| | |
|---|---|
| **PROJECT:** | **NEW COUNCIL CHAMBER AND OFFICE EXTENSION TO MEATH COUNTY COUNCIL CIVIC OFFICES** |
| **SUBJECT:** | **SUSTAINABILITY AND ENERGY STATEMENT** |
| **REFERENCE:** | **18-120** |
| **DATE:** | **25th NOVEMBER 2022** |

**Delap & Waller Ltd.**

**Dublin**
Bloomfield House,
Bloomfield Avenue
Dublin 8
Tel: +353 (0)1 535 5900

**Revision History**

| Revision | Date | By | Checked | Approved |
|---|---|---|---|---|
| 00 | 02/11/2022 | Ryan Young | Vince Shapland | Ryan Young |
| 01 | 04/11/2022 | Ryan Young | Vince Shapland | Ryan Young |
| 02 | 25/11/2022 | Ryan Young | Vince Shapland | Ryan Young |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

**Offices**

Dublin: Bloomfield House, Bloomfield Avenue, Dublin 8, +353 (0)1 535 5900

**Confidential Information**

This document is made available to the recipient on the express understanding that the information contained in it be regarded and treated by the recipient as strictly confidential. The contents of this document are intended only for the sole use of the recipient and should not be disclosed or furnished to any other person.

**Disclaimer of Liability**

The information contained in this document is provided for the sole use of the recipient on the named project only, and no reliance should be placed on the information by any other person or for any other purpose. In the event that the information is disclosed or furnished to any other person, then Delap and Waller Limited accepts no liability for any loss or damage incurred by that person whatsoever as a result of using the information.

**Copyright ©**

## Contents

## 1.0 EXECUTIVE SUMMARY

The report has been prepared by Delap and Waller for Bucholz McAvoy Architects to outline the and energy and sustainability specification required for the New Council Chamber and Office Extension to Meath County Council Civic Offices. The proposed extension been designed to achieve compliance with Technical Guidance Document L 2022.

The nearly Zero Energy Building (nZEB) standard requires an overall improved energy performance for the fabric, services and lighting specification. The standard requires a CPC level of <1.15 and an EPC level of <1.00. The nZEB also introduces a mandatory requirement for renewable energy sources, providing 20% of the primary energy use. Alternatively a 10% renewable contribution is acceptable provided passive improvements are introduced which reduce the primary energy demand.

The new extension will be designed with the principles of the energy hierarchy, whereby energy and carbon is minimised through passive means such as fabric improvements, thermal mass and natural ventilation. Thereafter, low-zero and renewable technologies are implemented where appropriate.

Simulations have been carried out using IES Virtual Environment Software 2022 for the energy, thermal comfort and ventilation assessments. This software has been validated under the CIBSE TM33 and AM11. This Energy Statement reports the predicted energy performance and carbon dioxide emissions ($CO_2$) of the extension using compliant design simulation software. The report outlines the design considerations that may be adopted to reduce the energy demand and $CO_2$ emissions during the development's operation.

The report will summarise the how the extension has implemented wider sustainability principles into the design, such as, natural daylight distribution, thermal comfort, embodied carbon, natural ventilation, indoor air quality, on site renewables, sustainable urban drainage (SuDs) and biodiversity. The principles of SuDs have been developed and designed by Punch Consulting Engineers.

The table below summarises the energy, carbon and renewable performance of the extension, when assessed against TGD Part L 2022. The proposed energy demonstrates that compliance with nZEB is achieved without additional on-site renewable energy generating technologies. Meath County Council are conscious of the climate emergency and the importance of on-site renewable energy generation on the path to net zero carbon. As such, an on site solar photovoltaic has been included to offset a percentage of $CO_2$ emissions generation by the new developments operation.

| | Energy Performance Coefficient (CPC) ≤1.00 | Carbon Performance Coefficient (EPC) ≤1.15 | Renewable Energy Ratio (RER) ≥0.20 |
|---|---|---|---|
| Proposed Council Chamber and Extension | 0.81 | 0.83 | 0.39 |

***Table 1: Meath County Council Extension – TGD Part L compliance results***

# 2.0 ASSESSMENT METHODOLOGY

## 2.1 Architectural Design

The dynamic simulation model was generated using the site plan, floor plans, sections, elevations and Revit model provided by Bucholz McAvoy Architects.

