# PART L COMPLIANCE REPORT

# FOR

# UNIPHAR WAREHOUSE

# AT

# SITE C, COLLEGE LANE, GREENOGUE, RATHCOOLE, CO. DUBLIN

# FOR

# JORDANSTOWN PROPERTIES LTD

Date of Issue: 05/07/2021 Version: 0.0

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## Document History

| Version No. | Description | Prepared By | Reviewed By | Date |
|---|---|---|---|---|
| 0.0 | Part L Compliance assessment | DN | EN | 05/07/2021 |
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# Contents

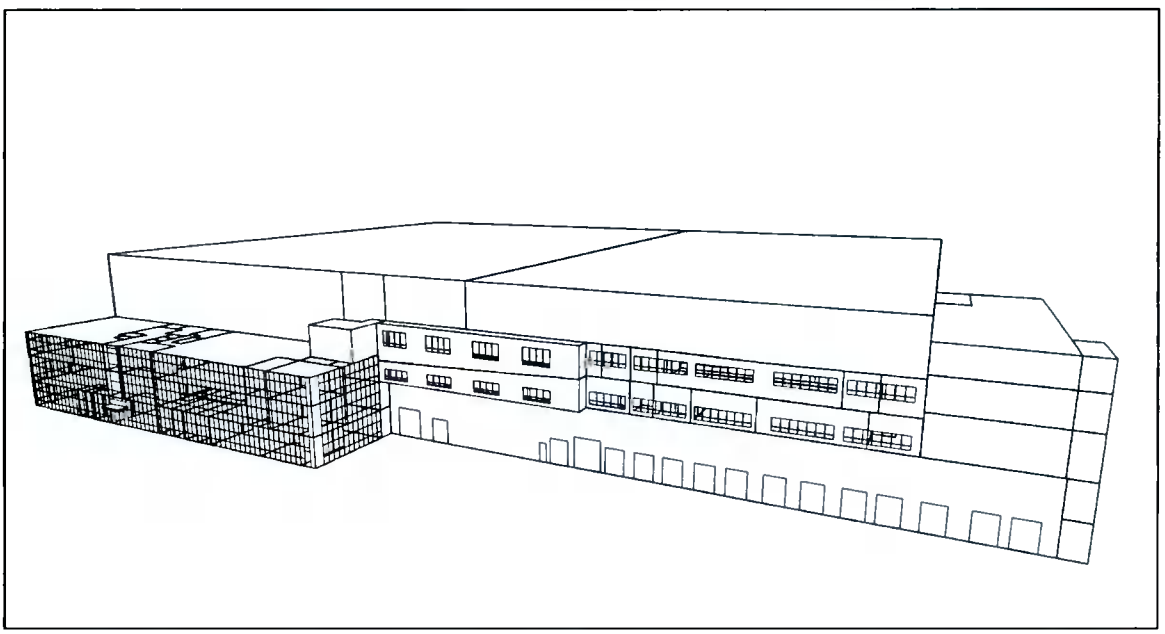
# 1. Executive Summary

With consideration to the EU energy performance of Buildings Directive (EPBD), the Building Regulations Technical Guidance Document, Part L (NZEB), for sustainable design and reductions in energy and carbon emissions, the building services design strategy for this development utilises sustainable design options and energy efficient systems that are technically, environmentally and economically feasible for a project of this kind.

The strategy targets a low energy and environmentally friendly building. This report will demonstrate that the design philosophy for the proposed development will employ a holistic approach to the construction and integration of the building, its systems and its users.

The design team recognises the need for the building to be designed and operated in a manner that reduces the energy consumption and carbon emission of the building. This objective will be achieved in an economical manner whilst maintaining an internal environment that is functional as a warehouse and comfortable for occupants.

To meet the target set out for the proposed development, the energy modelling software used in the analysis is IES <VE2019> which utilises the new SBEMie 5.5.h calculation engine. The analysis was undertaken to identify the most suitable design for the proposed development in terms of energy efficiency, recued carbon output and the application of renewable technologies. The proposed design outlined in this report demonstrates that the development will be compliant with Part L of the Building Regulations (Nearly Zero Energy Buildings) and will achieve a Building Energy Rating (BER) of A3.



The $CO_2$ emission rate from the proposed building is less than that of the reference building used in the Part L assessment. The calculated primary energy consumption rate of the proposed building is also less than that of the reference building. The following table demonstrates compliance and indicates the calculated results of the proposed building versus the reference building under Part L Technical guidance document;

| 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 | 27 kgCO2/m2.annum |
| Calculated CO2 emission rate from Actual building | 23.8 kgCO2/m2.annum |
| **Carbon Performance Coefficient (CPC)** | **0.88** |
| **Maximum Permitted Carbon Performance Coefficient (MPCPC)** | **1.15** |
| Calculated primary energy consumption rate from Reference building | 141.1 kWh/m2.annum |
| Calculated primary energy consumption rate from Actual building | 121.1 kWh/m2.annum |
| **Energy Performance Coefficient (EPC)** | **0.86** |
| **Maximum Permitted Energy Performance Coefficient (MPEPC)** | **1** |
| **Renewable Energy Ratio (RER)** | **0.13** |
| **Minimum Renewable Energy Ratio** | **0.1** |

The calculated energy performance coefficient and carbon performance coefficient of the proposed building do not exceed the maximum permitted under the Part L. The energy and carbon emission performance of the proposed building are less than 14% and 12% of reference building under the Part L 2017 respectively.

In order to achieve the overall Nearly Zero Energy Performance criteria, a renewable energy target, 10%-20% of its energy provided must come from onsite or nearby renewables. The renewable primary energy has been assessed showing the calculation with an RER of 0.13 being achieved under the current proposed design. The energy contribution from the heat pumps is considered to be renewable energy, this equates to 15.74 kWh/m²/year of primary energy being provided on site, approximately 13% of total primary energy come from renewable onsite. The building may also employ PV technology at roof level to increase the renewable energy ratio.

