# Energy & Sustainability Statement

## Sawbridgeworth Evangelical Congregational Church

Listen. Consider. Apply. Deliver.

| | |
|---|---|
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| **Project:** | Sawbridgeworth Evangelical Congregational Church |
| **Document Title:** | Energy & Sustainability Statement |
| **Date:** | 12/03/24 |
| **MES Contact Details:** | [redacted] |
| **Authorised By:** | Tom Reynolds |
| **Signature:** | [redacted] |

# MES Offices

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## Appendices

# 1.0 Introduction

## 1.1 Executive Summary

MES Building Solutions have been engaged to provide an energy statement to address the requirements of East Herts District Council in relation to the proposed development at Sawbridgeworth Evangelical Church. The purpose of this energy statement is to provide an overview of how sustainability will be promoted both during and after construction and to establish the predicted energy requirements for the proposed development. It will illustrate how energy efficiency measures in conjunction with renewable generation can be used to reduce the predicted energy consumption and associated carbon dioxide emissions. It will also show how potable water use will be minimised.

The applicable planning policies this report will address are policy CC2 of the East Herts District Plan and the additional guidance contained in the East Herts District Council Sustainability SPD (adopted March 2021).

The energy and carbon reductions detailed in this report have been achieved by following the energy hierarchy, which includes:

- Calculation of estimated baseline energy consumption & $CO_2$ emissions using SBEM calculations
- Implementation of the energy hierarchy (be lean, be clean, be green)
- Assessment of the viability of connection to existing heat networks and/or the use of CHP
- Calculation of estimated energy consumption & $CO_2$ emissions at each stage of energy hierarchy
- Calculation of estimated final energy consumption & $CO_2$ emissions
- Calculation of reduction in emissions achieved
- Calculation of contribution from renewable, decentralised or low carbon generation, if applicable

In line with the favoured approach of East Herts District Council energy modelling has been undertaken using the latest version of Part L (2021) and SBEM to determine the expected energy and $CO_2$ consumption of the development.

The proposed development achieves at 51% reduction in carbon dioxide emissions over a Part L 2021 compliant baseline. This has been achieved by the use of;

- Improved building fabric over the Part L 2021 minimum requirements (to reduce heat loss)
- The use of MVHR unit(s) to reduce heat loss through controlled ventilation
- Use of air source heat pumps to provide space and DHW heating
- 7.0kWp PV array

Table 1.1, below, shows a breakdown of the modelled performance based on the SBEM calculations at each stage of the Energy Hierarchy. Further details can be found in Section 3 and the appendices to this report.

Table 1.1: Total reduction in energy use and carbon emissions

| | Regulated Energy Consumption (kWh per annum) | Regulated $CO_2$ Emissions (Tonnes per annum) | Regulated $CO_2$ savings | |
|---|---|---|---|---|
| | | | (Tonnes per annum) | (%) |
| Baseline | 14,804 | 2.1 | | |
| Be Lean, Be Clean | 14,154 | 1.8 | 0.3 | 13% |
| Be Green | 6,642 | 1.0 | 0.8 | 38% |
| Cumulative on site savings | 8,161 | | 1.1 | 51% |

The existing extension to the original church is not in good condition and, due to its age, it lacks insulation throughout. Given its age the existing extension is most likely of single skin construction or has an small, uninsulated cavity and the roof is not lined and lacks any form of thermally proficient construction which compounds the issue of heat loss. The proposed extension, however, will be constructed to achieve higher than statutorily required standards of insulation and air permeability. This, combined with the use of renewable and energy efficient heating systems will ensure a highly sustainable and energy efficient building – one that, as above, delivers a 51% reduction in operational carbon. The lack of insulation makes the existing extension an unsuitable candidate for installation of energy efficient heating systems such as heat pumps and ventilation heat recovery systems. The restrictions that the existing construction places on retrofit thermal efficiency (solid walls, solid ground floor and issues with addressing thermal bridging between these elements and any retrofitted insulation) mean that much greater thermal efficiency can be achieved in the proposed new extension than by retrofitting the existing. LZC heating and ventilation systems are only economically viable for buildings with good thermal performance as they are significantly more efficient in highly efficient buildings and provide much better occupant comfort. We would expect that an extension that significantly exceeds the current Part L 2021 specification requirements, such as this one, would achieve a carbon payback (where the operational carbon savings offset the increased embodied carbon of its construction) well before the end of its theoretical design life.

## 1.2 Planning Policy

In terms of planning the main policy contained in the East Herts District Plan is CC2, which is reproduced below;

**Policy CC2 Climate Change Mitigation**

I. All new developments should demonstrate how carbon dioxide emissions will be minimised across the development site, taking account of all levels of the energy hierarchy. Achieving standards above and beyond the requirements of Building Regulations is encouraged.

II. Carbon reduction should be met on-site unless it can be demonstrated that this is not feasible or viable. In such cases effective offsetting measures to reduce on-site carbon emissions will be accepted as allowable solutions.

III. The energy embodied in construction materials should be reduced through re-use and recycling , where possible, of existing materials and the use of sustainable materials and local sourcing.

**Policy WAT4 Efficient Use of Water Resources**

Development must minimise the use of mains water by:

(a) Incorporating water saving measures and equipment;

(b) Incorporating the recycling of grey water and utilising natural filtration measures where possible;

(c) Designing residential development so that mains water consumption will meet a target of 110 litres or less per head per day.

East Herts District Council have also issued a Sustainability SPD that includes a series of checklists for key aspects of sustainability.

This report will address the following sections of the above document;

Energy Efficiency & Carbon
Renewable Energy

Water Management

Relevant sections of this report address the aspects of sustainability covered by the checklist, and the completed checklist can be found in Appendix E to this report.

# 2.0 Description of the Development

## 2.1 Location

The proposed development is located on London Road, Sawbridgeworth. The immediately surrounding area is comprised primarily of residential buildings ranging from 2 to 3 storeys in height. The site location can be found in Figure 2.1, below.


Figure 2.1: Aerial photograph showing site location

## 2.2 Details of the Development

The application is for the demolition of an extension to the main church building and the construction of a larger replacement containing multi-function spaces, kitchen, refreshment area, office and meeting room.

The extension is attached to the existing building with a glazed link, with the main part of the extension being comprised of a two storey building with a single storey projection at the rear. Construction is expected to be of masonry cavity wall, concrete ground floor and timber joisted monopitch roofs.

Floor plans and elevations showing the proposed development can be found in Figures 2.2-2.7, below.


