PART L COMPLIANCE REPORT

FOR

WAREHOUSE DEVELOPMENT

AT

SITE R, AERODROME BUSINESS PARK, RATHCOOLE, CO. DUBLIN

FOR

EXETER PROPERTY

Date of Issue: 07/10/2021 Version: 1.0

Document History

Version No.	Description	Prepared By	Reviewed By	Date
0.0	Part L Compliance assessment	EN	CD	21/05/2021
1.0	Part L Compliance assessment	EN	CD	07/10/2021

Contents

1. Executive Summary

With consideration to the EU energy performance of Buildings Directive (EPBD) and the Building Regulations Technical Guidance Document, Part L (NZEB) the building services design strategy for this development utilise 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 of the building.

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 comfortable for occupants and visitors.

To meet the target set out for the proposed development, the energy modelling software used in the analysis is IES <VE2019> which utilises the SBEMie 5.5.h calculation engine. The analysis was undertaken to identify the most suitable design in terms of energy efficiency and recued carbon output. 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 A2.

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.

2. Introduction

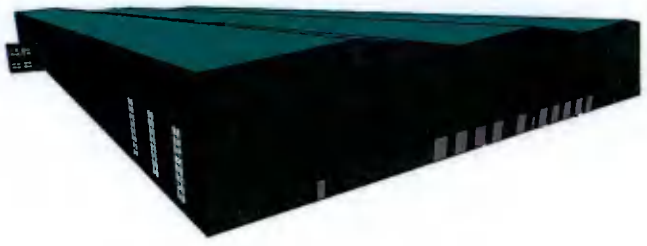
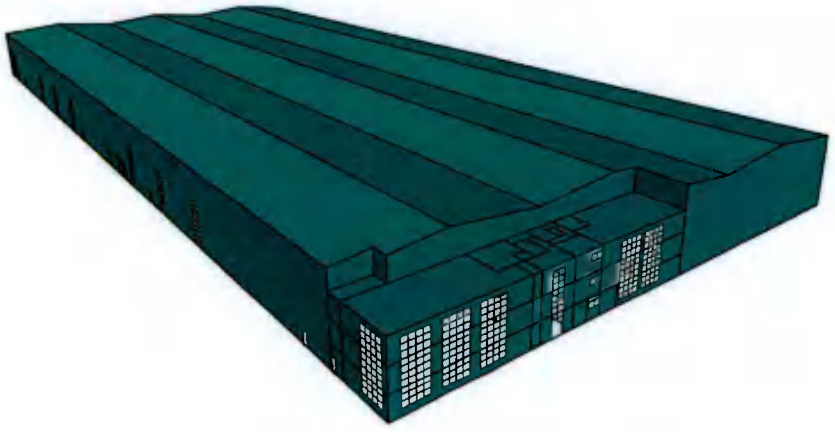
Axiseng was commissioned by Exeter Property to undertake a Part L – NZEB / BER analysis on the proposed development known as Site R, Aerodrome Business Park, Rathcoole, Co. Dublin. The new building is a warehouse with a three-storey ancillary office block. The building includes the following energy conservation measures to achieve the most energy effective performance possible;

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

The sustainable design of the proposed development presents an opportunity to ensure the overall building performs efficiently and meets the NZEB challenges. This report details the proposed design solution used in the analysis to show compliance with Part L and the BER.

The building shall also be seeking a BREEAM accreditation as part of the sustainability targets for the building.

3. Geometry

South	East
	
North	**West**
	
Perspective View	
	

4. 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	0.18
Warehouse Floor	2.0
Office External Wall (100mm insulation)	0.20
Warehouse Cladding Wall (80mm insulation)	0.23
Internal Wall to Warehouse (100mm insulation)	0.18
Office Roof	0.20
Warehouse Roof	0.23
Exposed Internal Floor to unheated area	0.18
Door / Access Vehicle	1.4
Window_00	1.4 (0.44 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.

4.1 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 3 m³/(h.m²) @ 50 pa comply with the Building Regulation Part L in the provision of air tightness..