The preliminary building energy rating calculation indicates A3 being achieved for the proposed building.

## 2. Planning Description

Jordanstown Properties intend to apply for permission for development of lands (2.7 hectares) at a site known as 'Site C' College Lane, Greenogue, Rathcoole, Co. Dublin. The development will consist of modifications to a permitted warehouse development (as granted under SDCC Reg. Ref SD19A/0407).

The amendments principally comprise: an overall increase in the commercial floor area by 15,479 sq m from the permitted 13,959 sq m to 29,438 sq m. The permitted scheme has 3 No. internal ancillary office floor levels, and the proposed alterations provide 2 No. mezzanine levels in the warehouse area (i.e a total of 5 No. internal floor levels). The permitted maximum height of the development at 23.7 metres will remain unchanged.

The additional 15,479 sq m development proposed will comprise an increase in the warehouse floor area from 12,369 sq m to 13,353 sq. m, staff facilities from 548 sq m to 2,582 sq m and ancillary office area from 1,042 sq m to 2,437 sq m. Provision of a 2 No. storey mezzanine warehouse area (9,703 sq m), integrated plant room (434 sq m) and plant area on 2 No. floors (929 sq m).

The development will also include the construction of a 2 No. storey car-parking area (4,057 sq m and 7.8m height) to accommodate an increase from the previously permitted 119 No. ancillary car parking spaces to 190 No. car parking spaces; 13 No. designated van parking spaces (no dedicated van spaces previously proposed); 72 No. permitted cycle parking spaces; reconfiguration of the HGV yard and an increase in the number of HGV dock levellers from 12 No. to 14 No. and the provision of 16 No. van loading level entry doors; sprinkler tank and associated underground pumps; repositioned ESB substation (15 sq m and 3 m height); bin storage (42 sq m and 2.9 m height); amended lighting layout; signage; modifications to hard and soft landscaping and boundary treatments; and associated site development works above and below ground.

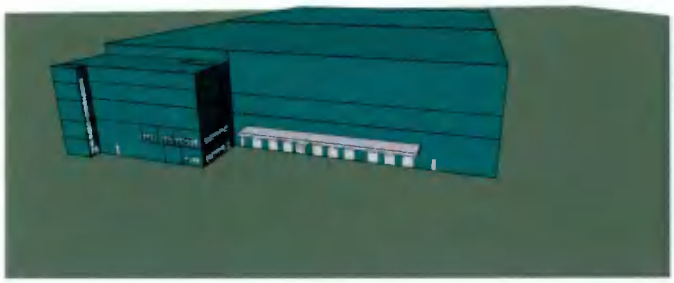
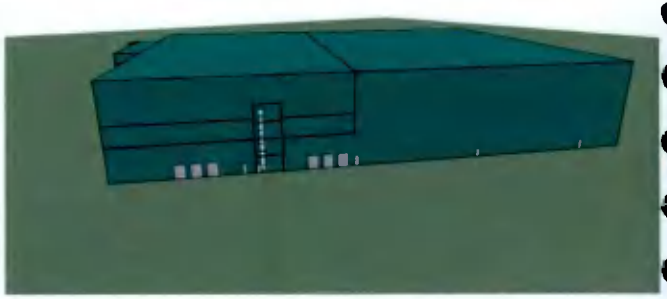
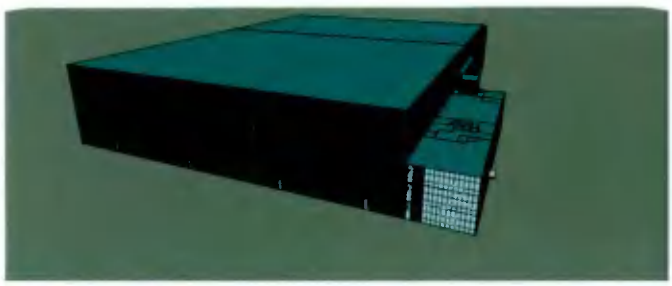
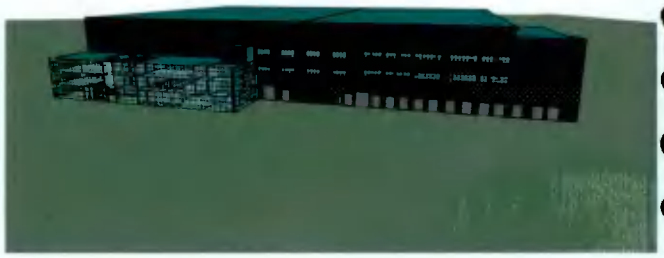
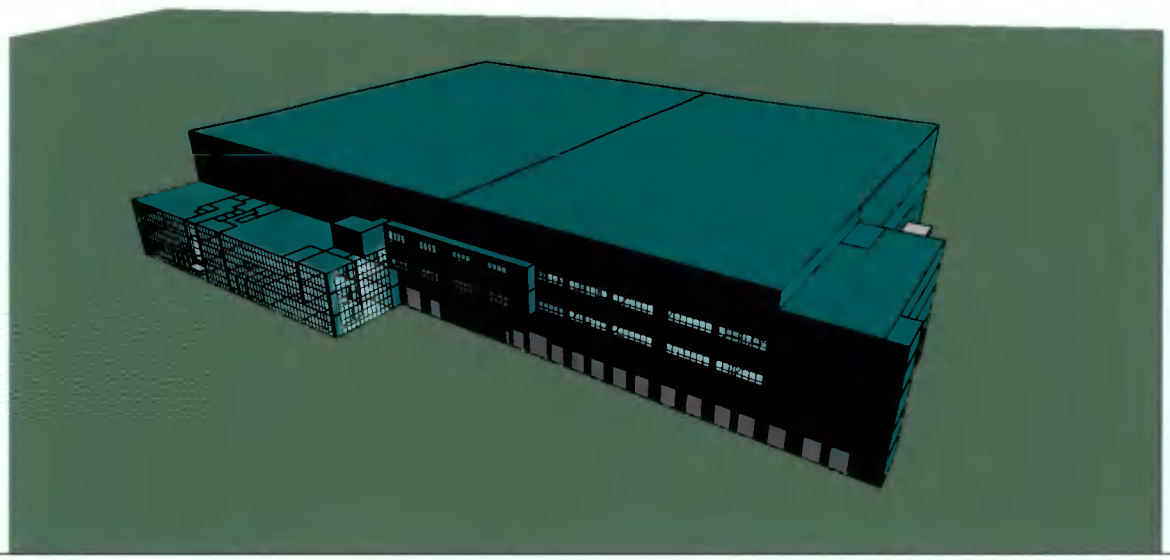
# 3. Introduction