Figure 2.2 – Geound floor plan


Figure 2.3 – First floor plan

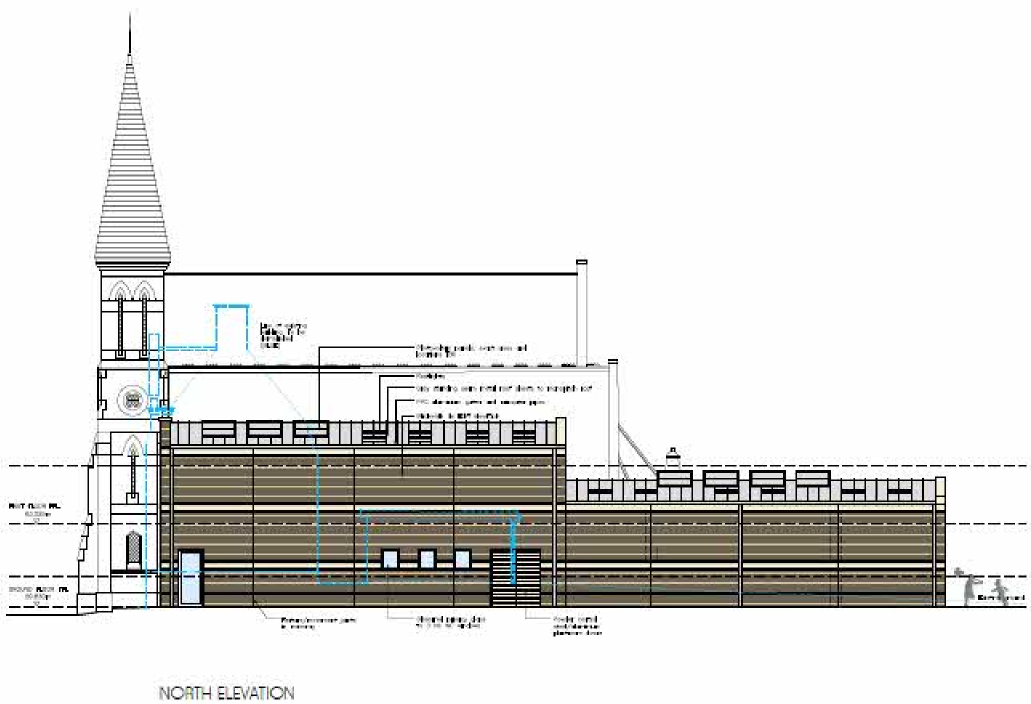


Figure 2.4 – North Elevation


Figure 2.5 – East Elevation


Figure 2.6 – South Elevation

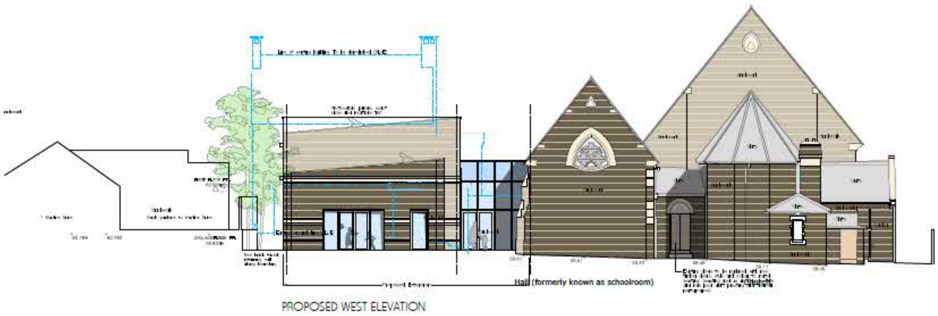


Figure 2.7 – West Elevation

# 3.0 Energy Statement

## 3.1 The Energy Hierarchy

In order to address energy efficiency the design team have adopted the energy hierarchy. The energy hierarchy is generally accepted as the most effective way of reducing a buildings' carbon emissions.

1. Be lean: use less energy
2. Be clean: supply energy efficiently
3. Be green: use renewable energy

Development proposals should:

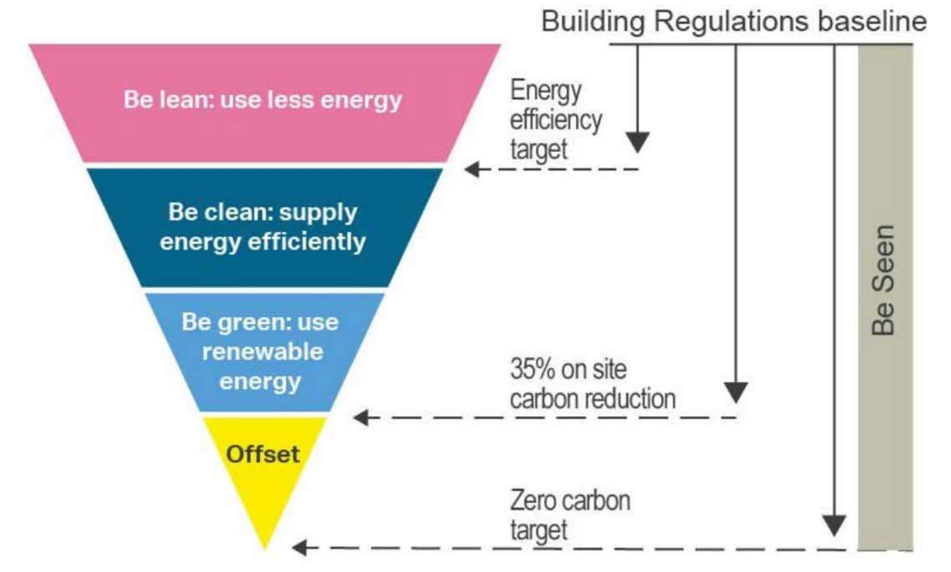


Figure 3.1: The Energy Hierarchy

Reducing energy demand

The first step in the process of reducing the overall energy used and $CO_2$ produced by the building is to minimise the energy required to heat it. A well-insulated building envelope and passive design will reduce the energy requirement for heating and ventilating the building.

Energy efficient systems

The second step is to specify services and controls, lighting and appliances that are energy efficient and which result in further reduction in energy requirements.

Making use of Low or zero-carbon (LZC) technologies

When the energy demand has been reduced by implementing the processes of improving the fabric and energy efficiency, then LZC technologies can be employed to reduce the environmental impact of the remaining energy consumption.

## 3.2 Calculating Baseline Energy Demand

The first step is to calculate a Building Regulations Part L2 2021 compliant specification in order to establish baseline emissions for the development. Calculated energy data using the government's approved methodology, SBEM, has been used to establish baseline energy requirements which comply with the 2021 edition of Part L standards. To calculate the associated carbon emissions Part L 2021 carbon factors have been used, as per Part L 2021.

The baseline emissions and energy consumption figures for the extension have been taken from the Part L2 TER calculations as generated from the SBEM modelling. The results are shown in Table 3.1 below. Full details (SBEM BRUKL) can be found in Appendix 1.

| Table 3.1: 'Baseline' energy use and carbon emissions | | | | |
|---|---|---|---|---|
| | Regulated Energy Consumption (kWh per annum) | Regulated $CO_2$ Emissions (Tonnes per annum) | Regulated $CO_2$ savings | |
| | | | (Tonnes per annum) | (%) |
| Baseline | 14,804 | 2.1 | | |

## 3.3 'Be Lean' & 'Be Clean' – Building Fabric & Efficiency Improvements

The first step of the energy hierarchy looks at reducing energy consumption in the building through improvements to its fabric. This reduces the energy required to run the building and thus the emissions associated with that energy use.

The new 2021 Part L is already very stringent in terms of fabric performance targets. It can be difficult to achieve further improvements over the fabric specification used for the 'Notional Building'. As such, further opportunities for improvement to the building fabric and services beyond those which meet the current 2021 Building Regulations requirements can be very limited. However, some further improvements are possible by considering the following steps:

- Reduce elemental U-Values
- Reducing heat loss through uncontrolled ventilation (air leakage)

The full specification used for modelling at this stage of the energy hierarchy can be found in Table 3.2, below.

| Table 3.2: 'Be Lean' Specification | |
|---|---|
| Element | Specification |
| External Walls | 0.18W/m$^2$K |
| Ground Floor | 0.13W/m$^2$K |
| Flat Roofs | 0.11W/m$^2$K |
| Windows | 1.20W/m$^2$K |
| Rooflights | 1.25W/m$^2$K |
| Air Permeability | 3.00m$^3$/m$^2$/hr |
| Thermal Bridging | Representative detailing for similar projects |
| Ventilation | Natural with local extract where required |
| Lighting | LED lamps throughout (130 lumens/watt) |
| Space Heating | ASHP(VRF) |
| DHW | From main heating system |
| LZC Technology | As Part L 2021 Notional Building |

The improved 'Be Lean' carbon dioxide emissions and energy consumption figures as taken from the SBEM model for the above specification are shown in Table 3.3, below, and the SBEM BRUKL can be found in Appendix 1 to this report.

| Table 3.3: Total reduction in energy use and carbon emissions | | | | |
|---|---|---|---|---|
| | Regulated Energy Consumption (kWh per annum) | Regulated $CO_2$ Emissions (Tonnes per annum) | Regulated $CO_2$ savings | |
| | | | (Tonnes per annum) | (%) |
| Baseline | 14,804 | 2.1 | | |
| Be Lean, Be Clean | 14,154 | 1.8 | 0.3 | 13% |

## 3.4 'Be Green' – $CO_2$ Reduction Through the Use of LZC Technologies & Energy Storage

This section will examine the available renewable energy generation technologies and determine which is most appropriate for the proposed development.

Available Renewable Generation Technologies

Energy resources accepted as renewable or low carbon technologies are defined by the Department of Energy and Climate Change Low Carbon Buildings Program as:

Solar photovoltaics
Wind turbines
Small hydro
Solar thermal hot water
Ground source heat pumps
Air source heat pumps
Bio-energy
Renewable CHP
Micro CHP (Combined heat and power)

Solar Photovoltaics

Solar panel electricity systems, also known as solar photovoltaics (PV), capture the sun's energy using photovoltaic cells. These cells do not need direct sunlight to work – they can still generate some electricity on a cloudy day. The cells convert the sunlight into electricity, which can be used to run household appliances and lighting. When excess power is generated this can be sold back to the grid or stored onsite.