| Title | Document Reference | Date |
|---|---|---|
| Ground Floor GA / Reference | 0314-A2-00 | 16/10/2022 |
| First Floor GA / Reference | 0314-A2-01 | 16/10/2022 |
| Second Floor GA / Reference | 0314-A2-02 | 16/10/2022 |
| Sections | 0314_SK_06D Section A-A | 16/10/2022 |

***Table 2: Architectural Drawing Schedule***

## 2.2 Software

The modelling was carried out using IES Virtual Environment Software Version 2022 for the Building Regulation assessments, this software complies with the requirements of the Chartered Institute of Building Services Engineers (CIBSE), which has been validated under the CIBSE TM33, and has been approved by the Ministry of Housing, Communities and Local Government for such calculations.

## 2.3 Simulation Weather Data

The ASHRAE International Weather for Energy Calculation (IWEC) file is used to show compliance with Irish Building Regulations. The IWEC files contain weather data from up to 18 years of DATSAV3 hourly weather data. The Dublin weather data has been selected for all simulations within the report.

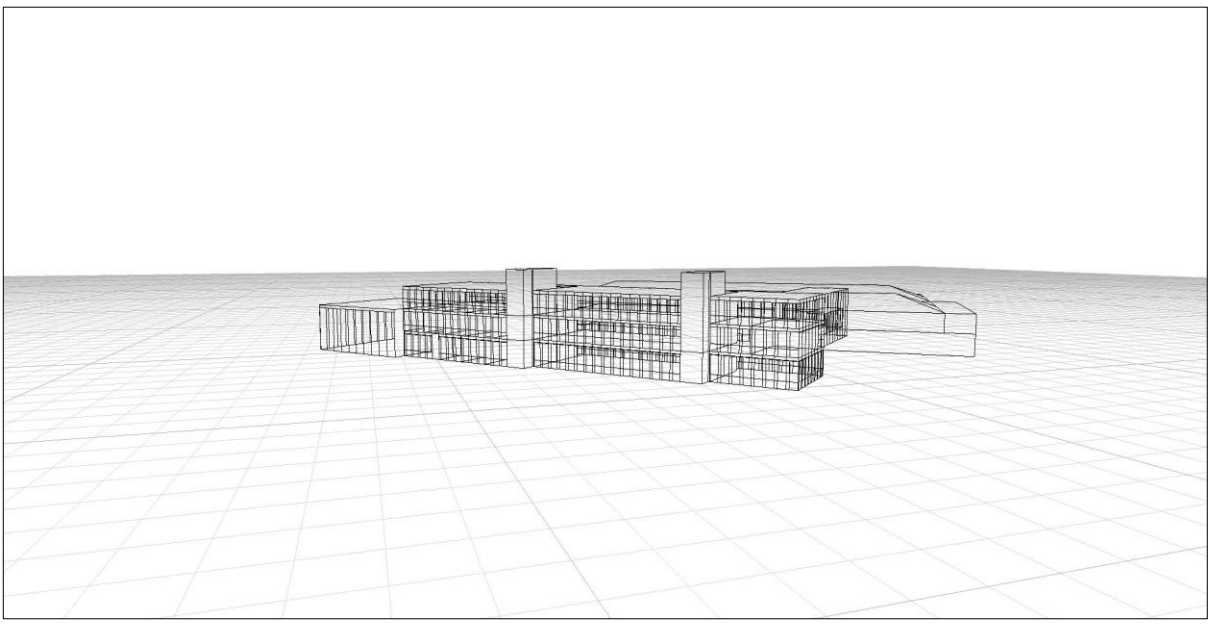

***Figure 1: MCC Buvinda House IES model.***

## 3.0 PLANNING POLICY

The sustainability strategy for the proposed development addresses the relevant policies within Meath County Council Climate Action Strategy 2019-2014.

### 3.1 MCC Climate Action Strategy

**Section 10. Build Environment**

The objectives under Built Environment are set out below and the following summarises the actions from these objectives, we are planning to undertake in the period 2019-2025. It includes a high level ambition, with specific actions, indicators and owners.

- To ensure that climate adaptation is mainstreamed into all activities and operations.
- To ensure that climate resilience is considered for all council-lead developments.

