

ENERGY STATEMENT

Former Big Cat Sanctuary, Codicote Road,
Codicote, Welwyn, AL6 9TU

Produced by XCO₂ for Howarth Homes

July 2026



XCO2
56 Kingsway Place, Sans Walk
London EC1R 0LU

+44 (0)20 7700 1000
mail@xco2.com
xco2.com



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	01	02	03			
Remarks	First issue for comment	Update following scheme changes	Update following client comments			
Prepared by	JS	EK	EK			
Checked by	ZS	JS	JS			
Date	28/05/2026	17/07/2026	22/07/2026			
Project reference	10.275					

EXECUTIVE SUMMARY

The energy strategy for the Codicote Road development has been developed in line with the energy policies of both North Hertfordshire District Council and Welwyn Hatfield Borough Council, the site falling across both council boundaries. A three-step energy hierarchy has been implemented and the estimated regulated CO₂ savings on site are 25.7% against a Part L 2021 compliant scheme. The development complies with Part L 2021 of the Building Regulations, the Building Regulations applicable at the time of writing.

This Energy Statement has been prepared by XCO₂ on behalf of Howarth Homes in support of a detailed planning application for a Proposed Development at the former Big Cat Sanctuary, Codicote Road, Welwyn.

This application has been submitted to both North Hertfordshire District Council and Welwyn Hatfield Borough Council as a result of the site straddling both councils.

The Proposed Development includes the demolition of all existing buildings and structures on site and the redevelopment of the site to provide 109 residential units, ten of which are wheelchair accessible apartments designed to Part M4(3), with the remainder comprising two, three and four bed houses.

The energy strategy outlined in this report has been developed using the Building Regulations Part L 2021 methodology and SAP 10.2 emission factors.

The methodology used to determine the expected operational CO₂ emissions for the development is based on a three-step energy hierarchy and the CO₂ savings achieved for each step are outlined adjacent and overleaf. This hierarchy follows the Greater London Authority (GLA) approach and naming convention, which is used here as a familiar reporting structure rather than because the GLA has any jurisdiction over the site.

The proposed heating and hot water strategy comprises individual gas boilers with a seasonal efficiency of 92%, together with mechanical ventilation with heat recovery (MVHR) and roof mounted photovoltaic (PV) panels.

USE LESS ENERGY

The first step addresses reduction in energy demand, through the adoption of passive and active design measures.

The proposed energy efficiency measures include levels of insulation beyond the limiting fabric standards of Part L 2021, low air permeability, efficient lighting, MVHR, and energy saving controls for space conditioning and lighting.

The assessment has been carried out with a combined baseline for all new build areas. Each dwelling archetype has been modelled individually in SAP and the results weighted by unit count and floor area.

By means of energy efficiency measures alone, regulated CO₂ emissions are shown to reduce by:

Regulated CO ₂ Savings at Use Less Energy Stage		
	%	t/yr
Site wide	3.5	3.75

SUPPLY ENERGY EFFICIENTLY

The application site is not located within, and is not expected to be served by, any existing or proposed district heat network.

A site-wide heat network has not been deemed a suitable approach for this development, because the majority of dwellings are houses, where low heat density and high pipework heat losses make individual systems more efficient. There is a small block of 10

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flats, but a dedicated communal system is unfeasible given its low total heat load and disproportionate space requirements. Individual systems are therefore proposed across the entire development, comprising gas boilers with a seasonal efficiency of 92%. No savings arise at this stage of the hierarchy.

USE RENEWABLE ENERGY

The feasibility study carried out for the development identified PV panels as the technology to be adopted for this scheme. Air Source Heat Pumps were assessed as part of the energy strategy and were found to be technically feasible. However, the proposed energy strategy, comprising enhanced fabric performance, energy efficient building services and roof-mounted PV panels, achieves compliance with the relevant local planning policy requirements and carbon reduction targets for the development. Individual gas-fired systems are therefore proposed as the preferred heating solution for this application.