The roof of the proposed development is almost flat and reasonably sized. This will enable a reasonable amount of PV to be located on the roofs and for this to be oriented broadly to the south – as this is the optimum orientation for peak generation. Despite this it is not going to be possible to achieve a significant reduction in carbon emissions using PV alone, mainly as mains electricity is now a low carbon fuel and this is what is displaced by PV generation. As such although this is a suitable technology it will only deliver a significant carbon reduction in conjunction with other LZC technologies.

Wind Turbines

Wind turbines harness the power of the wind and use it to generate electricity. Forty percent of all the wind energy in Europe blows over the UK, making it an ideal country for domestic turbines. Urban sites such as the location of this development are generally unsuitable for wind turbine installations due to the interrupted turbulent wind flows caused by surrounding buildings and large obstacles. There are also possible issues with noise and 'flicker' for the neighbouring buildings.

The urban nature of the site and lack of space mean that a wind turbine cannot be recommended as a viable option for this development. There are also general issues surrounding the use of building mounted turbines with the potential for excessive noise and vibration within the building and the effect of flicker on surrounding buildings and amenity spaces.

| Table 3.5: Average Wind Speeds | |
|---|---|
| 45m above ground level | 6.4m/s |
| 25m above ground level | 5.8m/s |
| 10m above ground level | 5.2m/s |

## Small Hydro Generation

Hydroelectricity generation uses running water to generate electricity, whether it is a small stream or a larger river. All streams and rivers flow downhill. Before the water flows down the hill, it has potential energy because of its height. Hydro power systems convert this potential energy into kinetic energy in a turbine, which drives a generator to produce electricity. Small, or ‘micro’ hydro generation requires a reliable source of flowing water with a reasonably constant flow velocity. Systems of this nature are normally installed in locations with a natural moving water source such as a river, stream or spring where part of the flow can be diverted through a generator.

There is no such source of flowing water in this case and small hydro generation is not an option for this development.

## Solar Water heating

Solar water heating systems use free heat from the sun to warm domestic hot water. Solar hot water heating can generate a large proportion of a buildings annual DHW requirement. The displaced fuel would be mains gas meaning that the $CO_2$ savings of this type of system would be relatively low due to the low carbon intensity of the displaced fuel. However, this technology would need sufficient space on the roof for the panels and to provide heat to each apartment would need individual pipework taking down through the building. This technology cannot provide a significant carbon reduction on its own, so combination with another technology would be required. As PV is much simpler and more reliable to integrate into a building this technology is not considered suitable for this development, as the available roofspace would be better used for PV than solar thermal.

## Heat Pumps

Heat pumps use similar technology as refrigerators but reversed. A refrigerant liquid is used as a medium to extract heat from a source and convert it into useful heat energy. The heat source used can be generally one of three types; the ground, the air or a body of water.  Both ground and water sourced heat pumps use a long circuitous pipe through which a refrigerant is pumped. In ground sourced heat pumps this can be either a coiled pipe or ‘slinky’ that is buried in a series of horizontal trenches or a loop inside a vertical bore hole to depths that can be up to 200m or deeper. Water sourced heat pumps generally use a similar system to the ‘slinky’ used for ground sourced systems but either floated on or submerged in a body of water (either a large pool or running water source). Air source heat pumps have a refrigerant coil mounted outside the building through which is passed air so that heat can be extracted. All three types of heat pump generally use the collected heat from the source to heat water. The heated water can then be used for space heating and DHW. Heat pumps require an input of energy to drive pumps, this is usually electricity and so their renewable generation is the difference between the input and output energy. Most have very good efficiencies; energy produced by heat pumps is typically in the region of 2.5 times that which is required to run them, giving efficiencies of 250% and above.

The site has the potential space to allow for the use of either ground source heat pumps (GSHPs) or air source heat pumps (ASHPs). There is significant space available on site, although detailed design work will be required to determine whether ground loops would interfere with any trees or, potentially, burials in the churchyard. If ground loops are not possible then there will almost certainly be enough space for boreholes – although these do require the correct ground conditions. ASHPs do not need the ground interface and their external condensers could be located on the roofs or the rear elevation of the building. At this stage, therefore, either main type of heat pump can be considered as a suitable technology for this development.

Bio Energy
The Low Carbon Buildings Program (LCBP) defines biomass as follows:

"Biomass is often called 'bioenergy' or 'biofuels'. These biofuels are produced from organic materials, either directly from plants or indirectly from industrial, commercial, domestic or agricultural products. Biofuels fall into two main categories:

Woody biomass includes forest products, untreated wood products, energy crops, short rotation coppice (SRC), e.g. willow.

Non-woody biomass includes animal waste, industrial and biodegradable municipal products from food processing and high energy crops, e.g. rape, sugar cane, maize."

For small-scale domestic [and small scale commercial] applications of biomass the fuel usually takes the form of wood pellets, wood chips and logs. The LCBP goes on to state:

"There are two main ways of using biomass to heat a domestic property:

Stand-alone stoves providing space heating for a single room. These can be fuelled by logs or pellets but only pellets are suitable for automatic feed. Generally they are 5-11 kW in output, and some models can be fitted with a back boiler to provide water heating.

Boilers connected to central heating and hot water systems. These are suitable for pellets, logs or chips, and are generally larger than 15 kW"

(http://www.lowcarbonbuildings.org.uk/micro/biomass)

This technology is dismissed as the space requirements needed for the boiler and pellet store make this impractical along with complying with clean air zone requirements.

'Be Green' Modelled Performance

As identified above, the use of PV and heat pumps have been identified as the most suitable technologies for this development. Use of heat pumps for space heating and DHW heating will provide a large improvement in the overall energy consumption and, therefore, carbon emissions associated with the development. PV will generate renewable energy on-site. As the type of heat pump has not been determined at this stage of design development this report is based on the use of ASHPs. These have a slightly worse performance than GSHPs, so should the full design process enable GSHPs to be used then the performance will only improve over that modelled in this report, which will result in lower carbon dioxide emissions than we have calculated here.

The full specification used for modelling at this stage of the energy hierarchy can, therefore, be found in Table 3.6, below.

Table 3.6: 'Be Green' Specification

| Element | Specification |
|---|---|
| External Walls | 0.18W/m$^2$K |
| Ground Floor | 0.13W/m$^2$K |
| Flat Roofs | 0.11W/m$^2$K |
| Windows | 1.20W/m$^2$K |
| Rooflights | 1.25W/m$^2$K |
| Air Permeability | 3.00m$^3$/m$^2$/hr |
| Thermal Bridging | Representative detailing for similar projects |
| Ventilation | Natural with local extract where required |

| | |
|---|---|
| Lighting | LED lamps throughout (130 lumens/watt) |
| Space Heating | ASHP(VRF) |
| DHW | From main heating system |
| LZC Technology | 7.0kWp PV array |

The improved 'Be Green' carbon dioxide emissions and energy consumption figures as taken from the SBEM model for the above specification are shown in Table 3.7, below, and the SBEM BRUKL can be found in Appendix 2 to this report.