B1.1 Encourage and promote the move towards near-zero-energy in council new-build builings, in line with EU policy.

B1.2 Incorporate climate considerations into the planning and design stage to future proof all future council led developments for projected temperatures, heavy rain and local flooding.

B1.3 Promote increased energy efficiency in the council housing stock including retrofitting.

B2.1 Introduce maintenance contracts that detail maintenance programmes that support climate adaptation measurs, such as grassland management.

B2.2 Advocate the introduction of effective BMS on large corporate buildings.

B2.3 Explore the potential for district heating in council owned buildings.

B2.4 Explore ESCo packages for council owned sites/services.

B2.5 Introduce ISO 15001 as part of new energy policy.

B2.6 Build in climate related requirements into energy/facilities management contractors.

**Section 11. Clean Energy**

Energy use is changing fast. The shift to renewable sources, however, needs to happen faster. This is not just in terms of how power is generated but also in terms of how it is used in heating, buildings and transport. Global competition is helping to spread best project development practices, reducing technology and project risk, and making renewables more cost-competitive than ever before.

County Meath, like the rest of Ireland, is reliant upon fossil fuels for the generation of power, heat (hot water and steam) and transport fuels. Ireland is currently facing a fine of up to €75 million each year, as official predictions show that it will fall short of its EU renewable-energy targets. For us to become a more sustainable region we need to dramatically increase our deployment in low carbon energy generation technologies, which will cut across
all of our targets relating to commercial and industrial, domestic and transport emissions, and improved energy security.

C1.7 Explore potential for renewable energy/microgeneration at council facilities.

C1.8 Develop information packs to be distributed will all new developments.

**Section 15. Planning**

One of our key roles is to ensure County Meath is properly planned. If we can do this with climate change in mind, it will help us to avoid 'locking in' high carbon and climate-vulnerable developments and land use patterns in the long-term.

By planning properly, we can increase the viability of new public and active transport routes renewable energy projects and business cases for investing in areas of currently underused and low quality greenspace. New developments served by such infrastructure will become a significant part of the appeal for existing and new domestic and commercial occupants.

To enable this, we will need to be bold in our use of local planning powers, in order to ensure that we make use of it as a tool for delivering on the objectives that can benefit our businesses and residents.

P1.1 To seek to improve the energy efficiency in developments in accordance with the Building Regulations Part L and exceeding these standards where possible.

P1.2 To support the use of heat pumps instead of gas boilers where suitable.

P1.3 To encourage development proposals to maximise energy efficiency through siting, layout, design or which incorporate best practice in energy technologies, conservation and implementation of smart technology.

P1.4 To require, where feasible and practical the provision of photovoltaic solar panels in new residential developments, commercial developments and public building for electricity generation/storage and/or water heating purposes

## 4.0 PROPOSED EFFICIENT DESIGN

This section will summarise design fabric and services specification to achieve compliance with TGD Part L 2022.

### 4.1 Fabric Specification

Table 3 below outlines the target fabric specification used for the proposed extension. The values are compared with the TGD Part L 2022 limiting values for new build developments.

| | Proposed Fabric Design | Part L 2022 Limiting Values |
|---|---|---|
| Ground / Exposed Floor | 0.14 W/m$^2$K | 0.25 W/m$^2$K |
| External Walls | 0.18 W/m$^2$K | 0.21 W/m$^2$K |
| Internal Partitions | - | - |
| External Roof | 0.11 W/m$^2$K | 0.20 W/m$^2$K |
| Glazing | 1.10 W/m$^2$K | 1.60 W/m$^2$K |
| | G Value = 0.30 | N/A |
| Opaque / Spandrel Panels | 1.10 W/m$^2$K | 1.60 W/m$^2$K |
| Air Permeability | 3.00 m$^3$/h.m$^3$ at 50 Pa | 3.00 m$^3$/h.m$^3$ at 50 Pa |
| Thermal Bridging | Acceptable Construction Details* | Default y-value of 0.15 |

***Table 3: Proposed Fabric Specification Values***

**Acceptable Construction Details will be applied where feasible.*

U-Values for opaque elements will be calculated by manufacturer or using approved software following conventions outlined in BR 443. U-Values and G-Value information relating to openings will be provided by the system manufacturer. It should be emphasises that the U-Value targets listed in table three are indicative based on initial design and may vary as the design progresses.