5. 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)
Open Plan Office / Office	500	7	AUTO-ON-OFF	0.10	DIMMING	Standalone	0.10
Toilet	200	6	AUTO-ON-OFF	0.10	-	-	-
Lobby / Corridor	200	7	AUTO-ON-OFF	0.10	-	-	-
Tea Station	300	7	AUTO-ON-OFF	0.10	-	-	-
Warehouse	300	3	AUTO-ON-OFF	0.10	-	-	-
Canteen	400	7	AUTO-ON-OFF	0.10	-	-	-
Changing Facilities	200	7	AUTO-ON-OFF	0.10	-	-	-
Storage	200	7	AUTO-ON-OFF	0.10	-	-	-
Meeting	500	7	AUTO-ON-OFF	0.10	-	-	-
Reception	300	7	AUTO-ON-OFF	0.10	DIMMING	Standalone	0.10

Automatic daylight control (automatic dimming) in the open plan offices, office, meeting, café, 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.

6. 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)
Office, Meeting, Board, Tea Station, Reception,	VRF	Centralised Mech Vent	85% Plate Heat Ex	1.90
Showers / Store / Lockers	Elec radiator	Centralised Mech Vent	-	1.90
Toilet (Inside warehouse)	Elec Radiator	Localised exhaust mech Vent	-	0.3
Stairs, Corridor Lobby,	Elec 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 board are to be installed with a mechanically ventilated heat recovery unit served by heating and chilled water from the Variable Refrigerant Flow System. The Electric 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 – local room heater Heat Source – Storage electric heater Seasonal Efficiency – 1 Fuel Type – Electricity Pump Type – NA Serve units – Electric radiator	Generator Type 2 – Split Unit (VRF) Heat Source – Heat Pump Air Source EER / SEER – 5.0 / 7.2 Fuel Type – Electricity	Generator Type 1 – Heat pump (air source) Seasonal Efficiency – 2.85 Fuel Type – Electricity Overall Seasonal Efficiency (SCoP) – 2.85 Storage Volume (litres) – 1000 Storage losses (KWh/(l.day)) – 0.00470 Circulation losses (W/m) – 10 Loop Length (metres) – 100

Generator Type 2 – Split Unit (VRF) Heat Source – Heat Pump Air Source Seasonal Efficiency – 4.5 Fuel Type – Electricity Pump Type – NA		Pump Power (kW) – 0.2 Time Switch – Yes *Rules of thumb applied in case of absence of data, where:

The heating and will be fed with low-temperature hot water from a heat pump with a seasonal coefficient performance (sCOP) of over 450%. The generation of high temperature hot water will be utilised through hydro box or heat pump technology with a domestic hot water tank connected to the heat pump achieving an sCOP of over 285%.

The following control types have been applied to all systems;

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

Central VRF Control will be designed 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.

7. Renewables

Renewable technologies have been employed to offset and exceed the requirements of building regulations Part L. The heating and cooling in the office building are to be met by the variable refrigerant volume technology with a designed sCOP over 450% which is considered to be a form of renewable energy technology. The Domestic Hot Water is met by a heat pump system and therefore, is identified as renewable energy technology as well.

8. Result

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

8.1 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.

Site R

Date: Wed May 19 15:05:20 2021

Administrative Information

Building Details

Address: Aerodrome Business Park, Gruenogue, Empty, Empty, Co. Dublin, 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	10.5 kgCO2/m2.annum
Calculated CO2 emission rate from Actual building	9.3 kgCO2/m2.annum
Carbon Performance Coefficient (CPC)	0.89
Maximum Permitted Carbon Performance Coefficient (MPCPC)	1.15
Calculated primary energy consumption rate from Reference building	55.2 kWh/m2.annum
Calculated primary energy consumption rate from Actual building	47.5 kWh/m2.annum
Energy Performance Coefficient (EPC)	0.86
Maximum Permitted Energy Performance Coefficient (MPEPC)	1
Renewable Energy Ratio (RER)	0.15
Minimum Renewable Energy Ratio	0.1

Heat Transmission through Building Fabric

Element	$U_{x\,Limit}$	$U_{x\,Calc}$	$U_{i\,Limit}$	$U_{i\,Calc}$	Surface with maximum U-value*
Walls**	0.21	0.19	0.6	0.2	L0000001_W1
Floors (ground and exposed)	0.21	0.19	0.6	0.19	L000003C_F_A3
Pitched roofs	0.16	-	0.3	-	"No heat loss pitched roofs"
Flat roofs	0.2	0.19	0.3	0.19	L0000032_C
Windows, roof windows, and rooflights	1.6	1.39	3	1.39	L0000001_W1_O0
Personnel doors	1.6	1.43	3	1.43	L0000000_W1_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"