The incorporation of photovoltaics is expected to reduce CO₂ emissions further, with estimated savings as follows:

Regulated CO ₂ Savings at Renewable Energy Stage		
	%	t/yr
Site wide	22.2	24.07

CUMULATIVE ON SITE SAVINGS

The overall regulated CO₂ savings on site against a Part L 2021 compliant scheme are therefore:

Cumulative Regulated CO ₂ Savings		
	%	t/yr
Site wide	25.7	27.82

DISCLAIMER

XCO2 does not endorse or recommend specific manufacturers, products or materials.

Any reference to specific materials and components is solely for the purposes of recommendation of their thermal and/or embodied carbon performance.

It will be the responsibility of other design team members to specify exact products suitable for the development to match the set performance recommendations. XCO2 is not responsible for confirming or checking any performance parameters not related to thermal conductivity and/or embodied carbon of a product or component (such as, but not limited to, structural integrity, fire risk rating, hygroscopy/hydrophoby, size or cost differences).

INTRODUCTION

This chapter presents the description of the site and of the development proposal, the energy policy framework and the methodology employed for the energy assessment.

SITE & PROPOSAL

The proposed scheme is a detailed planning application for the redevelopment of the former Big Cat Sanctuary on Codicote Road. The proposal involves the demolition of all existing buildings and structures on site and the redevelopment of the site to provide a 100% residential scheme, together with access, parking, hard and soft landscaping, public open space and associated works. The scheme includes 109 new homes, of which 99 are houses and 10 are wheelchair accessible apartments designed to Part M4(3). The site

extends to approximately 4.0 hectares and its current lawful use falls within Class E, most recently operating as a farm shop.

 Site Location



Figure 1: Approximate location of the application site.

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POLICY FRAMEWORK

The proposal will seek to respond to the energy policies of the following documents:

- North Hertfordshire Local Plan (2011-2031),
- North Hertfordshire Sustainability Supplementary Planning Document (SPD) (2024),
- Welwyn Hatfield Local Plan (2016-2036), and,
- Welwyn Hatfield Sustainability SPD (2025).

The proposal also accounts for the emerging Welwyn Hatfield New Local Plan, which has completed consultation and is being prepared for release.

The most relevant applicable energy policies in the context of the proposed development are presented below.

NORTH HERTFORDSHIRE LOCAL PLAN (2011-2031)

Policy D1: Sustainable design

Policy SP9: Design and Sustainability

Policy SP11: Natural resources and sustainability

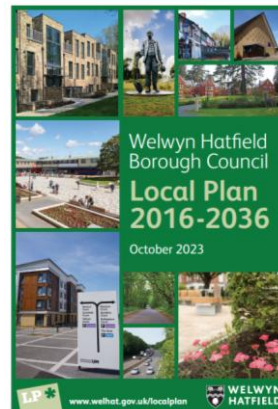
Policy NE12: Renewable and low carbon energy development



WELWYN HATFIELD LOCAL PLAN (2016-2036)

Policy SP 1 Delivering Sustainable Development

Policy SADM 13 Sustainability Requirements



WELWYN HATFIELD NEW LOCAL PLAN

SP 1: Sustainable Development

SP 5: The Green Belt

SP 6: Mitigating and Adapting to Climate Change

DMP 3: Energy Efficiency and Net Zero Design

DMP 7: Renewable and Low Carbon Energy

DMP 9a: Heat Risk and Mitigation

DMP 9b: Carbon Offsetting



METHODOLOGY

The sections below present the methodology followed in determining the on-site and off-site carbon savings for the proposed scheme.

ON-SITE CARBON SAVINGS – THE ENERGY HIERARCHY

The methodology employed to develop the energy strategy for the scheme and achieve on-site carbon savings is as follows:

The **baseline** CO₂ emissions are first established, i.e. the emissions of a scheme that is compliant with Part L 2021 of the Building Regulations.