### 4.2 Lighting Specification

Lighting calculations have not been carried out at this stage of this design. Table 4 below provides an indicative proposal for the lighting power consumption and controls for each room type within the office. The NEAP calculation will be updated once the lighting design has developed further. Lighting is one of the main sources of energy demand within an office. Therefore, given the high levels of natural daylight, the LED lighting will be linked to daylight sensors which will dim when there is adequate levels of natural daylight.

| Room Type | Lighting Lumens / Watt (Lm/W) | Controls |
|---|---|---|
| Council Chamber | 100.00 | Daylight Sensors |
| Open Office | 100.00 | Occupancy & DALI Sensors |
| Cellular Office | 100.00 | Occupancy & DALI Sensors |

| | | |
|---|---|---|
| Circulation Areas | 100.00 | Occupancy & DALI Sensors |
| Communal Areas | 100.00 | Occupancy & DALI Sensors |
| Toilets | 100.00 | Occupancy Sensors |
| Store | 100.00 | Occupancy Sensors |
| Plant Room | 100.00 | Occupancy Sensors |

***Table 4: Initial Lighting Efficiencies***

### 4.3 Control Information

Each separate regulated energy end use will be separately metered and monitored via a central building management system. The BMS will provide the end user with a notification
Lighting systems will have provision for metering and monitoring via a central BMS system. The building electric power factor is assumed as the default >0.95 for the purposes of the assessment.

### 4.4 Ventilation

The intention is that all habitable areas will utilise natural ventilation as the primary source of ventilation via automatic and manual openings within the façade to provide single sided ventilation, cross ventilation or stack ventilation through solar chimneys. During times of high occupancy density or low external temperatures, the BMS system will switch to the mechanical ventilation with heat recovery (MVHR) in selected areas as detailed in table 4. The MVHR system will provide a consistent supply of fresh tempered air and ensure a consistent level of good air quality, while simultaneously reducing the space heating demand.

Toilet areas will be provided with mechanical extract ventilation which has a specific fan power of ≤0.40 W/l/s.

| Room Type | Ventilation Strategy | Specific Fan Power (W/l/s) | Heat Recovery Efficiency |
|---|---|---|---|
| Council Chamber | Natural and Mechanical | 1.60 | 80.00% |
| Open Office | Natural Ventilation | - | - |
| Cathaoilrleach Office | Natural and Mechanical | 1.60 | 80.00% |
| Cellular Office | Natural Ventilation | 1.60 | 80-86% |
| Ancillary Council | Natural and Mechanical | 1.60 | 80.00% |
| Toilets | Mechanical Extract | 0.40 | - |
| Store | Natural | - | - |
| Plant Room | Natural | - | - |
| Circulation Areas | Natural | - | - |

***Table 4: MCC Buvinda House Ventilation Strategy***

### 4.5 Space Heating & Cooling

Space heating and cooling within the council chamber is delivered via a variable air volume air handling system served through a highly efficient variable refrigerant flow air source heat pump. The proposed ASHP will have a heating efficiency of 3.75 and a cooling seasonal EER of 4.50.

All other areas will have space heating provided via an air to water heat pump system, distributed via underfloor heating at a design flow temperature of 35°C. The seasonal efficiency of the air source heat pump will be ≥3.75.

### 4.6 Domestic Hot Water

Domestic Hot Water will be provided via an Air to Water Heat Pump with integrated immersion. The dedicated heat pump will have a hot water efficiency of 288%. The system will have hot water storage estimated at 500 litres.

### 4.7 Renewable Technologies

Meath County Council are conscious of the climate emergency and the importance of on-site renewable energy generation on the path to net zero carbon as well as striving to achieve a betterment beyond current Part L. As such, for the purposes of this energy & sustainability statement, a solar photovoltaic analysis has been carried out for the proposed council chamber and extension.

The purpose of this analysis was to investigate the quantity, size, generation and subsequent energy and carbon savings that could be realised with the inclusion of a PV array. The table below summarises the salient findings of the analysis.