Table 3.7: Total reduction in energy use and carbon emissions

| | Regulated Energy Consumption (kWh per annum) | Regulated $CO_2$ Emissions (Tonnes per annum) | Regulated $CO_2$ savings | |
|---|---|---|---|---|
| | | | (Tonnes per annum) | (%) |
| Baseline | 14,804 | 2.1 | | |
| Be Lean, Be Clean | 14,154 | 1.8 | 0.3 | 13% |
| Be Green | 6,642 | 1.0 | 0.8 | 38% |
| Cumulative on site savings | 8,161 | | 1.1 | 51% |

## 4.0 Water Consumption

Policy WAT4 of the East Herts District Plan requires that development limit the consumption of potable water. Although a full BREEAM assessment is not going to be undertaken, to show how the development is proposing to follow the WAT4 requirements we have used the BREEAM v6.1 methodology for calculating and limiting the use of potable water on site. This is detailed under BREEAM v6.1 credit WAT01 and involves assessing the development's potable water use against an industry standard baseline. Credits are then awarded based on the percentage improvement achieved over and above the baseline. The table below shows the improvements and corresponding credits awarded.

| BREEAM Credits available for percentage improvement over baseline building water consumption | |
|---|---|
| % improvement | No. of BREEAM credits |
| 12.50% | 1 |
| 25% | 2 |
| 40% | 3 |
| 50% | 4 |
| 55% | 5 |
| 65% | Exemplary performance |

Table 6.1: BREEAM WAT01 credits

This development will target the achievement of the equivalent of 2 BREEAM credits under this issue – so a 25% improvement over the baseline. At this stage no detailed calculations can be undertaken as the full kitchen specification is not developed. However, the expected performance of each of the water use elements is highlighted in the table below (elements marked in red are not present in the proposed development);

| Water efficient consumption levels by component type | | | | | | | |
|---|---|---|---|---|---|---|---|
| Component | Performance levels (quoted numbers are minimum performance required to achieve the level) | | | | | | |
| | Base | 1 | 2 | 3 | 4 | 5 | Unit |
| WC | 6 | 5 | 4.5 | 4 | 3.75 | 3 | Effective flush volume (litres) |
| Wash hand basin taps | 12 | 9 | 7.5 | 4.5 | 3.75 | 3 | litres/min |
| Showers | 14 | 10 | 8 | 6 | 4 | 3.5 | litres/min |
| Baths | 200 | 180 | 160 | 140 | 120 | 100 | litres |
| Urinal (2 or more urinals) | 7.5 | 6 | 3 | 1.5 | 0.75 | 0 | litres/bowl/hour |
| Urinal (1 urinal only) | 10 | 8 | 4 | 2 | 1 | 0 | litres/bowl/hour |
| Greywater/rainwater system | 0% | 0% | 0% | 25% | 50% | 75% | % of WC/urinal flushing demand met using recycled non-potable water |
| Kitchen tap: kitchenette | 12 | 10 | 7.5 | 5 | 5 | 5 | litres/min |
| Kitchen taps: restaurant (pre-rinse nozzles only) | 10.3 | 9 | 8.3 | 7.3 | 6.3 | 6 | litres/min |
| Domestic sized dishwashers | 17 | 13 | 13 | 12 | 11 | 10 | litres/cycle |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Domestic sized washing machines | 90 | 60 | 50 | 40 | 35 | 30 | litres/use |
| Waste disposal unit | 17 | 17 | 0 | 0 | 0 | 0 | litres/min |
| Commercial sized dishwashers | 8 | 7 | 6 | 5 | 4 | 3 | litres/rack |
| Commercial/Industrial sized washing machines | 14 | 12 | 10 | 7.5 | 5 | 4.5 | litres/kg |

Table 6.2: Required water consumption by element

This shows that, in accordance with WAT4, the development is using water efficient fittings to minimise the consumption of mains water.

# Appendix 1

## 'Be Lean' SBEM BRUKL

# BRUKL Output Document

Compliance with England Building Regulations Part L 2021

HM Government

**Project name**

## Sawbridgeworth Evangelical Church - Be Lean

As designed

**Date:** Fri Feb 23 12:40:30 2024

## Administrative information

### Building Details

**Address:** Sawbridgeworth Evangelical Church, SAWBRIDGEWORTH, CM21 9EH

### Certifier details

**Name:** MES Building Solutions

**Telephone number:** Phone

**Address:** Newark Beacon, Beacon Hill Office Park, Cafferata Way, NEWARK, NG24 2TN

### Certification tool

**Calculation engine:** Apache

**Calculation engine version:** 7.0.25

**Interface to calculation engine:** IES Virtual Environment

**Interface to calculation engine version:** 7.0.25

**BRUKL compliance module version:** v6.1.e.1

**Foundation area [m²]:** 195.3

## The $CO_2$ emission and primary energy rates of the building must not exceed the targets

| | | |
|---|---|---|
| Target $CO_2$ emission rate (TER), $kgCO_2/m^2.annum$ | 4.9 | |
| Building $CO_2$ emission rate (BER), $kgCO_2/m^2.annum$ | 4.76 | |
| Target primary energy rate (TPER), $kWh_{PE}/m^2.annum$ | 52.23 | |
| Building primary energy rate (BPER), $kWh_{PE}/m^2.annum$ | 51.13 | |
| Do the building's emission and primary energy rates exceed the targets? | BER =< TER | BPER =< TPER |

## The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

| Fabric element | $U_{a-Limit}$ | $U_{a-Calc}$ | $U_{i-Calc}$ | First surface with maximum value |
|---|---|---|---|---|
| Walls* | 0.26 | 0.18 | 0.18 | 00000007:Surf[1] |
| Floors | 0.18 | 0.13 | 0.13 | 00000007:Surf[2] |
| Pitched roofs | 0.16 | - | - | No pitched roofs in building |
| Flat roofs | 0.18 | 0.11 | 0.11 | 0000000E:Surf[4] |
| Windows** and roof windows | 1.6 | 1.2 | 1.2 | 00000007:Surf[0] |
| Rooflights*** | 2.2 | 1.25 | 1.25 | 0000000E:Surf[0] |
| Personnel doors^ | 1.6 | - | - | No personnel doors in building |
| Vehicle access & similar large doors | 1.3 | - | - | No vehicle access doors in building |
| High usage entrance doors | 3 | - | - | No high usage entrance doors in building |

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

* Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows.

** Display windows and similar glazing are excluded from the U-value check. *** Values for rooflights refer to the horizontal position.

^ For fire doors, limiting U-value is 1.8 W/m²K

NB: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

| Air permeability | Limiting standard | This building |
|---|---|---|
| m³/(h.m²) at 50 Pa | 8 | 3 |

**Building services**

**For details on the standard values listed below, system-specific guidance, and additional regulatory requirements, refer to the Approved Documents.**

| | |
|---|---|
| **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 |

1- Electric Panel Heater MV

| | Heating efficiency | Cooling efficiency | Radiant efficiency | SFP [W/(l/s)] | HR efficiency |
|---|---|---|---|---|---|
| **This system** | 1 | - | 0 | - | - |
| **Standard value** | N/A | N/A | N/A | N/A | N/A |
| **Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system** | | | | | NO |

2- VRF - Notional

| | Heating efficiency | Cooling efficiency | Radiant efficiency | SFP [W/(l/s)] | HR efficiency |
|---|---|---|---|---|---|
| **This system** | 3 | 5 | 0 | 1.2 | 0.8 |
| **Standard value** | 2.5* | N/A | N/A | 2^ | N/A |
| **Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system** | | | | | YES |

* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.

^ Limiting SFP may be increased by the amounts specified in the Approved Documents if the installation includes particular components.

3- Electric Panel Heater NV

| | Heating efficiency | Cooling efficiency | Radiant efficiency | SFP [W/(l/s)] | HR efficiency |
|---|---|---|---|---|---|
| **This system** | 1 | - | 0 | - | - |
| **Standard value** | N/A | N/A | N/A | N/A | N/A |
| **Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system** | | | | | NO |

"No HWS in project, or hot water is provided by HVAC system"

**Zone-level mechanical ventilation, exhaust, and terminal units**

| ID | System type in the Approved Documents |
|---|---|
| A | Local supply or extract ventilation units |
| B | Zonal supply system where the fan is remote from the zone |
| C | Zonal extract system where the fan is remote from the zone |
| D | Zonal balanced supply and extract ventilation system |
| E | Local balanced supply and extract ventilation units |
| F | Other local ventilation units |
| G | Fan assisted terminal variable air volume units |
| H | Fan coil units |
| I | Kitchen extract with the fan remote from the zone and a grease filter |

NB: Limiting SFP may be increased by the amounts specified in the Approved Documents if the installation includes particular components.