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

8.2 BER document

Virtual Environment 7.0.13 (SBEMIE v6.5.h.2)

Provisional Building Energy Rating (BER)

Provisional BER for the building detailed below is: **A2**

Aerodrome Business Park
Greenogue
Emply
Co. Dublin
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:**	**19 May 2021**
Useful Floor Area (m^2):	**23129.8**	**Valid Until:**	**18 May 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

A2
47 kWh/m^2/yr
0.28

LEAST EFFICIENT

Carbon Dioxide (CO_2) Emissions Indicator

BEST
0

Calculated annual CO_2 emissions
8 kgCO_2/m^2/yr
0.28

1.0

2.0

WORST
>3.0

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.

9. 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;

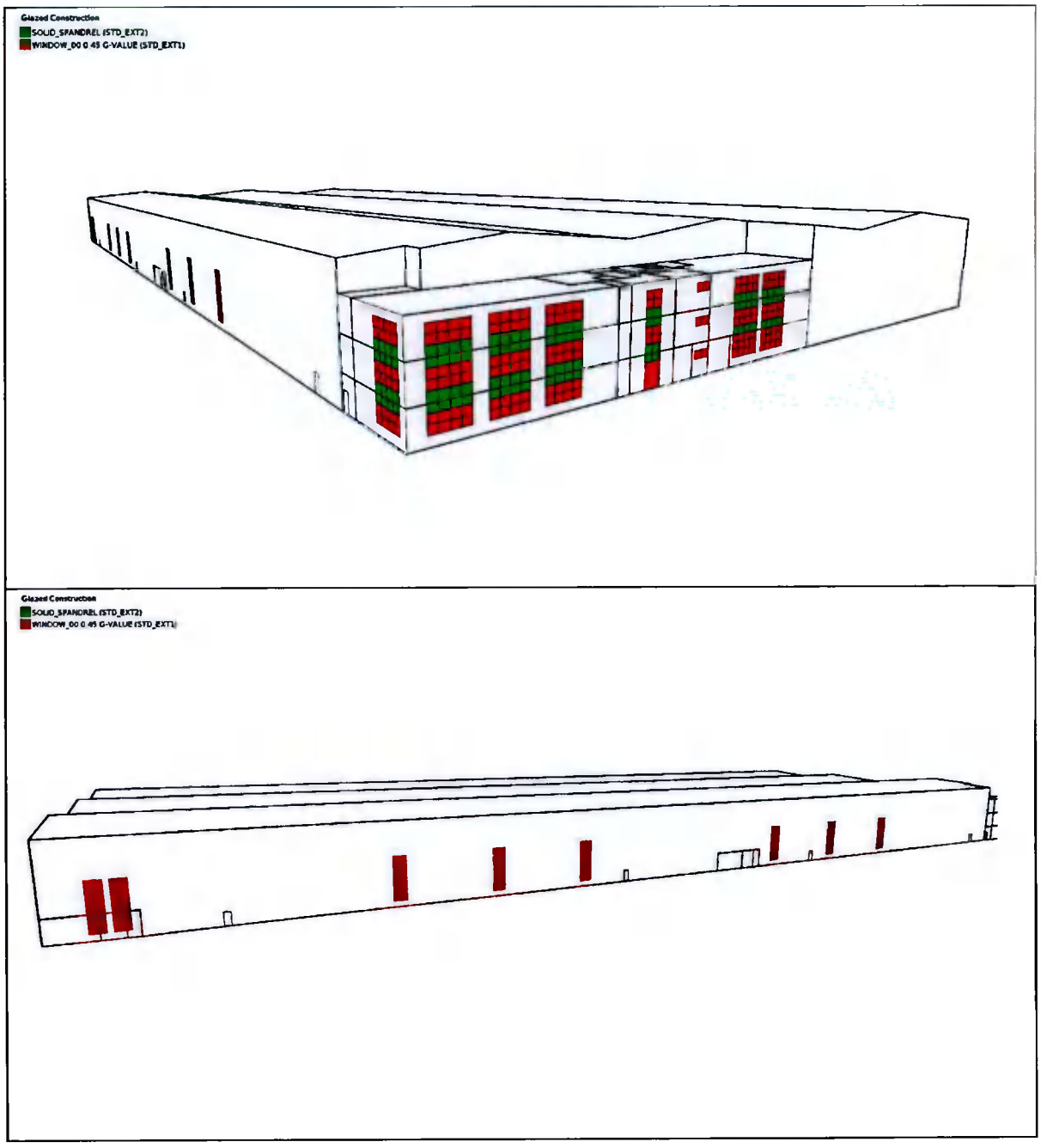
Parameter	Input
Orientation of site/building	According to the site plan
Adjacent building	Adjacent block (existing building behind site application) is taken into account.
Weather conditions	Dublin IWEC / UK Part L ManchesterTRY05.fwt
Thermal properties of the glazing	Side lit window - 0.44 g-value
Shading 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.