The analysis estimated that the proposed PV array will offset approximately 10.49% of the buildings regulated carbon emissions per annum. The intention is that the PV array will be installed on a phased basis. It should be noted that the PV array will be supplementary to the minimum statutory Part L requirements.

| | |
|---|---|
| Number of Panels | 154no. |
| Size of array (kWp) | 53.90 kWp |
| Inclination of Panels | 30° |
| Orientation | South-East |
| Degree of Shading Category | Modest |
| Estimated Annual Energy Generation | 35,220 kWh/annum |
| Estimated Carbon Emissions Savings | 18,279.18 kg$CO_2$/annum |
| Estimated Payback Period | 10 Years |
| No. of LEED credits achieved | 3 credits |

***Table 5: MCC Buvinda House PV analysis summary table***

## 5.0 SUSTAINABILITY PRINCIPLES

### 5.1 Passive Design

In order to minimise the energy demand, a passive design and fabric first approach has been adopted for the proposed extension. Space heating and cooling is one of the highest users of energy within a typical office, therefore minimising heat loss through the fabric and encouraging balanced solar gain in winter, autumn and spring was key.

In terms of U-Values, the proposed targets for floors, walls, roof and glazed elements have been carefully considered and specified and significantly improve upon the minimum requirements within TGD Part L 2022. One of the most significant elements of heat loss in any building is that lost through cracks, penetrations and junctions as a result of construction, also referred as air leakage or infiltration. When measured at construction stage this is expressed as $m^3$ ($m^2$/hr) @ 50 Pascals. The maximum figure allowed under current regulations is 10 $m^3$ ($m^2$/hr) @ 50 Pascals, with typical new buildings achieving a figure of between 5-7.00 $m^3$ ($m^2$/hr) @ 50 Pascals. The proposed extension has been designed to achieve an air tightness of ≤3.00$m^3$ ($m^2$/hr) @ 50 Pascals, which represents a significant improvement and is an indication of quality of build. Careful consideration will be given to minimise heat loss as a result of linear thermal bridging.

Another high energy user in office buildings is energy associated with mechanical ventilation. The design intention is that all habitable spaces utilise natural ventilation as a priority, either through automatically and manual openings within the façade, passive ventilation or through the stack effect aided through solar chimneys. When the external ambient temperature drops and/or the internal air quality levels reach a threshold of 1200ppm of $CO_2$ , highly occupied spaces are aided through heat recover mechanical ventilation. The MVHR system shall provide fresh tempered air at 10 l/s/person. The system will have a minimum heat recovery efficiency of 80%, which in turn will reduce the heating requirement in these spaces. To further mitigate the risk of overheating and load on the ASHP, the size, orientation and solar properties of the glazing has been carefully designed. The area of glazing has been designed to meet the BRE's minimum daylight standards, with a reduced g-value of 0.30 as to not allow excessive solar gains in the warmer months.

In order to minimise energy associated with artificial internal lighting, the glazing size and specification within the offices and council chambers have been to designed to encourage good levels of natural daylighting. This level of natural daylighting when designed in conjunction with passive photoelectric sensors, will automatically dim or switch off the internal LED lights when the daylight achieved the required lux levels in these spaces. This negates the need for the user to actively control the lighting and minimises energy further.

### 5.2 Embodied Carbon

Embodied carbon is the total greenhouse gas (GHG) emissions (often simplified to "carbon") generated to produce a built asset. This includes emissions caused by extraction, manufacture/processing, transportation and assembly of every product and element in an asset. In some cases, (depending on the boundary of an assessment), it may also include the maintenance, replacement, deconstruction, disposal and end-of-life aspects of the materials and systems that make up the asset. It excludes operational emissions of the asset. There is no statutory requirement, currently in Ireland, for bodies to report or achieve an embodied carbon level. However, the design team are conscious that efforts should be made to reduce the embodied carbon impact of new builds. Within the proposed extension at Meath County Council, the design team considered various options for construction methodologies based on cost, structure, buildability and embodied carbon. The decision to proceed at this stage using a Glulam structure in addition to Cross Laminated Timber

(CLT) demonstrates a significant reduction in embodied carbon emissions compared to a concrete or steel frame structure.

**5.3 Sustainable Urban Drainage**

The proposed development has been assessed in relation to Sustainable Urban Drainage Systems (SuDS). A variety of SuDS measures may be adopted to comply with MCC recommendations. There are several benefits from the promotion of the SuDS recommendations within the proposed development such as; Biodiversity, water quality, Floor risk management, climate resilience and the potential for rainwater collection.