| **Zone name** | **SFP [W/(l/s)]** | | | | | | | | | **HR efficiency** | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **ID of system type** | **A** | **B** | **C** | **D** | **E** | **F** | **G** | **H** | **I** | | |
| **Standard value** | 0.3 | 1.1 | 0.5 | 2.3 | 2 | 0.5 | 0.5 | 0.4 | 1 | **Zone** | **Standard** |
| 00_AWC | - | - | 0.4 | - | - | - | - | - | - | - | N/A |
| 00_Kitchen | - | - | - | - | - | - | - | - | 0.8 | - | N/A |
| 00_WCs | - | - | 0.4 | - | - | - | - | - | - | - | N/A |
| 00_WCs | - | - | 0.4 | - | - | - | - | - | - | - | N/A |

| General lighting and display lighting | General luminaire | Display light source | |
|---|---|---|---|
| Zone name | Efficacy [lm/W] | Efficacy [lm/W] | Power density [W/m²] |
| Standard value | 95 | 80 | 0.3 |
| 00_AWC | 130 | - | - |
| 00_Circulation | 130 | - | - |
| 00_Entrance | 130 | - | - |
| 00_Flexible Halls | 130 | - | - |
| 00_Kitchen | 130 | - | - |
| 00_Kitchen Store | 130 | - | - |
| 00_Plant | 130 | - | - |
| 00_Refreshment Area | 130 | - | - |
| 00_Servery | 130 | - | - |
| 00_Staff Office | 130 | - | - |
| 00_Stairs | 130 | - | - |
| 00_Store | 130 | - | - |
| 00_Store | 130 | - | - |
| 00_WCs | 130 | - | - |
| 00_WCs | 130 | - | - |
| 01_Balcony/Breakout | 130 | - | - |
| 01_Large Meeting Room | 130 | - | - |
| 01_Lobby | 130 | - | - |
| 01_Office | 130 | - | - |
| 01_Stairs | 130 | - | - |
| 01_Store | 130 | - | - |
| 01_WCs | 130 | - | - |

## The spaces in the building should have appropriate passive control measures to limit solar gains in summer

| Zone | Solar gain limit exceeded? (%) | Internal blinds used? |
|---|---|---|
| 00_Circulation | NO (-9.6%) | NO |
| 00_Entrance | YES (+326.1%) | NO |
| 00_Flexible Halls | YES (+43.5%) | NO |
| 00_Refreshment Area | YES (+4.6%) | NO |
| 00_Servery | YES (+126.1%) | NO |
| 00_Staff Office | N/A | N/A |
| 01_Balcony/Breakout | NO (-27.1%) | NO |
| 01_Large Meeting Room | NO (-48.8%) | NO |
| 01_Office | NO (-6.9%) | NO |

## Regulation 25A: Consideration of high efficiency alternative energy systems

| | |
|---|---|
| **Were alternative energy systems considered and analysed as part of the design process?** | YES |
| Is evidence of such assessment available as a separate submission? | NO |
| Are any such measures included in the proposed design? | YES |

# Technical Data Sheet (Actual vs. Notional Building)

## Building Global Parameters

| | Actual | Notional |
|---|---|---|
| Floor area [m²] | 422 | 422 |
| External area [m²] | 1036.4 | 1036.4 |
| Weather | LON | LON |
| Infiltration [m³/hm²@ 50Pa] | 3 | 3 |
| Average conductance [W/K] | 285.86 | 298.22 |
| Average U-value [W/m²K] | 0.28 | 0.29 |
| Alpha value* [%] | 24.52 | 10 |

* 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 Establishments/Takeaways |
| | Offices and Workshop Businesses |
| | General Industrial and Special Industrial Groups |
| | Storage or Distribution |
| | Hotels |
| | Residential Institutions: Hospitals and Care Homes |
| | Residential Institutions: Residential Schools |
| | Residential Institutions: Universities and Colleges |
| | Secure Residential Institutions |
| | Residential Spaces |
| **100** | **Non-residential Institutions: Community/Day Centre** |
| | Non-residential Institutions: Libraries, Museums, and Galleries |
| | Non-residential Institutions: Education |
| | Non-residential Institutions: Primary Health Care Building |
| | Non-residential Institutions: Crown and County 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 |

## Energy Consumption by End Use [kWh/m²]

| | Actual | Notional |
|---|---|---|
| Heating | 10.34 | 10 |
| Cooling | 4.65 | 2.11 |
| Auxiliary | 5.5 | 9.3 |
| Lighting | 4.36 | 6.85 |
| Hot water | 8.69 | 10.5 |
| Equipment* | 22.76 | 22.76 |
| **TOTAL**** | **33.54** | **38.76** |

* Energy used by equipment does not count towards the total for consumption or calculating emissions.
** Total is net of any electrical energy displaced by CHP generators, if applicable.

## Energy Production by Technology [kWh/m²]

| | Actual | Notional |
|---|---|---|
| Photovoltaic systems | 0 | 3.68 |
| Wind turbines | 0 | 0 |
| CHP generators | 0 | 0 |
| Solar thermal systems | 0 | 0 |
| *Displaced electricity* | *0* | *3.68* |

## Energy & $CO_2$ Emissions Summary

| | Actual | Notional |
|---|---|---|
| Heating + cooling demand [MJ/m²] | 158.98 | 111.63 |
| Primary energy [$kWh_{PE}/m^2$] | 51.13 | 52.23 |
| Total emissions [kg/m²] | 4.76 | 4.9 |

## 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] Other local room heater - unfanned, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Electricity | | | | | | | | | | |
| | Actual | 147.5 | 0 | 41 | 0 | 0 | 1 | 0 | 1 | 0 |
| | Notional | 198.1 | 0 | 39 | 0 | 0 | 1.41 | 0 | ---- | ---- |
| [ST] Other local room heater - unfanned, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Electricity | | | | | | | | | | |
| | Actual | 64 | 0 | 17.8 | 0 | 24.6 | 1 | 0 | 1 | 0 |
| | Notional | 85.3 | 0 | 16.8 | 0 | 20.9 | 1.41 | 0 | ---- | ---- |
| [ST] Variable refrigerant flow, [HS] ASHP, [HFT] Electricity, [CFT] Electricity | | | | | | | | | | |
| | Actual | 75.9 | 111.5 | 7 | 6.2 | 4.4 | 3 | 5 | 3 | 5 |
| | Notional | 69.3 | 46.9 | 6.9 | 2.8 | 7.3 | 2.78 | 4.63 | ---- | ---- |
| [ST] No Heating or Cooling | | | | | | | | | | |
| | Actual | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Notional | 0 | 0 | 0 | 0 | 0 | 0 | 0 | ---- | ---- |

### Key to terms

| | |
|---|---|
| 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 (for notional building, value depends on activity glazing class) |
| 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 |

# Appendix 2

## ‘Be Green’ SBEM BRUKL

# BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2021

**Project name**

## Sawbridgeworth Evangelical Church - Be Green - 7 kWp PV

As designed

**Date:** Fri Feb 23 12:21:26 2024

## Administrative information

### Building Details

**Address:** Sawbridgeworth Evangelical Church, SAWBRIDGEWORTH, CM21 9EH

### Certifier details

**Name:** MES Building Solutions

**Telephone number:** Phone

**Address:** Newark Beacon, Beacon Hill Office Park, Cafferata Way, NEWARK, NG24 2TN

### Certification tool

**Calculation engine:** Apache

**Calculation engine version:** 7.0.25

**Interface to calculation engine:** IES Virtual Environment

**Interface to calculation engine version:** 7.0.25

**BRUKL compliance module version:** v6.1.e.1

**Foundation area [m²]:** 195.3

## The $CO_2$ emission and primary energy rates of the building must not exceed the targets

| | | |
|---|---|---|
| Target $CO_2$ emission rate (TER), $kgCO_2/m^2.annum$ | 4.9 | |
| Building $CO_2$ emission rate (BER), $kgCO_2/m^2.annum$ | 2.42 | |
| Target primary energy rate (TPER), $kWh_{PE}/m^2.annum$ | 52.23 | |
| Building primary energy rate (BPER), $kWh_{PE}/m^2.annum$ | 24.73 | |
| Do the building's emission and primary energy rates exceed the targets? | BER =< TER | BPER =< TPER |

## The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

| Fabric element | $U_{a-Limit}$ | $U_{a-Calc}$ | $U_{i-Calc}$ | First surface with maximum value |
|---|---|---|---|---|
| Walls* | 0.26 | 0.18 | 0.18 | 00000007:Surf[1] |
| Floors | 0.18 | 0.13 | 0.13 | 00000007:Surf[2] |
| Pitched roofs | 0.16 | - | - | No pitched roofs in building |
| Flat roofs | 0.18 | 0.11 | 0.11 | 0000000E:Surf[4] |
| Windows** and roof windows | 1.6 | 1.2 | 1.2 | 00000007:Surf[0] |
| Rooflights*** | 2.2 | 1.25 | 1.25 | 0000000E:Surf[0] |
| Personnel doors^ | 1.6 | - | - | No personnel doors in building |
| Vehicle access & similar large doors | 1.3 | - | - | No vehicle access doors in building |
| High usage entrance doors | 3 | - | - | No high usage entrance doors in building |

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

* Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows.