The software used to model and calculate the energy performance and carbon emissions is SAP10.2. The emissions are established by modelling representative dwelling types and multiplying the Target Emission Rate (TER) of each type with the cumulative floor area for that type to establish the total emissions for the domestic element of the proposal.

The same approach is followed to determine the energy performance and CO₂ emissions of the proposed scheme for each of the steps of the **Energy Hierarchy**. The CO₂ emissions are estimated based on the SAP Dwelling Emission Rate (DER). The Energy Hierarchy aims at delivering significant carbon savings on-site. The three consecutive steps of the energy hierarchy are:

- **Use less energy** - whereby the demand for energy is reduced through a range of passive and active energy efficiency measures;
- **Supply energy efficiency** - whereby as much of the remaining energy demand is supplied as efficiently as possible (e.g. by connecting to a district energy network or developing a site-wide energy network), and,
- **Renewable and low carbon energy** - whereby renewable technologies are incorporated to offset part of the carbon emissions of the development. The uptake of renewable technologies is based on feasibility and viability considerations, including their compatibility with the energy system determined in the previous step.

The implementation of the energy hierarchy determines the total regulated carbon savings that can be feasibly and viably achieved on site.

The percentage improvement against the baseline emissions is compared to the relevant targets for each element. Where a shortfall arises, savings through off-site measures should be considered.

The Conclusions section summarises the energy strategy and associated carbon savings for the proposed development.

USE LESS ENERGY

The proposals incorporate a range of passive and active design measures that reduce the energy demand for space conditioning, hot water and lighting. Design guidance is also provided to reduce the risk of overheating in residential dwellings. The regulated carbon saving achieved in this step of the energy hierarchy is 3.5% over the site wide baseline level.

To assess the savings achieved through efficiency measures alone, the 'use less energy' stage SAP calculations retain the same gas boiler and hot water system as the proposed scheme, so that the effect of the fabric and ventilation measures is isolated from the effect of the PVs. The Part L 2021 notional dwelling for a gas heated home is itself served by a gas boiler, so the heating system is common to both the baseline and the Be Lean case and the saving at this stage reflects fabric, airtightness and ventilation improvements only.

Corridor walls (flats)	0.26	0.25	4%
Roof	0.16	0.10	38%
Windows and glazed doors	1.6	1.30; g-value 0.55	19%
Opaque doors	1.6	1.20	25%

PASSIVE DESIGN MEASURES

ENHANCED U-VALUES

The heat loss of different building fabric elements is dependent upon their U-value. A building with low U-values provides better levels of insulation and reduced heating demand during the cooler months.

The proposed development incorporates levels of insulation and glazing performance that improve on the limiting fabric standards of Part L 2021, in order to reduce the demand for space heating.

The table below and adjacent compares the proposed building fabric against the limiting U-values set out in Approved Document L 2021.

Table 2: Thermal envelope U-values modelled in SAP for the Proposed Development

Residential (flats & houses) (U-values in W/m ² .K)			
Element	Building Regulations	Proposed	Improvement
Walls	0.26	0.18	31%
Ground floor	0.18	0.10	44%

AIR PERMEABILITY IMPROVEMENT

Heat loss may also occur due to air infiltration. Although this cannot be eliminated altogether, good construction detailing and the use of best practice construction techniques can minimise the amount of air infiltration.

The proposed development will aim to improve upon the Part L 2021 minimum standards for air permeability by targeting a rate of 3m³/m².h at 50Pa.

THERMAL BRIDGING

Thermal bridging can cause significant heat loss within buildings, whereby junctions between insulated building fabric elements provide less thermal resistance than the surrounding envelope. While repeating thermal bridges such as timber studs, rafters and wall ties are accounted for within u-value calculations, linear thermal bridges such as floor junctions, corners, roof junctions and window reveals must be included separately within the SAP and DSM calculations.