## 6.0 RESULTS

The report was prepared by Delap and Waller for Bucholz McAvoy architects to outline the and energy and sustainability specification required for the proposed new office extension at Meath County Council's Offices; Buvinda House. The proposed extension been designed to achieve compliance with Technical Guidance Document L 2022.

The nearly Zero Energy Building (nZEB) standard requires an overall improved energy performance for the fabric, services and lighting specification. The standard requires a CPC level of <1.15 and an EPC level of <1.00. The nZEB also introduces a mandatory requirement for renewable energy sources, providing 20% of the primary energy use. Alternatively a 10% renewable contribution is acceptable provided passive improvements are introduced which reduce the primary energy demand. The new extension has been designed with the principles of the energy hierarchy, whereby energy and carbon is minimised through passive means such as fabric improvements, thermal mass and natural ventilation. Thereafter, low-zero and renewable technologies are implemented where appropriate.

The table below summarises the energy, carbon and renewable performance of the extension, when assessed against TGD Part L 2022. Meath County Council are conscious of the climate emergency and the importance of on-site renewable energy generation on the path to net zero carbon.

A solar photovoltaic analysis has been carried out for the proposed council chamber and extension. The purpose of this analysis was to investigate the quantity, size, generation and subsequent energy and carbon savings that could be realised with the inclusion of a PV array. The analysis estimated that the proposed PV array will offset approximately 10.49% of the buildings regulated carbon emissions per annum as well as demonstrate a significant improvement beyond TGD Part L 2022. The intention is that the PV array will be installed on a phased basis.

The BRIRL output report from the NEAP calculation is outlined in Appendix A.

| | Energy Performance Coefficient (CPC) ≤1.00 | Carbon Performance Coefficient (EPC) ≤1.15 | Renewable Energy Ratio (RER) ≥0.20 |
|---|---|---|---|
| Proposed Council Chamber and Extension | 0.81 | 0.83 | 0.39 |

***Table 6: Meath County Council Extension – TGD Part L compliance results***

## APPENDIX A – BRIRL 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.**

# Meath County Council - PV

**Date:** Fri Nov 04 10:55:22 2022

## Administrative information

### Building Details

**Address:** Office Extension, Planning, Address 3, Address 4, Co. Meath, Eircode

### NEAP

**Calculation engine:** SBEMIE

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

**Interface to calculation engine:** Virtual Environment

**Interface to calculation engine version:** 7.0.15

**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:** Ryan Young

**Telephone number:** Empty

**Email:** ryoung@delapandwaller.com

**Address:** Delap & Waller, Bloomfield House, Bloomfield Avenue, Dublin 8, D08 H2Y9

## 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 | 14.7 kgCO2/m2.annum |
| Calculated CO2 emission rate from Actual building | 12.2 kgCO2/m2.annum |
| **Carbon Performance Coefficient (CPC)** | **0.83** |
| **Maximum Permitted Carbon Performance Coefficient (MPCPC)** | **1.15** |
| Calculated primary energy consumption rate from Reference building | 76.7 kWh/m2.annum |
| Calculated primary energy consumption rate from Actual building | 61.8 kWh/m2.annum |
| **Energy Performance Coefficient (EPC)** | **0.81** |
| **Maximum Permitted Energy Performance Coefficient (MPEPC)** | **1** |
| **Renewable Energy Ratio (RER)** | **0.39** |
| **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 | 0.38 | 0.6 | 1.1 | 02000002_W1_O4 |
| Floors (ground and exposed) | 0.21 | 0.14 | 0.6 | 0.14 | 00000008_F |
| Pitched roofs | 0.16 | - | 0.3 | - | "No heat loss pitched roofs" |
| Flat roofs | 0.2 | 0.11 | 0.3 | 0.11 | 00000008_C |
| Windows, roof windows, and rooflights | 1.6 | 1.1 | 3 | 1.1 | 00000008_W1_O0 |
| Personnel doors | 1.6 | - | 3 | - | "No ext. personnel doors" |
| 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 |