** Display windows and similar glazing are excluded from the U-value check. *** Values for rooflights refer to the horizontal position.

^ For fire doors, limiting U-value is 1.8 W/m²K

NB: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

| Air permeability | Limiting standard | This building |
|---|---|---|
| m³/(h.m²) at 50 Pa | 8 | 3 |

**Building services**

**For details on the standard values listed below, system-specific guidance, and additional regulatory requirements, refer to the Approved Documents.**

| | |
|---|---|
| **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 |

1- Electric Panel Heater MV

| | **Heating efficiency** | **Cooling efficiency** | **Radiant efficiency** | **SFP [W/(l/s)]** | **HR efficiency** |
|---|---|---|---|---|---|
| **This system** | 1 | - | 0 | - | - |
| **Standard value** | N/A | N/A | N/A | N/A | N/A |
| **Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system** | | | | | NO |

2- VRF - Proposed (Daikin RXYA10A or Equiqalent)

| | **Heating efficiency** | **Cooling efficiency** | **Radiant efficiency** | **SFP [W/(l/s)]** | **HR efficiency** |
|---|---|---|---|---|---|
| **This system** | 4.09 | 7.55 | 0 | 1.2 | 0.8 |
| **Standard value** | 2.5* | N/A | N/A | 2^ | N/A |
| **Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system** | | | | | YES |

* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.

^ Limiting SFP may be increased by the amounts specified in the Approved Documents if the installation includes particular components.

3- Electric Panel Heater NV

| | **Heating efficiency** | **Cooling efficiency** | **Radiant efficiency** | **SFP [W/(l/s)]** | **HR efficiency** |
|---|---|---|---|---|---|
| **This system** | 1 | - | 0 | - | - |
| **Standard value** | N/A | N/A | N/A | N/A | N/A |
| **Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system** | | | | | NO |

"No HWS in project, or hot water is provided by HVAC system"

**Zone-level mechanical ventilation, exhaust, and terminal units**

| **ID** | **System type in the Approved Documents** |
|---|---|
| A | Local supply or extract ventilation units |
| B | Zonal supply system where the fan is remote from the zone |
| C | Zonal extract system where the fan is remote from the zone |
| D | Zonal balanced supply and extract ventilation system |
| E | Local balanced supply and extract ventilation units |
| F | Other local ventilation units |
| G | Fan assisted terminal variable air volume units |
| H | Fan coil units |
| I | Kitchen extract with the fan remote from the zone and a grease filter |
| NB: Limiting SFP may be increased by the amounts specified in the Approved Documents if the installation includes particular components. | |

| **Zone name** | **SFP [W/(l/s)]** | | | | | | | | | **HR efficiency** | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **ID of system type** | **A** | **B** | **C** | **D** | **E** | **F** | **G** | **H** | **I** | | |
| **Standard value** | 0.3 | 1.1 | 0.5 | 2.3 | 2 | 0.5 | 0.5 | 0.4 | 1 | **Zone** | **Standard** |
| 00_AWC | - | - | 0.4 | - | - | - | - | - | - | - | N/A |
| 00_Kitchen | - | - | - | - | - | - | - | - | 0.8 | - | N/A |
| 00_WCs | - | - | 0.4 | - | - | - | - | - | - | - | N/A |
| 00_WCs | - | - | 0.4 | - | - | - | - | - | - | - | N/A |

| General lighting and display lighting | General luminaire | Display light source | |
|---|---|---|---|
| Zone name | Efficacy [lm/W] | Efficacy [lm/W] | Power density [W/m²] |
| Standard value | 95 | 80 | 0.3 |
| 00_AWC | 130 | - | - |
| 00_Circulation | 130 | - | - |
| 00_Entrance | 130 | - | - |
| 00_Flexible Halls | 130 | - | - |
| 00_Kitchen | 130 | - | - |
| 00_Kitchen Store | 130 | - | - |
| 00_Plant | 130 | - | - |
| 00_Refreshment Area | 130 | - | - |
| 00_Servery | 130 | - | - |
| 00_Staff Office | 130 | - | - |
| 00_Stairs | 130 | - | - |
| 00_Store | 130 | - | - |
| 00_Store | 130 | - | - |
| 00_WCs | 130 | - | - |
| 00_WCs | 130 | - | - |
| 01_Balcony/Breakout | 130 | - | - |
| 01_Large Meeting Room | 130 | - | - |
| 01_Lobby | 130 | - | - |
| 01_Office | 130 | - | - |
| 01_Stairs | 130 | - | - |
| 01_Store | 130 | - | - |
| 01_WCs | 130 | - | - |

## The spaces in the building should have appropriate passive control measures to limit solar gains in summer

| Zone | Solar gain limit exceeded? (%) | Internal blinds used? |
|---|---|---|
| 00_Circulation | NO (-9.6%) | NO |
| 00_Entrance | YES (+326.1%) | NO |
| 00_Flexible Halls | YES (+43.5%) | NO |
| 00_Refreshment Area | YES (+4.6%) | NO |
| 00_Servery | YES (+126.1%) | NO |
| 00_Staff Office | N/A | N/A |
| 01_Balcony/Breakout | NO (-27.1%) | NO |
| 01_Large Meeting Room | NO (-48.8%) | NO |
| 01_Office | NO (-6.9%) | NO |

## Regulation 25A: Consideration of high efficiency alternative energy systems

| | |
|---|---|
| **Were alternative energy systems considered and analysed as part of the design process?** | YES |
| Is evidence of such assessment available as a separate submission? | NO |
| Are any such measures included in the proposed design? | YES |

# Technical Data Sheet (Actual vs. Notional Building)

## Building Global Parameters

| | Actual | Notional |
|---|---|---|
| Floor area [m²] | 422 | 422 |
| External area [m²] | 1036.4 | 1036.4 |
| Weather | LON | LON |
| Infiltration [m³/hm²@ 50Pa] | 3 | 3 |
| Average conductance [W/K] | 285.86 | 298.22 |
| Average U-value [W/m²K] | 0.28 | 0.29 |
| Alpha value* [%] | 24.52 | 10 |

* 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 Establishments/Takeaways |
| | Offices and Workshop Businesses |
| | General Industrial and Special Industrial Groups |
| | Storage or Distribution |
| | Hotels |
| | Residential Institutions: Hospitals and Care Homes |
| | Residential Institutions: Residential Schools |
| | Residential Institutions: Universities and Colleges |
| | Secure Residential Institutions |
| | Residential Spaces |
| **100** | **Non-residential Institutions: Community/Day Centre** |
| | Non-residential Institutions: Libraries, Museums, and Galleries |
| | Non-residential Institutions: Education |
| | Non-residential Institutions: Primary Health Care Building |
| | Non-residential Institutions: Crown and County 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 |

## Energy Consumption by End Use [kWh/m²]

| | Actual | Notional |
|---|---|---|
| Heating | 8.93 | 10 |
| Cooling | 3.08 | 2.11 |
| Auxiliary | 5.5 | 9.3 |
| Lighting | 4.36 | 6.85 |
| Hot water | 7.29 | 10.5 |
| Equipment* | 22.76 | 22.76 |
| **TOTAL**** | **29.16** | **38.76** |

* Energy used by equipment does not count towards the total for consumption or calculating emissions.
** Total is net of any electrical energy displaced by CHP generators, if applicable.