Axiseng was commissioned by Jordanstown Properties Ltd. to undertake a Part L – NZEB / BER analysis on the Industrial temperature-controlled Warehouse for Site C at College Lane, Greenogue, Rathcoole, Co. Dublin. The new building is a large warehouse and multiple storey administration block. The building services strategy for the development has been considered in terms of Part L Compliance (NZEB). The building includes the following energy conservation measures to achieve the most energy effective performance possible;

- High-performance construction envelope including low u-value and solar g-value
- Airtightness construction
- High energy-efficient Variable Refrigerant Flow for heating and cooling system
- High energy-efficiency induction system for heating and cooling system
- Air source heat pump for hot water system
- Heat Recovery in Mechanical Ventilation System
- Low specific fan power installed unit;
- Low installed lighting power & intelligent lighting control including daylight sensors

The sustainable design of the proposed development presents an opportunity to ensure the overall building performs efficiently and meets the NZEB challenges. The model inputs where passive and active design elements will be incorporated and are summarised in the following sections. This report details the proposed design solution used in the analysis and the calculation of the building performance metrics used to show compliance with Part L and BER.

## 4. Geometry

| South | East |
|---|---|
|  |  |
| **North** | **West** |
|  |  |
| **Perspective View** | |
|  | |

## 5. Construction

The following construction has been created based on the proposed u-value which exceed the target u-values set out in Table 1, of the Building Regulation Part L;

| Building Element | Targeted u-value (w/m²K) |
|---|---|
| Exposed Floor | 0.16 |
| External Wall | 0.19 |
| Internal Wall to unheated area | 0.21 |
| Roof | 0.15 |
| Door | 1.43 |
| Vehicle Access | 1/6 |
| Spandrel/Solid panel | 1.6 |
| Window_00 | 1.3 (0.48 g-value) |

The details of construction assigned are illustrated in visualisation image under *Appendices, Assigned construction details* in this report.

The reduction of fabric losses from the proposed development will be achieved by using materials with U-values which are lower than those required by the 2017 Building Regulations, demonstrating the energy efficient approach being adopted for this development.

### 5.1 Thermal Bridging

The following default thermal bridging coefficients input were used;

| | Junctions involving metal cladding | QA accredited | Junctions NOT involving metal cladding | QA accredited |
|---|---|---|---|---|
| Type of junction | Psi (W/(m·K)) | | Psi (W/(m·K)) | |
| Roof-wall | 0.420 | ☐ | 0.180000 | ☐ |
| Wall-ground floor | 1.730 | ☐ | 0.240000 | ☐ |
| Wall-wall (corner) | 0.380 | ☐ | 0.140000 | ☐ |
| Wall-floor (not ground) | 0.040 | ☐ | 0.110000 | ☐ |
| Lintel above window/door | 1.910 | ☐ | 0.450000 | ☐ |
| Sill below window | 1.910 | ☐ | 0.080000 | ☐ |
| Jamb at window/door | 1.910 | ☐ | 0.090000 | ☐ |

The building air permeability was set to the 5 m³/(h.m²) @ 50 pa comply with the Building Regulation Part L in the provision of air tightness.

## 6. Lighting & Control

The following proposed on the lighting installed power and controls are modelled in the thermal model.

| Room | Design Illuminance (Lux) | Installed Power Wattage (w/m2) | Control Type | | | | |
|---|---|---|---|---|---|---|---|
| | | | Occupancy controls | Parasitic Power (w/m2) | Photoelectric | Sensor type | Parasitic Power (w/m2) |
| Warehouse – Mezzanine | 150 | 5 | AUTO-ON-OFF | 0.07 | - | - | - |
| Large Warehouse | 150 | 8 | AUTO-ON-OFF | 0.07 | - | - | - |
| Lobby / Corridor | 200 | 7 | AUTO-ON-OFF | 0.07 | - | - | - |
| Manager Office | 500 | 7 | AUTO-ON-DIMMED | 0.07 | DIMMING | Standalone | 0.07 |
| Open Plan Office | 500 | 7 | AUTO-ON-DIMMED | 0.07 | DIMMING | Standalone | 0.07 |
| Meeting | 400 | 7 | AUTO-ON-DIMMED | 0.07 | DIMMING | Standalone | 0.07 |
| Lobby / Corridor | 200 | 7 | AUTO-ON-OFF | 0.07 | - | - | - |
| Kitchen | 300 | 7 | AUTO-ON-OFF | 0.07 | - | - | - |
| Reception | 400 | 10 | AUTO-ON-OFF | 0.07 | DIMMING | Standalone | 0.10 |
| Toilet | 200 | 7 | AUTO-ON-OFF | 0.07 | - | - | - |
| Changing Facilities | 200 | 7 | AUTO-ON-OFF | 0.07 | | | |
| Storage | 200 | 7 | AUTO-ON-OFF | 0.07 | - | - | - |
| Canteen | 300 | 7 | AUTO-ON-OFF | 0.07 | DIMMING | Standalone | 0.10 |
| Tea Station | 500 | 10 | AUTO-ON-OFF | 0.07 | - | - | - |
| Plant Room | 200 | 10 | AUTO-ON-OFF | 0.07 | - | - | - |
| IT Comms | 300 | 7 | AUTO-ON-OFF | 0.07 | - | - | - |
| Facility Workshop | 400 | 7 | AUTO-ON-OFF | 0.07 | | | |