## Building Services

**The standard values listed below are minimum values for efficiencies and maximum values for SFPs. Refer to the Building Regulations documents for details.**

| | |
|---|---|
| **Whole building lighting automatic monitoring & targeting with alarms for out-of-range values** | YES |
| **Whole building electric power factor achieved by power factor correction** | 0.9 to 0.95 |

1- 2.1 - Split System - AHU w Heat Recovery

| | Heating efficiency | Cooling efficiency | Radiant efficiency | SFP [W/(l/s)] | HR efficiency |
|---|---|---|---|---|---|
| **This system** | 3.75 | 4.5 | - | 1.6 | 0.8 |
| **Standard value** | 2.75 | N/A** | N/A | 1.6^ | N/A |
| **Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system** | | | | | NO |

** No automatic check on chiller efficiency has been performed by the tool in this case. Refer to Building Regulations documents for limiting efficiency.

^ Limiting SFP may be extended by the amounts specified in the Building Regulations documents if the system includes additional components as listed in those documents.

2- 1.0 - Split System - Underfloor / Natural Ventilation

| | Heating efficiency | Cooling efficiency | Radiant efficiency | SFP [W/(l/s)] | HR efficiency |
|---|---|---|---|---|---|
| **This system** | 3.75 | 4.5 | - | - | - |
| **Standard value** | 2.75 | 4.14** | N/A | N/A | N/A |
| **Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system** | | | | | NO |

** Standard shown is for split and multi-split air conditioners <6 kW. For systems 6-12 kW, limiting efficiency is 3.87.

3- 1.1 - Split System - Underfloor / Mech Extract

| | Heating efficiency | Cooling efficiency | Radiant efficiency | SFP [W/(l/s)] | HR efficiency |
|---|---|---|---|---|---|
| **This system** | 3.75 | 4.5 | - | - | - |
| **Standard value** | 2.75 | 4.14** | N/A | N/A | N/A |
| **Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system** | | | | | NO |

** Standard shown is for split and multi-split air conditioners <6 kW. For systems 6-12 kW, limiting efficiency is 3.87.

4- 1.2 - Split System - Underfloor / MVHR

| | Heating efficiency | Cooling efficiency | Radiant efficiency | SFP [W/(l/s)] | HR efficiency |
|---|---|---|---|---|---|
| **This system** | 3.75 | 4.5 | - | - | - |
| **Standard value** | 2.75 | 4.14** | N/A | N/A | N/A |
| **Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system** | | | | | NO |

** Standard shown is for split and multi-split air conditioners <6 kW. For systems 6-12 kW, limiting efficiency is 3.87.

1- SYST0002-DHW

| | Water heating efficiency | Storage loss factor [kWh/litre per day] |
|---|---|---|
| **This building** | 2.88 | 0.007 |
| **Standard value** | 0.8* | N/A |

* Standard shown is for all types except absorption and gas engine heat pumps.

| Zone | Solar gain limit exceeded? (%) | Internal blinds used? |
|---|---|---|
| 00 - COUNCILORS CIRC | N/A | N/A |
| 00 - AV STORAGE | N/A | N/A |
| 00 - KITCHENETTE | N/A | N/A |
| 00 - COUNCIL OFFICE | NO (-32.4%) | NO |
| 01 - OFFICE CIRC | NO (-53.1%) | NO |

## Overheating

No zones in project where overheating risk check is applicable.

## Primary Energy Contributions to RER

| Technology | kWh/annum |
|---|---|
| Photovoltaic systems | 35215.4 |
| Wind turbines | 0 |
| Solar thermal for water heating | 0 |
| Biomass for space and/or water heating | 0 |
| Biogas for space and/or water heating | 0 |
| Heat pumps for space and/or water heating | 95925.6 |
| CHP generators for space and/or water heating | 0 |
| District heating for space and/or water heating | 0 |
| Process energy | 0 |
| **Total for renewables** | **131141.0** |
| **Total for renewables & non-renewables** | **337777.3** |

# Technical Data Sheet (Actual vs. Reference Building)

## Building Global Parameters

| | Actual | Reference |
|---|---|---|
| Area (m2) | 3349 | 3349 |
| External area (m2) | 5629 | 5629 |
| Weather | DUB | DUB |
| Infiltration (m3/hm2 @ 50Pa) | 3 | 3 |
| Average conductance (W/K) | 2737.85 | 1983.88 |
| Average U-value (W/m2K) | 0.49 | 0.35 |
| Alpha value* (%) | 33.31 | 21.08 |