Heat loss from linear thermal bridges is known as the Psi-value (Ψ), measured in W/mK. Psi-values can be obtained through the modelling of specific junctions based on the proposed construction details. Where

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individual junctions are not modelled, SAP applies a single cumulative figure known as the y-value, and Part L 2021 uses a reference y-value of 0.20 for the notional building.

The SAP models for this development do not rely on a global y-value. Each junction has been entered individually using independently assessed Psi-values, which is the more onerous and more accurate route. The values used include 0.05 W/mK for lintels, eaves and gables, 0.04 W/mK for sills, jambs and corners, 0.03 W/mK for intermediate floors, 0.06 W/mK for party walls between dwellings, and 0.10 W/mK for ground floor junctions.

As the technical design of the building fabric is developed, the assumed Psi-values must be confirmed by detailed modelling of the proposed junctions, or replaced by Approved Document L default values. The SAP results depend on these figures being achieved in the built detail, so this should be carried out early in the technical design.

REDUCING THE NEED FOR ARTIFICIAL LIGHTING

The development will be designed to maximise daylight in all habitable spaces as a way of improving the health and wellbeing of its occupants.

All of the habitable areas will benefit from large areas of glazing to increase the amount of daylight within the internal spaces where possible. This is expected to reduce the need for artificial lighting whilst delivering pleasant, healthy spaces for occupants.

Guidance has also been developed for minimising overheating risk while achieving good daylight levels across the residential areas. The detailed design will need to adhere to this guidance in order to achieve a balanced design encompassing reduced overheating risk (in line with CIBSE TM59 and Approved Document O) whilst simultaneously achieving good levels of daylight ingress across the site. Achievement of good daylight levels in internal spaces will inherently lead to a reduced need for artificial lighting. Please refer to Appendix A, Overheating Risk Mitigation Design Guidance, for further details.

FABRIC ENERGY EFFICIENCY

The predicted performance of the dwellings against the Part L Fabric Energy Efficiency target has been taken from the SAP models of each archetype and

weighted by unit count and floor area. The energy demand of the dwellings per square metre is represented by the Dwelling Fabric Energy Efficiency (DFEE), and in order to reach Part L compliance this must not exceed the Target Fabric Energy Efficiency (TFEE).

Table 3 summarises the findings from the assessment and demonstrates that the DFEE does not exceed the TFEE.

Table 3: Area averaged Target and Dwelling Fabric Energy Efficiency for the residential portion of the scheme

Fabric Energy Efficiency		
TFEE (kWh/m ² .yr)	DFEE (kWh/m ² .yr)	Improvement
36.46	34.02	6.7%

GLAZING PERCENTAGE

The recommended glazing percentages for the development are discussed in Appendix A – Overheating Risk Mitigation Design Guidance, which proposes to limit the glazing ratio to 25% of room area, especially on S/E/W facing facades. External shading recommendations are also included. This will reduce risk of overheating and potential cooling needs.

ACTIVE DESIGN MEASURES

HIGH EFFICACY LIGHTING

The development intends to incorporate low energy lighting fittings throughout. All light fittings will be specified as low energy lighting, and will accommodate light emitting diodes (LEDs), compact fluorescents (CFLs) or fluorescent luminaires only.

HEAT RECOVERY VENTILATION

Mechanical ventilation heat recovery (MVHR) is proposed. The mechanical ventilation system will include heat recovery in order to achieve ventilation in the most energy-efficient way. MVHR units will be fitted with summer bypass functions to ensure the heat recovery can be turned off in the summer months, so as not to increase the risk of overheating. Openable windows are proposed for the residential dwellings, naturally ventilating occupied spaces to reduce the risk of overheating.

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CONTROLS

Advanced lighting and space conditioning controls will be incorporated, specifically:

- For residential communal areas of infrequent use (localised to the block of flats), occupant sensors will be fitted for lighting, whereas day lit areas will incorporate daylight sensors where appropriate; and,
- Heating controls in dwellings will comprise time and temperature zone controls; and delayed start thermostats to efficiently maintain comfortable temperatures.