9.1 Façade specification

The following figures show the locations of glazing and solid panels modelled on external façade in the proposed development building.

- Double Glazed window with solar transmittance 0.44 g-value –Red
- Solid panel (opaque) – Green


Glazed Construction
SOLID_SPANDREL (STD_EXT2)
WINDOW_00 0.45 G-VALUE (STD_EXT1)
Glazed Construction
SOLID_SPANDREL (STD_EXT2)

9.2 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
L00_CANTEEN	3429.81	3521.46	Pass	No
L00_DRIVER'S RECEPTION	441.61	1149.77	Pass	No
L00_OPEN PLAN OFFICE	4771.96	7344.9	Pass	No
L00_RECEPTION OFFICE	265.58	1256.03	Pass	No
L00_WAREHOUSE	31729.08	956868.7	Pass	No
L01_OFFICE	460.48	1724.53	Pass	No
L01_OPEN PLAN OFFICE	2363.57	4371.73	Pass	No
L01_OPEN PLAN OFFICE	4719.39	7344.9	Pass	No
L01_SINGLE OFFICE	273.5	705.04	Pass	No
L01_TEA STATION	308.16	1262.51	Pass	No

10. Conclusion

The passive measures included such as minimising solar gain (glazing selection), reducing fabric heat loss and improving the airtightness significantly contribute towards reducing the loads on the 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.

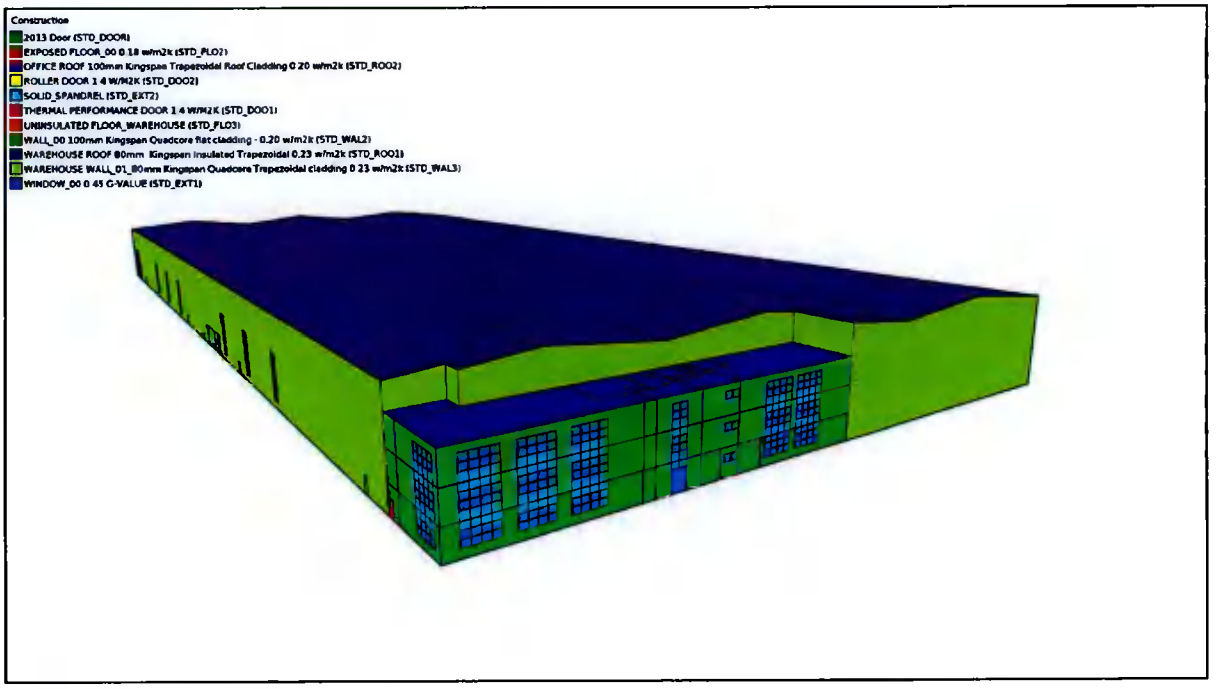
The results in Part L compliance assessment shows that the proposed development has an Energy Performance Coefficient (EPC) less than the Maximum Permitted EPC (MPEPC) of 1.0. The building also has a Carbon Performance Coefficient (CPC) less than the Maximum Permitted CPC (MPCP) of 1.15. The result shows that the proposed development has a Renewable Energy Ratio of 0.15 (15%) which exceeds the 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, of the Building Regulation 2017 Part L for buildings other than Dwellings.