Automatic daylight control (automatic dimming) in the open plan offices, office, meeting, staff canteen, and reception allows for electrical energy savings as well as increasing the occupant exposure to natural daylight. Other rooms other than open plan office and reception/cafe are to be fitting with presence detection automatic sensors to switching off the lighting when the room are unoccupied.

## 7. HVAC

HVAC system design has been considered to ensure minimal energy requirements in the building. The following table is a list of proposed HVAC system design identified in room types within proposed development;

| Room | HVAC System | Ventilation Type | Heat Recovery Unit | Specific Fan Power (W/l/s) |
|---|---|---|---|---|
| Warehouse | Induction system | Centralised mech Vent | 85% Thermal wheel Variable | 1.90 |
| Office, Meeting, Lounge, Tea Station, Reception, staff canteen, stairs | VRF | Centralised Mech Vent | 85% Thermal wheel | 1.90 |
| IT Comms | Wall mounted split unit | Room air circulation | - | - |
| Showers | LTHW radiator | Centralised Mech Vent | - | 1.90 |
| Showers, Toilet, | LTHW Radiator | Localised exhaust mech Vent | - | 0.5 |
| Stairs, Corridor Lobby, | LTHW Radiator | Room air circulation | - | - |

The proposed HVAC system are selected based upon their efficiency performance, which has been assessed to ascertain their coefficient performance in terms of heating, cooling, and hot water generation. All open plan office, office, meeting room, Reception, and Cafe are to be installed with a mechanically ventilated heat recovery unit served by heating and chilled water from the Variable Refrigerant Flow System. The IT Data Comms is to be fitted with localised wall-mounted split unit system.

The low temperature hot water radiators are to be located in stairways, corridors, toilets, and wet changing rooms.

| Heating Plant System | Cooling Plant System | Domestic Hot Water |
|---|---|---|
| **Generator Type 1** – Induction<br>Heat Source – Heat Pump Air Source<br>Seasonal Efficiency – 3.74<br>Fuel Type – Electricity<br>Pump Type – NA<br><br>**Generator Type 2** – Split Unit (VRF)<br>Heat Source – Heat Pump Air Source<br>Seasonal Efficiency – 3.80<br>Fuel Type – Electricity<br>Pump Type – NA<br><br>**Generator Type 3** – Split Unit<br>Heat Source – Heat Pump Air Source<br>Seasonal Efficiency – 4.40<br>Fuel Type – Electricity<br>Pump Type – NA<br><br>Generator Type 4 – Radiator<br>Heat Source – Heat Pump Air Source<br>Seasonal Efficiency – 3.80<br>Fuel Type – Electricity<br>Pump Type – VSD multiple pressure sensors | **Generator Type 1** – Induction system<br>Heat Source – Heat Pump Air Source<br>EER / SEER – 4.65 / 3.2<br>Fuel Type – Electricity<br><br>**Generator Type 2** – Split Unit (VRF)<br>Heat Source – Heat Pump Air Source<br>EER / SEER – 5.4 / 4.50<br>Fuel Type – Electricity<br><br>**Generator Type 3** – Split Unit<br>Heat Source – Heat Pump Air Source<br>EER / SEER – 5 / 6 4<br>Fuel Type – Electricity | Generator Type 1 – Heat pump (air source)<br>Seasonal Efficiency – 3.80<br>Fuel Type – Electricity<br>Overall Seasonal Efficiency (SCoP) – 3.80<br>Storage Volume (litres) – 2000<br>Storage losses (KWh/(l.day)) – 0.00470<br>Circulation losses (W/m) – 10<br>Loop Length (metres) – 691<br>Pump Power (kW) – 0.2<br>Time Switch – Yes<br><br>*Rules of thumb applied in case of absence of data, where: |

The heating and will be fed with low-temperature hot water from variable refrigerant flow system (VRF) with a seasonal coefficient performance (sCOP) over 450%. The generation of high temperature hot water will be utilised through dedicated heat pump system connected to LTHW system for heating. The heating and cooling system in induction system will be utilised through multi-function heat pumps.

The following control types have been applied to all systems;

| Metering Provision | System Controls |
|---|---|
| Provision for Metering – Yes<br>Metering "Out of range" – Yes<br>Electric Power Factor - > 0.95 | Central Time Control – Yes<br>Optimum Start / Stop Control – Yes<br>Local Time Control – Yes<br>Local Temperature Control – Yes<br>Weather Compensation Control - Yes |

Central BMS will be designed to check metering to monitor & optimise energy usage. The energy management system is expected to review and adjust the operating efficiencies and strategy for the various building services to minimise overall energy use carbon emission thus saving the cost.

## 8. Renewables

Renewable technologies have been employed to offset and exceed the requirements of building regulations Part L. The heating and cooling in the administration center are to be met by the variable refrigerant volume technology with a designed sCOP over 380% which is a form of renewable energy technology in this case. Domestic Hot Water is met by a dedicated heat pump system, therefore, is identified as renewable energy technology as well. The induction system in the temperature-controlled warehouse will be met by the multi-function heat pumps.