* Percentage of the building's average heat transfer coefficient which is due to thermal bridging

## Building Use

| % area | Building Type |
|---|---|
| | Retail/Financial and Professional services |
| | Restaurants and Cafes/Drinking Est./Takeaways |
| **90** | **Offices and Workshop businesses** |
| | General Industrial and Special Industrial Groups |
| | Storage or Distribution |
| | Hotels |
| | Residential Inst.: Hospitals and Care Homes |
| | Residential Inst.: Residential Primary schools |
| | Residential Inst.: Universities and colleges |
| | Secure Residential Inst. |
| | Residential spaces |
| **10** | **Non-residential Inst.: Community/Day Centre** |
| | Non-residential Inst.: Libraries, Museums, and Galleries |
| | Non-residential Inst.: Primary Education |
| | Non-residential Inst.: Primary Health Care Building |
| | Non-residential Inst.: Law Courts |
| | General Assembly and Leisure, Night Clubs and Theatres |
| | Others: Passenger terminals |
| | Others: Emergency services |
| | Others: Miscellaneous 24hr activities |
| | Others: Car Parks 24 hrs |
| | Others - Stand alone utility block |
| | Non-residential Inst.: Post-primary Education |
| | Residential Inst.: Residential Post-primary schools |

## HVAC Systems Performance

| System Type | | Heat dem MJ/m2 | Cool dem MJ/m2 | Heat con kWh/m2 | Cool con kWh/m2 | Aux con kWh/m2 | Heat SSEEF | Cool SSEER | Heat gen SEFF | Cool gen SEER |
|---|---|---|---|---|---|---|---|---|---|---|
| **[ST] Constant volume system (variable fresh air rate), [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Elec** | | | | | | | | | | |
| | **Actual** | 180.5 | 97.4 | 11.5 | 9.6 | 67.4 | 4.34 | 2.83 | 3.75 | 4.5 |
| | **Reference** | 116.5 | 65.2 | 39.5 | 5 | 19.7 | 0.82 | 3.6 | ---- | ---- |
| **[ST] Split or multi-split system, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity** | | | | | | | | | | |
| | **Actual** | 136.9 | 86.8 | 10.9 | 7.5 | 0 | 3.49 | 3.2 | 3.75 | 4.5 |
| | **Reference** | 77.8 | 93.7 | 26.4 | 7.2 | 3.1 | 0.82 | 3.6 | ---- | ---- |
| **[ST] Split or multi-split system, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity** | | | | | | | | | | |
| | **Actual** | 60.8 | 25.5 | 4.8 | 2.2 | 14 | 3.49 | 3.2 | 3.75 | 4.5 |
| | **Reference** | 51.1 | 32.7 | 17.3 | 2.5 | 24.7 | 0.82 | 3.6 | ---- | ---- |
| **[ST] Split or multi-split system, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity** | | | | | | | | | | |
| | **Actual** | 21.4 | 94.3 | 1.7 | 8.2 | 6.3 | 3.49 | 3.2 | 3.75 | 4.5 |
| | **Reference** | 30.5 | 92.7 | 10.3 | 7.2 | 5.8 | 0.82 | 3.6 | ---- | ---- |

### Key to terms

| | |
|---|---|
| Alpha value (%) | = percentage of the building's average heat transfer coefficient which is due to thermal bridging |
| Heat dem (MJ/m2) | = Heating energy demand |
| Cool dem (MJ/m2) | = Cooling energy demand |
| Heat con (kWh/m2) | = Heating energy consumption |
| Cool con (kWh/m2) | = Cooling energy consumption |
| Aux con (kWh/m2) | = Auxiliary energy consumption |
| Heat SSEFF | = Heating system seasonal efficiency |
| Cool SSEER | = Cooling system seasonal energy efficiency ratio |
| Heat gen SSEFF | = Heating generator seasonal efficiency |
| Cool gen SSEER | = Cooling generator seasonal energy efficiency ratio |
| ST | = System type |
| HS | = Heat source |
| HFT | = Heating fuel type |
| CFT | = Cooling fuel type |