## Energy Production by Technology [kWh/m²]

| | Actual | Notional |
|---|---|---|
| Photovoltaic systems | 13.42 | 3.68 |
| Wind turbines | 0 | 0 |
| CHP generators | 0 | 0 |
| Solar thermal systems | 0 | 0 |
| *Displaced electricity* | *13.42* | *3.68* |

## Energy & $CO_2$ Emissions Summary

| | Actual | Notional |
|---|---|---|
| Heating + cooling demand [MJ/m²] | 158.98 | 111.63 |
| Primary energy [$kWh_{PE}/m^2$] | 24.73 | 52.23 |
| Total emissions [kg/m²] | 2.42 | 4.9 |

## 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] Variable refrigerant flow, [HS] ASHP, [HFT] Electricity, [CFT] Electricity | | | | | | | | | | |
| | **Actual** | 75.9 | 111.5 | 5.2 | 4.1 | 4.4 | 4.09 | 7.55 | 4.09 | 7.55 |
| | **Notional** | 69.3 | 46.9 | 6.9 | 2.8 | 7.3 | 2.78 | 4.63 | ---- | ---- |
| [ST] Other local room heater - unfanned, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Electricity | | | | | | | | | | |
| | **Actual** | 147.5 | 0 | 41 | 0 | 0 | 1 | 0 | 1 | 0 |
| | **Notional** | 198.1 | 0 | 39 | 0 | 0 | 1.41 | 0 | ---- | ---- |
| [ST] Other local room heater - unfanned, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Electricity | | | | | | | | | | |
| | **Actual** | 64 | 0 | 17.8 | 0 | 24.6 | 1 | 0 | 1 | 0 |
| | **Notional** | 85.3 | 0 | 16.8 | 0 | 20.9 | 1.41 | 0 | ---- | ---- |
| [ST] No Heating or Cooling | | | | | | | | | | |
| | **Actual** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | **Notional** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | ---- | ---- |

### Key to terms

| | |
|---|---|
| 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 (for notional building, value depends on activity glazing class) |
| 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 |

# Appendix 3

## East Herts District Council Sustainability Checklist

# Sustainability Checklist

## Important: Please read instructions below.

Before you begin, download this form to your computer and complete using Acrobat Reader. **Please do not complete this form within your web browser (i.e. Explorer, Chrome, Firefox) as the information you write on and sign the form cannot be saved.**

**How to use the checklist**

The sustainable design and construction submission checklist needs to be submitted with applications for all new development (that result in a residential net gain of 1 dwelling and above or an increase in non-residential floorspace) and can also be used as part of the pre-application process.

The purpose of this checklist is to explain and evidence how the proposed development complies with District Plan policies that seek to improve the environmental sustainability of new development. The checklist topics and criteria reflect the sustainable design and construction guidance set out in the **Sustainability Supplementary Planning Document** (SPD): www.eastherts.gov.uk/sustainabilityspd

The checklist should be used as a tool to provide an overview of how a scheme addresses different aspects of sustainability, although each application will be assessed on its own merit, taking account of local circumstances. It does not replace other application submission requirements, but aims to provide an overarching framework to help facilitate the assessment of different, often overlapping, strands of sustainability.

Applicants should:

- Briefly summarise/ explain how their proposal complies with the relevant criteria, signposting to other relevant statements/ surveys as appropriate (for example, the transport assessment, biodiversity checklist and Sustainable construction, energy and water statement). The checklist does not need to repeat detailed information submitted elsewhere, but should provide an overview of the approach taken in the scheme.
- Ensure answers are explained and justified, not simply 'yes' or 'no' or 'not applicable';
- Use District Plan policies and the relevant sections in the SPD to inform responses;
- Ensure the level of detail submitted is proportionate to the type of application. For outline applications, the relevance of criteria will depend how many matters are reserved. Given the importance of incorporating sustainability measures early into the design process (as outlined in section 2 of the SPD), the Council think it is important that the checklist is considered at the outline stage. However, it is recognised it may not be possible to provide all the information required. In these circumstances, the applicant should demonstrate which checklist criteria are not applicable to their proposal.
- Ensure the level of detail submitted is proportionate to the scale of application. While major applications will require significantly more input than others, it is appropriate that all submissions should consider the sustainable design and construction issues raised and provide a response.
- Refer to the Council's website for further details about the submission requirements of particular applications: https://www.eastherts.gov.uk/planning-building/make-planning-application

# Site name and reference

Sawbridgeworth Evangelical Church

# Details of person responsible for completing checklist

**Name**

**Organisation**

**Relationship to the proposal** (e.g. applicant, agent, consultant)

With the following questions, please give a summary of the approach you are taking to address the criteria stated in the boxes provided.

# Energy and carbon reduction

En.1 Does the Sustainable construction, Energy and Water Statement detail how the proposed development's carbon emissions have been minimised and to what extent?

Have full and reserved matters planning applications also included a carbon reduction template within the statement? (See SPD Section 3.3 and appendix B)

Yes. Carbon emissions have been reduced by 51% over the Part L 2021 baseline. This has been achieved through an improved building fabric (13% reduction) and the use of ASHPs (38% reduction).

See the full Energy Statement for further details.

En.2 How have the site layout and building orientation and form been designed to minimise energy use? E.g. passive solar gain, natural shade, natural ventilation, thermal mass) (See SPD section 3.2.3)

The proposed extension is located on the north side of a large existing building. There is, therefore, limited scope for optimising the building for solar gain. It is only the element that extends to the rear past the existing church that can benefit from passive solar gain. In this area the glazing has been oriented to the south. The built form has been kept reasonably compact and cross ventilation is possible through the openings on opposing facades. Higher level opening rooflights will also enable additional ventilation and help reduce stratification and the buildup of heat gain.

Thermal mass will be utilised where possible in the building, mainly through the ground floor slab. Ideally this will be combined with the ability to ventilate over night (possibly via the rooflights, but a balance needs to be struck between ventilation and the security of the building) to enable the absorption of heat during the day and the purging of this over night.

**En.3** How has the energy hierarchy been applied to prioritise reducing the need for energy and implementing the 'fabric first approach'? (See SPD sections 3.2.2 and 3.2.3)

An improved building fabric has reduced carbon emissions by 13% via passive means. The use of a heat pump to provide space and DHW heating then provides and additional 57% reduction.

For full details please see the full Energy Statement

**En.4** How will you ensure that where renewable/ low carbon technologies have been included to reduce carbon, that these will be successfully integrated into the design of the development? (See SPD sections 3.2.4 and 3.2.5)

Design of the heat pumps(s) and emitter systems will be undertaken by the same party (as recommended by the Energy Saving Trust). The ASHP(s) will be suitable sized for the demand - which should be low due to the insulation uplift over Part L 2021 - and will be commissioned by a suitable specialist prior to completion.

**En.5** How has the energy embodied in construction materials been reduced? (e.g. reuse and recycling/ sustainable materials/ locally sourced) (See SPD section 3.2.6)

Significant design work still needs to be undertaken to determine the exact construction of the proposed development. However, materials will be sourced locally where possible. Materials with a low embodied carbon (timber, low carbon cement, etc.) will be specified wherever possible. The possibility of using demolition waste crushed on site for fill/hardcore will be investigated with the aim to recover as much of this as possible.

# Climate Change Adaptation

**CA.1** How has the site layout and buildings been designed to mitigate overheating, giving priority to measures in line with the cooling hierarchy? (See SPD section 4.2.2)

The site layout opportunities are extremely limited due to the Grade II listed buildings to be retained, and historical burial grounds in parts of the church gardens. However, a proportionate amount of south facing glazing is proposed to allow for passive solar gain whilst avoiding excessive south facing glazing which could result in overheating.

**CA.2** How has overheating been assessed and what measures are proposed to address it? (See SPD section 4.2.2)

Overheating will be managed through the use of opening windows and careful specification of the light transmittance of the glazing.

There is limited south-facing glazing due to the presence of the existing building to the south of the development site. This will limit the solar gain, but the elements of glass on the east and west elevations will be difficult to shade due to their orientation so will need the G-Value (light transmittance) carefully specifying during detailed design to limit the solar gain.

**CA.3** What Green Infrastructure is proposed? (See SPD section 4.2.3)

The surrounding green infrastructure of the remaining churchyard will be maintained to provide a green space in the center of the village. New high street trees and high biodiversity planting is proposed, sufficient to achieve 10% biodiversity net gain (BNG) on site. Please see the separate Ecology report and BNG calculations.

**CA.4** How have existing landscape features such as trees/woodlands and hedgerows been protected and incorporated within a Green Infrastructure network? (See SPD section 4.2.3)

Yes, the existing features of the churchyard will be maintained and protected during the construction process. All existing trees are to be retained and the majority of the existing hedgerow. A small section of hedgerow is to be removed but is to be compensated for by new trees and planting as noted in the separate Ecology report.

**CA.5** Where feasible and appropriate, have green roofs or walls been included. Please explain your answer? (See SPD section 4.2.3)

No green roofs or walls are proposed for this development as the roof spaces have generally been kept available for rooflights for solar gain/ventilation and solar panels for the low carbon strategy.