## 9. Result

The following NZEB/Part L & BER has been calculated with results highlight in below;

### 9.1 BRIRL Document

Output from Building Regulation Ireland (BRIRL) Document

# 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.**

# 21025 Uniphar Warehouse

**Date:** Mon Jul 05 10:46:04 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 | 27 kgCO2/m2.annum |
| Calculated CO2 emission rate from Actual building | 23.8 kgCO2/m2.annum |
| **Carbon Performance Coefficient (CPC)** | **0.88** |
| **Maximum Permitted Carbon Performance Coefficient (MPCPC)** | **1.15** |
| Calculated primary energy consumption rate from Reference building | 141.1 kWh/m2.annum |
| Calculated primary energy consumption rate from Actual building | 121.1 kWh/m2.annum |
| **Energy Performance Coefficient (EPC)** | **0.86** |
| **Maximum Permitted Energy Performance Coefficient (MPEPC)** | **1** |
| **Renewable Energy Ratio (RER)** | **0.13** |
| **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 | 0.19 | 0.6 | 0.24 | MT00000D_W2_A0 |
| Floors (ground and exposed) | 0.21 | 0.16 | 0.6 | 0.16 | SP000003_F |
| Pitched roofs | 0.16 | - | 0.3 | - | "No heat loss pitched roofs" |
| Flat roofs | 0.2 | 0.15 | 0.3 | 0.22 | ST000004_C_A1 |
| Windows, roof windows, and rooflights | 1.6 | 1.47 | 3 | 1.6 | WR000000_W1_O0 |
| Personnel doors | 1.6 | 1.57 | 3 | 1.58 | WR000001_W11_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)] — $U_{i\text{-}Limit}$ = Limiting individual element U-values [W/(m2K)]
$U_{a\text{-}Calc}$ = Calculated area-weighted average 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 | 5 |

## 9.2 BER document

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

# 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:** | 05 Jul 2021 |
| **Useful Floor Area ($m^2$):** | 29846.3 | **Valid Until:** | 04 Jul 2023 |
| **Main Heating Fuel:** | Grid Supplied Electricity | **BER Assessor No.:** | 123456 |
| **Building Environment:** | Air Conditioning | **Assessor Company No.:** | 123456 |
| | | **Assessor Scheme:** | SEAI |
| **Building Type:** | Storage or Distribution | | |

**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
121 kWh/$m^2$/yr
0.42

**LEAST EFFICIENT**

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

BEST
0
1.0
2.0
WORST
>3.0

Calculated annual $CO_2$ emissions
24 kg$CO_2$/$m^2$/yr
0.43

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.

## 10. Limiting the Effects of Solar gain in Summer

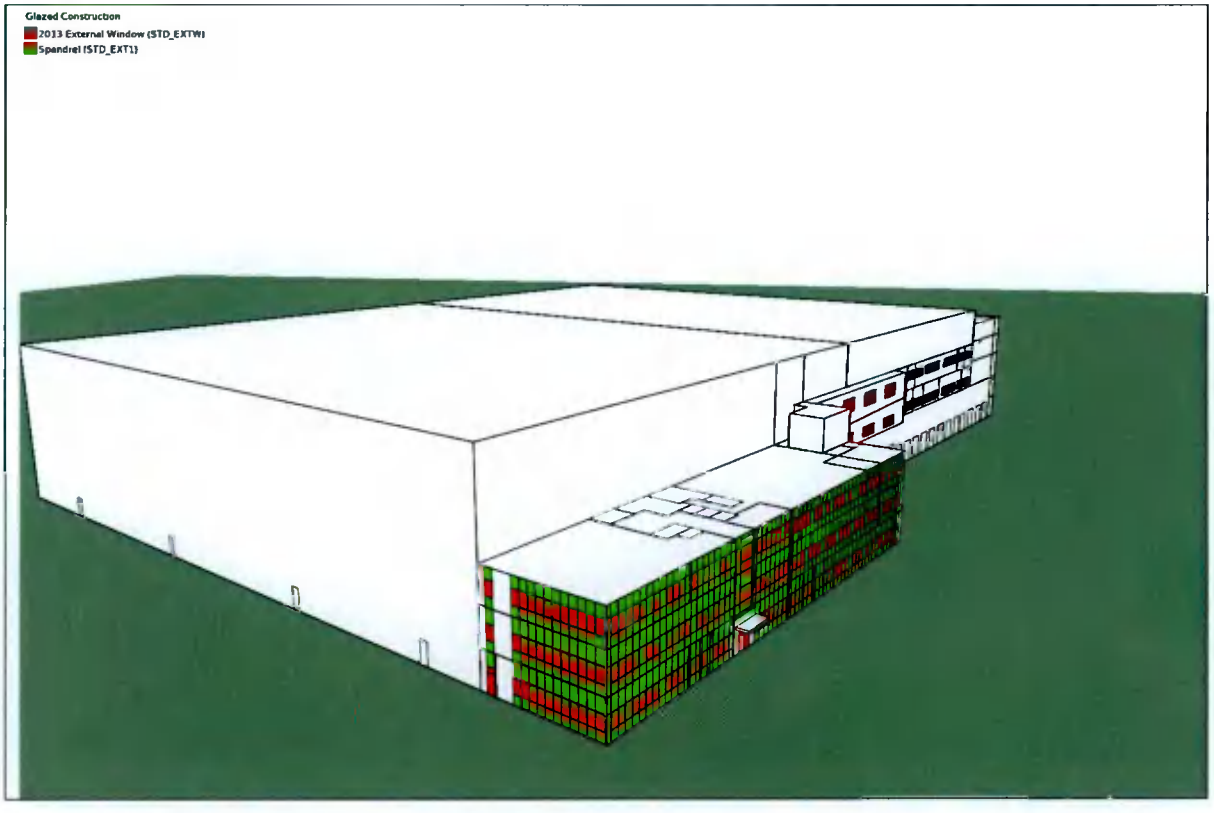
To assess the solar gain against criteria under section 1.3.5 *Limiting the effects of solar gain in summer* in Part L for solar gain compliance, a dynamic energy modelling simulation was carried out in IESVE software. The following model inputs for the proposed building were taken into account against the following factor;