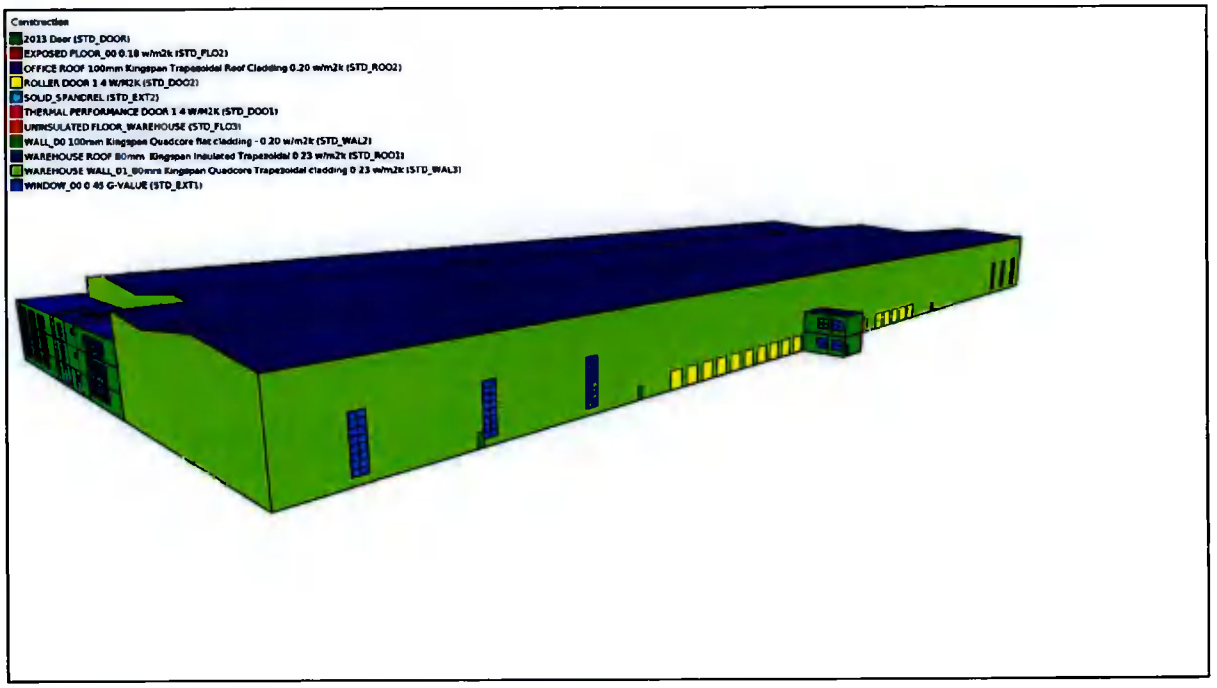
The results outlined under the limiting solar gain assessment shows all zones with façade design complies with performance criteria under section 1.3.5, Limiting the effects of solar gain in summer, Building Regulation 2017 Part L for buildings other than Dwellings.