MONITORING

In addition to the above design measures, the development will incorporate monitoring equipment and systems to enable occupiers to monitor and reduce their energy use.

Smart meters will be installed to monitor the heat and electricity consumption of each dwelling; the display board will demonstrate real-time and historical energy use data and will be installed at an accessible location within the dwellings.

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MINIMISING OVERHEATING

The potential risk of overheating for residential dwellings can generally be minimised by incorporating passive and active design measures, as set out below. Detailed design guidance has been provided for future detailed development to minimise overheating risk whilst achieving good daylight and energy performance across residential developments.

In addition, detailed overheating risk assessments of the residential areas will be conducted as part of compliance with Building Regulations Part O and will utilise the CIBSE TM59 methodology. It is highly recommended that this analysis takes place during RIBA Stage 4 to optimise the design prior to construction.

THE COOLING HIERARCHY

REDUCING THE AMOUNT OF HEAT ENTERING THE BUILDING IN SUMMER

External shading elements such as balconies, fins, overhangs, brise soleils and shutters integrated across the elevations, tailored to each specific façade orientation and design, can significantly reduce solar gains into occupied spaces. Internal blinds can further reduce the amount of heat entering buildings.

MINIMISING INTERNAL HEAT GENERATION THROUGH ENERGY EFFICIENT DESIGN

The distribution of heat infrastructure within all dwellings will be designed to reduce the lateral pipework lengths within the internal spaces to reduce heat loss. Heat sources and pipework will be sufficiently insulated (following CIBSE CoP1 guidelines).

USE OF THERMAL MASS AND HIGH CEILINGS TO MANAGE THE HEAT WITHIN THE BUILDING

During peak summer periods the thermal mass of the houses can absorb and store excess heat. The building will release its heat in the cooler evenings to allow for cooler internal spaces, dampening the peak diurnal weather conditions. This design strategy is recommended where feasible, and is discussed further in Appendix A.

PASSIVE VENTILATION

All rooms will have openable windows allowing for large opening fractions, and the houses are predominantly dual aspect, which will enable cross ventilation. Where acoustic and air quality constraints allow, the most effective way to reduce internal temperatures in dwellings is through purge ventilation.

MECHANICAL VENTILATION

MVHR is proposed across the development. The MVHR will be capable of operating in summer bypass mode, allowing for the dissipation of any heat build-up during peak summer conditions.

OVERHEATING RISK ASSESSMENT

Detailed overheating risk assessments will be conducted for the development for Building Control submission. A representative sample of the residential units deemed most at risk will be assessed in line with CIBSE TM59 and Part O, using dynamic thermal modelling software. The maximum permissible geometric open areas established by the Noise Impact Assessment for the plots fronting Codicote Road must be carried into that modelling, because Part O requires the overheating strategy to account for windows being closed at night where external noise is an issue.

USE LESS ENERGY - CO₂ EMISSIONS

At the 'use less energy' stage, the proposed development reduces regulated carbon emissions by 3.5% against the baseline. Energy cost to residents will also be reduced through the implementation of the energy efficiency measures outlined within this section.

Regulated CO ₂ Savings at 'Use Less Energy' Stage		
	%	t/yr
Site wide	3.5	3.75

RENEWABLE ENERGY

The renewable technologies feasibility study carried out for the development identified photovoltaic panels as the technology to be adopted for this scheme. The regulated carbon saving achieved in this step of the energy hierarchy is 22.2% over the site wide baseline level.

RENEWABLE TECHNOLOGIES FEASIBILITY STUDY

Methods of generating on-site renewable energy (Green) were assessed, once Lean measures were taken into account.

The development of Codicote Road will benefit from an energy efficient building fabric which will reduce the energy consumption of the proposed development in the first instance. A range of renewable technologies were subsequently considered including:

- Biomass;
- Ground/water source heat pumps;
- Air source heat pumps (ASHPs);
- Wind energy;
- Photovoltaic (PV) panels, and,
- Solar thermal panels.