| Parameter | Input |
|---|---|
| Orientation of site/building | According to the site plan |
| Adjacent building | Adjacent block (existing building behind site application) is taken into account. |
| Weather conditions | Dublin IWEC / UK Part L ManchesterTRY05.fwt |
| Thermal properties of the glazing | Side lit window - 0.48 g-value |
| Shading devices | None |
| Perimeter Zones | 6m depth including surrounding area less than 3m depth |
| Calculation Methodology | Benchmark Glazing Type 1 – East-facing façade with full width glazing to a height of 1m having a framing factor of 10% and solar energy transmittance (G-value of 0.68. |

The solar gains methodology outlined in Part L 2017 (NZEB) follows the UK methodology that has been adopted since 2013. Under SEAI Non-domestic Energy Assessment Procedure (NEAP) modelling guide which was issued in Q2 2019, the methodology outlined in Section "Limiting Solar Gains in Summer" closely follows what is issued in the UK Part L2A. On that basis, *UK PartL2A Criteria Solar Gain* toolkit in IESVE software has been used in the dynamic energy model simulation calculation against benchmark.

### 10.1 Internal Blind

The following figures show the locations of glazed including glass and solid panel modelled.


Glazed Construction
2013 External Window (STD_EXTW)
Spandrel (STD_EXT1)

## 10.2 Solar Gain Results

The results of the solar gain analysis are outlined in the following table figure. All perimeter zones with external glazing are in compliant with Part L 2017 based on the proposed glazing performance;

| Space Name (Zones) | Solar gain (MWh) | Reference Case Solar gain (MWh) | Part L 2017 Compliance | Internal Blind Required |
|---|---|---|---|---|
| Open Plan Office | 4198.6 | 5734.03 | Pass | No |
| Reception | 1903.08 | 2637.76 | Pass | No |
| Open Plan Office | 1904.53 | 2881.31 | Pass | No |
| Manager Office | 494.82 | 730.2 | Pass | No |
| Manager Office | 495.22 | 596.23 | Pass | No |
| Manager Office | 248.56 | 604.56 | Pass | No |
| Manager Office | 248.56 | 604.58 | Pass | No |
| Comms | 731.59 | 967.92 | Pass | No |
| Canteen | 1992.84 | 2293.01 | Pass | No |
| Open Plan Office | 5373.48 | 8031 | Pass | No |
| Meeting Room | 1954.36 | 3155.43 | Pass | No |
| Meeting Room | 735.7 | 946.65 | Pass | No |
| Meeting Room | 1475.08 | 1783.83 | Pass | No |
| Manager Office | 813.85 | 981.22 | Pass | No |
| Open Plan Office | 2504.76 | 3232.19 | Pass | No |
| Manager Office | 559.2 | 939.38 | Pass | No |
| Open Plan Office | 5117.08 | 8031 | Pass | No |
| Meeting Room | 1954.92 | 3155.43 | Pass | No |
| Meeting Room | 733.23 | 946.65 | Pass | No |
| Meeting Room | 1231.1 | 1783.83 | Pass | No |
| Open Plan Office | 3227.25 | 4418.43 | Pass | No |
| Manager Office | 646.29 | 718.92 | Pass | No |
| Manager Office | 1052 | 1112.19 | Pass | No |
| Open Plan Office | 1713.21 | 1814.91 | Pass | No |
| Canteen | 2331.24 | 2799.67 | Pass | No |
| Manager Office | 375.58 | 496.97 | Pass | No |
| Manager Office | 750.81 | 813.85 | Pass | No |
| Manager Office | 808.82 | 901.18 | Pass | No |
| Manager Office | 837.13 | 871.25 | Pass | No |
| Open Plan Office | 4387.48 | 4956.42 | Pass | No |
| Manager Office | 872.86 | 1027.7 | Pass | No |
| Open Plan Office | 3739.53 | 4418.43 | Pass | No |
| Warehouse | 25.22 | 591821.19 | Pass | No |
| Warehouse | 3.03 | 247825.27 | Pass | No |

## 11. Conclusion

The passive measures included in the design, such as minimising solar gain (glazing selection and external shading), reducing fabric heat loss through the building envelope and improving the airtightness significantly contribute towards reducing the loads on the active systems within the building. The active measures have been designed to reduce the primary energy consumption through intelligent control and highly efficient plant and equipment.

