of primary energy use and $CO_2$ emissions, relative to what would apply for a similar building generally satisfying the Building Regulations 2005. 'A' rated properties are the most energy efficient and will tend to have the lowest energy bills.

Address 1
Address 2
Address 3
Co. Carlow
Eircode

| | | | |
|---|---|---|---|
| **BER Number:** | voidvoidvoid | **Date of Issue:** | 29 Jan 2021 |
| **Useful Floor Area ($m^2$):** | 7410.2 | **Valid Until:** | 28 Jan 2023 |
| **Main Heating Fuel:** | Natural Gas | **BER Assessor No.:** | 107251 |
| **Building Environment:** | Heating and Natural Ventilation | **Assessor Company No.:** | 123456 |
| | | **Assessor Scheme:** | SEAI |
| **Building Type:** | Residential spaces | | |



**IMPORTANT:** This provisional BER is calculated on the basis of pre-construction plans and specifications provided to the BER assessor, and using the version of the assessment software quoted above. The BER assigned to this building on completion may be different, in the event of changes to those plans or specifications, or to the assessment software.

*Figure 9: Communal areas BER*

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ISO 14001:2004 EQA ENVIRONMENTAL APPROVED SYSTEM
OHSAS 18001:2007 EQA OCCUPATIONAL, HEALTH & SAFETY APPROVED SYSTEM