In determining the appropriate renewable technology for the site, the following factors were considered:

- CO₂ savings achieved;
- Site constraints;
- Any potential visual impacts;
- Lifetime; and,
- Maintenance.

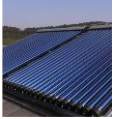
RENEWABLE ENERGY APPRAISAL SUMMARY

The table below summarises the factors taken into account in determining the appropriate renewable technologies for this project. This includes estimated capital cost, lifetime, level of maintenance and level of impact on external appearance. The final column indicates the feasibility of the technology in relation to the site conditions (10 being the most feasible and 0 being infeasible). It is important to note that the information provided is indicative and based upon early project stage estimates.

The feasibility study demonstrates that PV panels are the most feasible renewable technology for the site. PVs are adopted and are assessed in detail in the following section. ASHPs were also considered and were found to be technically feasible, but they are not necessary in order to achieve compliance with the applicable policy requirements and carbon reduction targets, which the proposed strategy of enhanced fabric performance, energy efficient building services and roof-mounted PV panels achieves. Individual gas-fired systems are therefore proposed as the preferred heating solution for this application.

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Table 4: Summary of renewable technologies feasibility study

		Comments	Lifetime	Maintenance	Impact on external appearance	Site feasibility
Biomass		Not adopted – burning of wood pellets releases high NOx emissions and they would likely need to be adopted on an individual basis for this development which is deemed inviable.	20 yrs.	High	High	1
PV		Adopted. See detailed assessment in following section of report.	25 yrs.	Low	Med	9
Solar thermal		Not adopted – PV is deemed more feasible and all available roof space has been maximised to include PV.	25 yrs.	Low	Med	7
GSHP		Not adopted – the installation of ground loops requires significant space, additional time at the beginning of the construction process and very high capital costs.	20 yrs.	Med	Low	4
ASHP		Not adopted – Considered and technically feasible, but not necessary to achieve compliance with the applicable policy requirements and carbon reduction targets, which are met by the proposed fabric, building services and PV strategy. Individual gas-fired systems with a seasonal efficiency of 92% are proposed for space heating and hot water.	20 yrs.	Med	Med	8
Wind		Not adopted - Wind turbines located at the site will have a significant visual impact on the site and surroundings.	25 yrs.	Med	High	2

DETAILED ASSESSMENT OF PHOTOVOLTAIC PANELS

Four types of solar cells are available on the market at present and these are mono-crystalline, poly-crystalline, thin film and hybrid panels. Although mono-crystalline and hybrid cells are the most expensive, they are also the most efficient with an efficiency rate of 12-22%. Poly-crystalline cells are cheaper but they are less efficient (9-15%). Thin film cells are only 5-8% efficient but can be produced as thin and flexible sheets.

Photovoltaics are considered a suitable technology for this development for the following reasons:

- The development provides an extent of roof space for the installation of PV panels;
- PV arrays are relatively easy to install when compared to other renewable systems; and
- PV panels provide a significant amount of CO₂ savings.

The proposed PV array comprises 2 kWp per house and 1 kWp per apartment. Across the accommodation schedule modelled in SAP this gives a total installed capacity of approximately 208kWp of roof mounted arrays, equating to an array area of approximately 832m².

Table 5 summarises the technical data for the PV array and the estimated CO₂ savings from the application of this technology. In total the PV installation produces regulated CO₂ savings of 22.2% for the development.