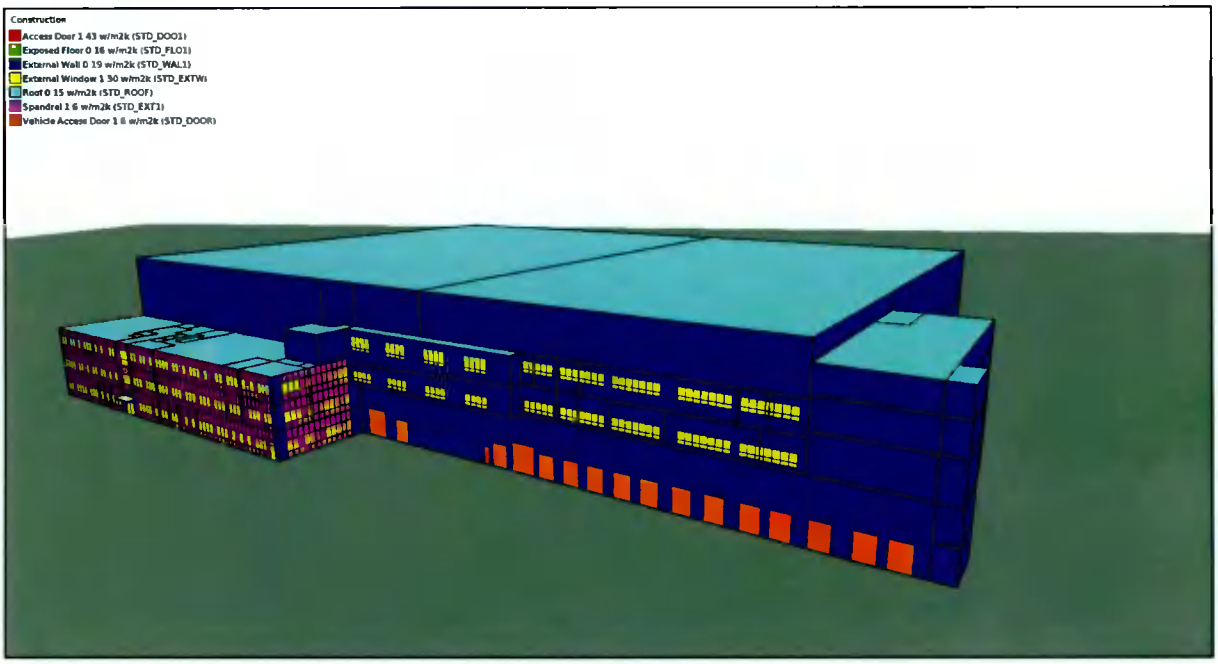
The results in Part L compliance assessment shows that the proposed development has an Energy Performance Coefficient (EPC) less than Maximum Permitted EPC (MPEPC) of 1.0. The building also has a Carbon Performance Coefficient (CPC) less than the Maximum Permitted CPC (MPCP) of 1.15. The result shows that the proposed development has a Renewable Energy Ratio of 0.12 (12%) exceeds target under Part L. It is concluded that the proposed building achieves the NZEB performance specification for energy and carbon dioxide emissions, therefore is in compliant with performance criteria under section 1.1.2, Building Regulation 2017 Part L for building other than Dwellings.

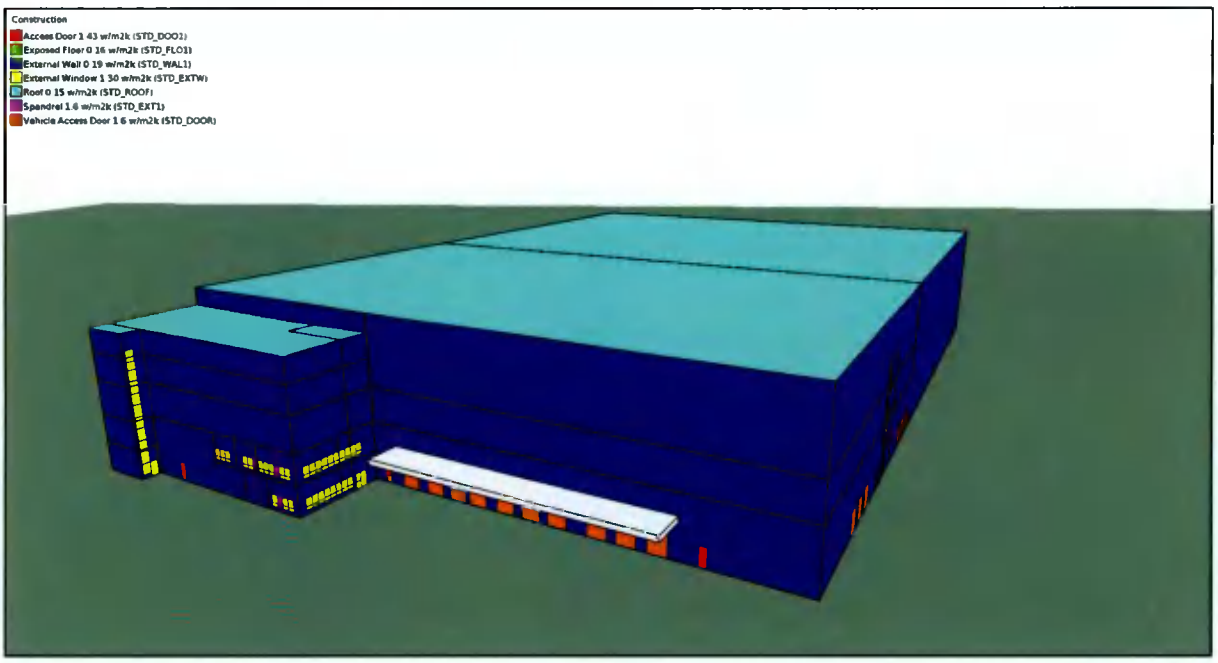
The result outlined under limiting solar gain assessment shows all zones with façade design complies with performance criteria under section 1.3.5, Limiting the effects of solar gain in summer, Building Regulation 2017 Part L for building other than Dwellings.