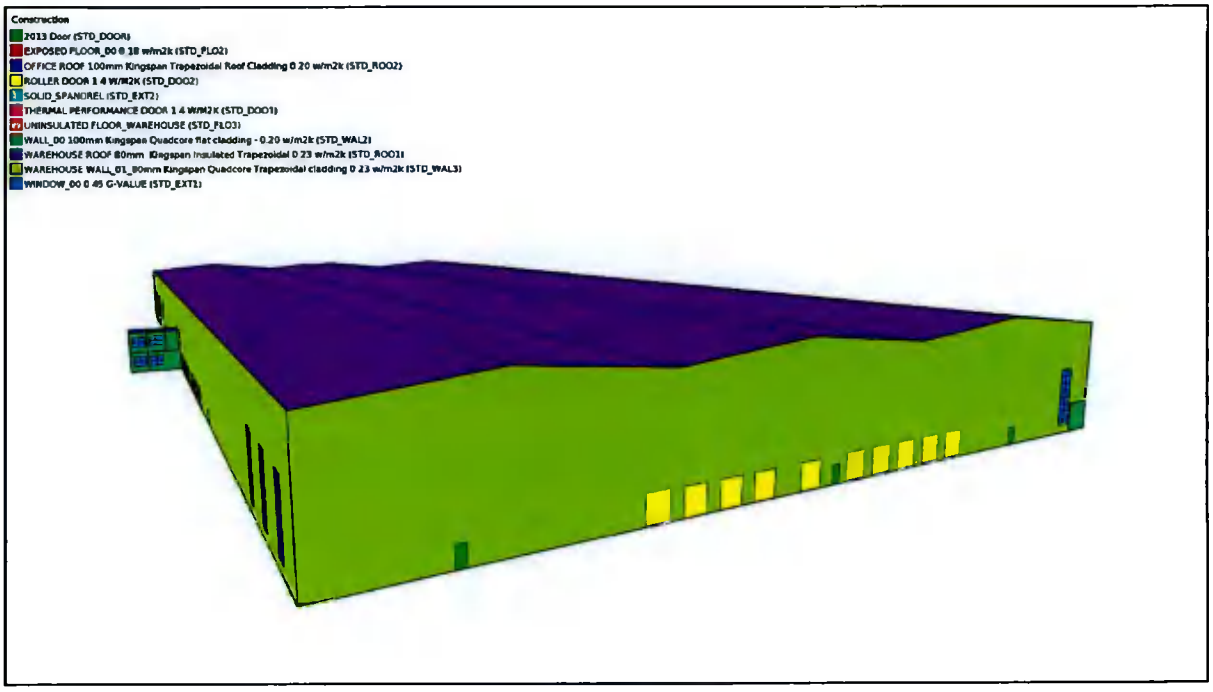
The results outlined in this report demonstrate that the proposed building envelope complies with the L5 (a, b, c, e) building regulation requirement outlined in Part L 2017.

11. Appendices

11.1 Assigned Construction Details






Construction
2013 Door (STD_DOOR)
EXPOSED FLOOR_00 0.18 w/m2k (STD_FLO2)
OFFICE ROOF 100mm Kingspan Trapezoidal Roof Cladding 0.20 w/m2k (STD_ROO2)
ROLLER DOOR 1.4 W/M2K (STD_DOO2)
SOLID_SPANDREL (STD_EXT2)
THERMAL PERFORMANCE DOOR 1.4 W/M2K (STD_DOO1)
UNINSULATED FLOOR_WAREHOUSE (STD_FLO3)
WALL_00 100mm Kingspan Quadcore flat cladding - 0.20 w/m2k (STD_WAL2)
WAREHOUSE ROOF 80mm Kingspan Insulated Trapezoidal 0.23 w/m2k (STD_ROO1)
WAREHOUSE WALL_01_80mm Kingspan Quadcore Trapezoidal cladding 0.23 w/m2k (STD_WAL3)
WINDOW_00 0.45 G-VALUE (STD_EXT1)


Construction
2013 Door (STD_DOOR)
EXPOSED FLOOR_00 0.18 w/m2k (STD_FLO2)
OFFICE ROOF 100mm Kingspan Trapezoidal Roof Cladding 0.20 w/m2k (STD_ROO2)
ROLLER DOOR 1.4 W/M2K (STD_DOO2)
SOLID_SPANDREL (STD_EXT2)
THERMAL PERFORMANCE DOOR 1.4 W/M2K (STD_DOO1)
UNINSULATED FLOOR_WAREHOUSE (STD_FLO3)
WALL_00 100mm Kingspan Quadcore flat cladding - 0.20 w/m2k (STD_WAL2)
WAREHOUSE ROOF 80mm Kingspan Insulated Trapezoidal 0.23 w/m2k (STD_ROO1)
WAREHOUSE WALL_01_80mm Kingspan Quadcore Trapezoidal cladding 0.23 w/m2k (STD_WAL3)
WINDOW_00 0.45 G-VALUE (STD_EXT1)