CA.6 Have measures been included to address surface water runoff? (See SPD section 4.2.4)

Please refer to the separate drainage strategy report. Infiltration (i.e. soakaway) is to be considered at detailed design stage subject to ground soakage and ground water testing to assess the site suitability. If infiltration is not technically feasible, stormwater attenuation is to be explored with controlled release to the public drainage system in line with the required run-off rated to be agreed with the Lead Local Flood Authority.

CA.7 If the application is major development, have details of SUDs been submitted? (See SPD section 4.2.4)

N/A

# Water efficiency

WA.1 For new residential proposals, have you demonstrated compliance with the target for mains water consumption to be 110 litres or less per heard per day in the Sustainable construction, Energy and Water Statement? (See SPD section 5.2.2)

N/A

WA.2 For non-residential development have measures been taken to reduce water consumption in the proposed development? (See SPD section 5.2.3)

Yes, an improvement over the baseline BREEAM v6.1 requirement is targeted - see the Energy Statement for full details.

WA.3 Has consideration been given to the using water recycling systems? (See SPD section 5.2.4)

No, these generally duplicate function and lead to increased embodied carbon due to the additional equipment required within the building. The increased maintenance and limited water savings that would be expected from a building of this type would most likely result in the additional embodied carbon not being offset by the savings made by reduced water consumption over the life of the plant required to operate the systems.

# Pollution-Air Quality

AQ.1 How has the proposal addressed the recommended minimum air quality standards? These apply to all new development as set out in paragraphs 6.1.2.2 of the SPD.

Using ASHPs will ensure that the development has no local emissions as it is heated entirely using mains electricity. This will ensure that it has no negative impact on local air quality.

AQ.2 How does the proposal show consideration of air quality in the design of new development? Design should address the following principles:

- Building and development layout and design
- Emissions from transport
- Sustainable energy

(See SPD section 6.1.2.4)

Using ASHPs will ensure that the development has no local emissions as it is heated entirely using mains electricity. This will ensure that it has no negative impact on local air quality.

There is no increase in transport use/parking demand from the existing. Building users will be encouraged to travel by sustainable transport means and the church is considering a mini-bus scheme. Please refer to the separate Transport Note for further details.

AQ.3 How has emissions mitigation been incorporated into the proposal? (See SPD section 6.1.2.5)

Using ASHPs will ensure that the development has no local emissions as it is heated entirely using mains electricity. This will ensure that it has no negative impact on local air quality.

**AQ.4** How will emissions be minimised through the construction and demolition phase of the development? Measures should follow the national guidance set out in section 6.1.2.7 of this SPD.

Measures will follow the national guidelines as set out in section 6.1.2.7 of the SPD and will form part of the construction management plan prepared by the main contractor when appointed.

**AQ.5** Has an Emissions Assessment been carried out as part of the Air Quality Neutral Requirement? The assessment should utilise the Damage Cost Approach.

An Emissions Assessment has not been carried out. Currently the existing extension uses an old mains gas boiler (inefficient and with on site particulate and NOx emissions). Moving to ASHP or GSHP will reduce the usage emissions. Please see the separate statement made in the Air Quality Report.

AQ.6 Has an Air Quality Impact Assessment been submitted? This must be submitted if the proposal meets any of the criteria listed in paragraphs 6.1.3 of the SPD.

N/A

AQ.7 Has an Air Quality Neutral Assessment been submitted? This must be submitted if the proposal meets the criteria listed in paragraphs 6.1.3 of this SPD.

Yes, this is a separate document.

# Pollution: Light Pollution

**LP.1** Does the proposal materially alter light levels outside the development and/or have the potential to adversely affect the neighbouring uses or amenity of residents and road users or impact on local ecology? (See SPD section 6.2.2)

| |
|---|
| No. |

**LP.2** Is the proposed light design the minimum required for security and operational purposes? (See SPD section 6.2.2)

| |
|---|
| Yes. |

**LP.3** Does the proposal minimise potential glare and spillage? Please detail the design measures adopted to ensure this. (See SPD section 6.2.2)

Lighting of the new building is expected to be controlled by timer and/or PIR such that lighting is only used when the buildings are in use.

# Biodiversity

**Bio.1** Have you submitted East Herts biodiversity checklist? (See SPD section 7.3)

PEA and PRA submitted with Biodiversity calculations setting out how the development will enhance biodiversity and achieve BNG 10% net gain.

**Bio.2** In accordance with the Biodiversity checklist, does the proposal affect a protected species or habitat? (See SPD section 7.2.4 and 7.3)

Please refer to the PEA and PRA. The existing buildings have some features that provide the potential for bat roosts. Further survey work will be carried out during bat roost season.

**Bio.3** If a protected species or habitat has been identified, has an ecological survey, with sufficient information been undertaken? (See SPD section 7.2.4 and 7.3)

Please refer to the PEA and PRA. The existing buildings have some features that provide the potential for bat roosts. Further survey work will be carried out during bat roost season.

**Bio.4** If relevant, has an ecological survey, with sufficient information been undertaken to assess the likely ecological impact of the development?

| |
|---|
| PEA and PRA submitted with Biodiversity calculations setting out how the development will enhance biodiversity and achieve BNG 10% net gain. |

**Bio.5** Has the mitigation hierarchy been applied undertaken, to demonstrate an adverse impact on biodiversity has been avoided? If this is not possible, has the impact been mitigated and then subsequently compensated? (See SPD section 7.2. and 7.3)

| |
|---|
| PEA and PRA submitted with Biodiversity calculations setting out how the development will enhance biodiversity and achieve BNG 10% net gain. |

**Bio.6** Has a net gain been achieved using a locally approved biodiversity metric? (See SPD section 7.2.5)

| |
|---|
| Yes, PEA and PRA submitted with Biodiversity calculations setting out how the development will enhance biodiversity and achieve BNG 10% net gain. |

**Bio.7** Has a suitable biodiversity management and monitoring strategy for the site been proposed?

| |
|---|
| Yes, see the PEA. |

# Sustainable Transport

T.1 Have you demonstrated that the development includes measures that reduce the overall need to travel, and particularly by private car? (See SPD section 8.2.2)

Yes, please refer to the separate Transport Note.

T.2 Have you demonstrated how, as first principles of design; the scheme's proposals prioritise walking and cycling within the development and link with existing networks beyond the development to deliver healthy and walkable neighbourhoods? (See SPD section 8.2.3)

Yes, please refer to the separate Transport Note.

**T.3** Where cycling facilities and any bus stops and/or transport hubs are to be provided, have you demonstrated that they accessible and attractive for all users and offer appropriate shelter? (See SPD section 8.2.3)

Yes, please refer to the separate Transport Note.

**T.4** Have you included measures (traditional and/or innovative) to encourage uptake of more sustainable modes of transport and engender modal shift from the outset of development? (See SPD section 8.2.2 and 8.2.3)

Yes, please refer to the separate Transport Note.

T.5 Have you developed and submitted to Herts County Council an appropriate Travel Plan, Transport Assessment and/or Statement (as appropriate)? (See SPD section 8.2.4)

Yes, refer to Transport Note. Pre-application engagement with the Highways Team has confirmed suitable documen

T.6 Where car parking is to be provided, have you provided justification for the number of spaces proposed and made provision for electric vehicle charging in accordance with the Vehicle Parking Provision at New Developments SPD?

Yes, please refer to the separate Transport Note.

# Waste Management

W.1 Have measures been proposed to reduce, re-use and recycle construction and demolition waste? (See SPD Sections 9.2.2 and 9.2.3)

To be reviewed at Construction Stage.  Reuse of demolished building materials, i.e. crushed masonry for hardcore, are

W.2 How has the internal and external design of the development factored in effective sustainable waste management measures? Has sufficient detail been submitted with the application? (See SPD Section 9.2.4)

Waste and Recycling provision remains unchanged from existing as the proposals simply replace the existing facilities

W.3 Have all the relevant criteria identified in table 13 of the SPD been addressed?
(See SPD Section 9.2.4)

**Data Protection Clause**

In accordance with the Data Protection Act 2018 the information you supply the Council will be used to process the planning application or any subsequent appeal and retained as per our published corporate data protection privacy policy which may be found here. Your details and comments will be shown on the website and this information may be shared with other Council departments and/or outside partners.

**I agree** (Please tick this box to confirm your agreement). ☐

**If you are happy with the information contained in this checklist, please save the PDF and submit with your planning application.**