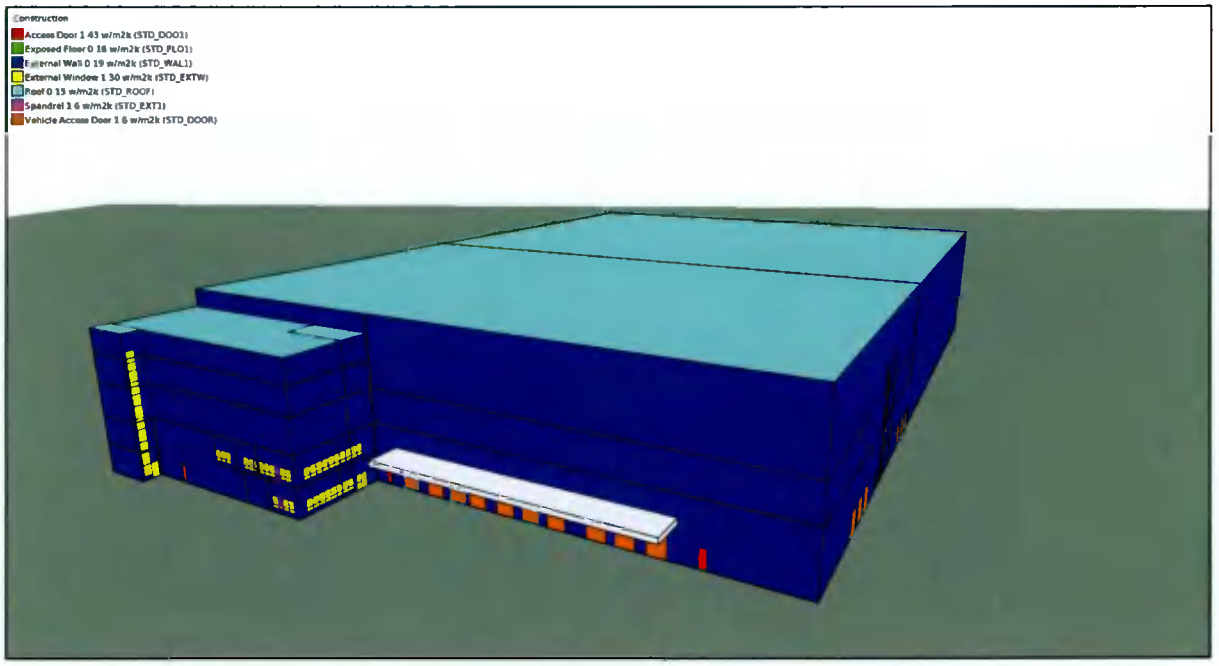
The results outlined in this Part L report demonstrate that the proposed design including the building envelope of the Library Centre with the L5 (a, b, c, e) building regulation requirement outlined in Part L 2017.

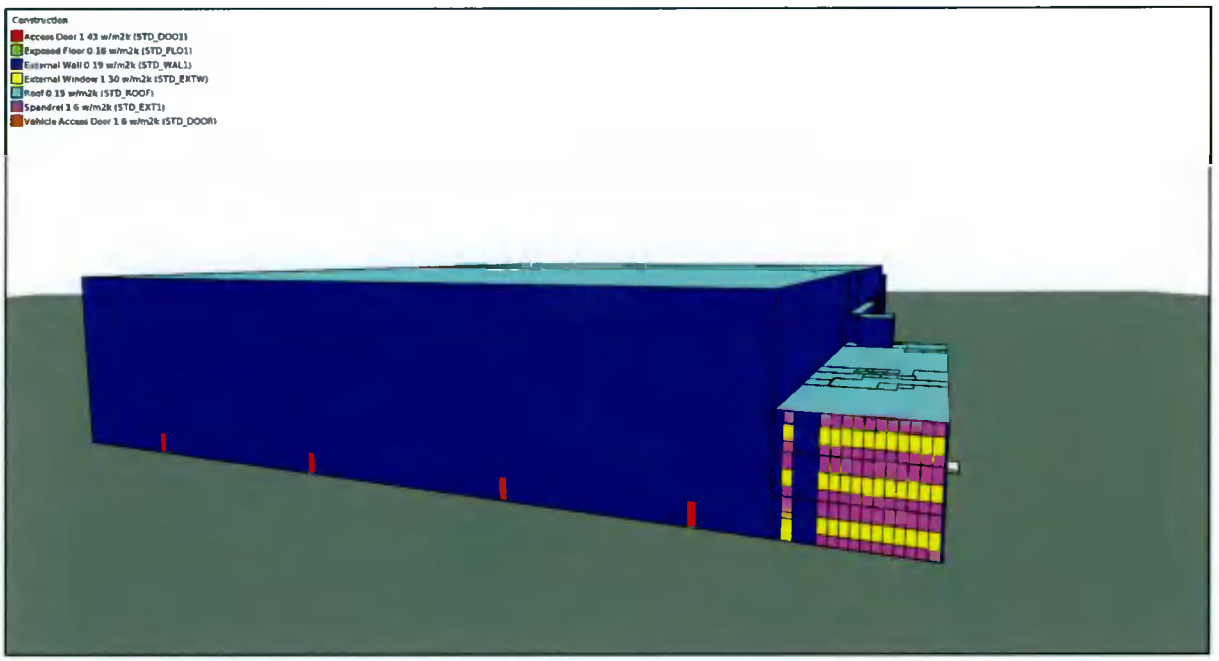
# 12. Appendices

## 12.1 Assigned Construction Details




Construction
Access Door 1.43 w/m2k (STD_DOO1)
Exposed Floor 0.18 w/m2k (STD_PLO1)
External Wall 0.19 w/m2k (STD_WAL1)
External Window 1.30 w/m2k (STD_EXTW)
Roof 0.15 w/m2k (STD_ROOF)
Spandrel 1.6 w/m2k (STD_EXT1)
Vehicle Access Door 1.6 w/m2k (STD_DOOR)


Construction
Access Door 1.43 w/m2k (STD_DOO1)
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