Figure 2: Monocrystalline PV arrays

Table 5: Summary of technical/operational data and estimated CO₂ savings for PVs

Photovoltaics – Domestic		
Array area	~832	m ²
Module efficiency (before losses)	21	%
Orientation	South (houses); East (flats)	
Carbon intensity of electricity	0.136	kgCO ₂ /kWh
Predicted site solar energy	1018.7	kWh/m ² .yr
Losses	20	%
System peak power	208	kWp
Primary electricity offset by PV array	176,996	kWh/yr.
Total CO₂ savings	24.07	tCO ₂ /yr.
Regulated baseline CO₂ emissions	108.27	tCO ₂ /yr.
% Regulated CO₂ reduction from site-wide baseline	22.2	%

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RENEWABLE AND LOW CARBON ENERGY

Following the measures adopted at the 'use less energy' stage, further regulated carbon emission savings of 22.2% are obtained through the incorporation of the proposed PV panels.

The savings at this stage arise entirely from photovoltaics, because the proposed gas boilers deliver no saving against the gas fired notional dwelling.

Regulated CO ₂ Savings at Renewable Energy Stage		
	%	t/yr
Site wide	22.2	24.07

PREDICTED ENERGY FIGURES

This section presents the metrics used to evaluate the predicted energy performance of the development: energy use intensity (EUI), space heating demand (SHD), and primary energy rate for the dwelling and notional buildings (DPER/TPER).

ENERGY USE INTENSITY (EUI) & SPACE HEATING DEMAND

Additional metrics for determining how efficient a development is are the space heating demand and energy EUI. The target values for these metrics, found in the table below, have been developed by the Low Energy Transition Initiative (LETI), and are supported by other industry bodies (RIBA, UKGBC, CIBSE, CCC).

Space heating demand measures fabric efficiency, indicating the energy needed to heat a development, regardless of the heating system efficiency.

EUI is a measure of regulated and unregulated energy consumption of the proposed development, which considers the efficiencies of space conditioning technologies, but excludes offset from PV. EUI can be defined as follows:

“Energy Use Intensity (EUI) is a measure of the total energy consumed in a building annually. It includes both regulated (fixed systems for lighting, heating, hot water, air conditioning and mechanical ventilation) and unregulated (cooking and all electrical appliances, and other small power) energy. It does not include energy use from electric vehicle charging or any reduction in EUI due to renewable energy generation on-site. EUI should be expressed using gross internal area (GIA).” (Energy Assessment Guidance, 2022, GLA).

The EUI and space heating demand figures have been calculated from the SAP 10.2 models of each dwelling archetype, weighted by unit count and floor area, as detailed in the methodology section of this report.

The following table summarises the predicted EUI and space heating demand for the proposed development.

Table 7: EUI and Space Heating Demand Results

Residential Predicted EUI and Space Heating Demand		
Building type	Energy Use Intensity (kWh/m ² .yr)	Space Heating (kWh/m ² .yr)
Residential	87.69	16.5

PRIMARY ENERGY RATE (DPER/TPER)

Similarly to the EUI, the Primary Energy Rating is calculated accounting for all estimated energy consumption, but adds a factor to account for the primary source of energy (e.g. a power plant), and transmission of the energy to a building.

The DPER following all Be Lean and Be Green measures for the proposed development performs better than the target primary energy rate (TPER), with an improvement of 17.2%.

Table 8: Primary Energy Rate Results

Residential Primary Energy Rate		
TPER (kWh _{PE} /m ² .yr)	DPER (kWh _{PE} /m ² .yr)	Improvement
59.04	48.91	17.2%

CONCLUSIONS

Following the implementation of the three step energy hierarchy, the cumulative regulated CO₂ savings on site are 25.7% against a Part L 2021 compliant scheme.

The assessment has been carried out by modelling eight dwelling archetypes in SAP 10.2, covering every house and flat type in the accommodation schedule, with the results weighted by unit count and floor area. The proposed development achieves compliance with Part L 2021 of the Building Regulations, the Building Regulations applicable at the time of writing, with the Dwelling Emission Rate, Fabric Energy Efficiency and Primary Energy Rate all improving on their respective targets.

ON SITE CO₂ SAVINGS

By implementing the three step energy hierarchy as detailed in the previous sections, the Regulated CO₂ emissions for the development have been reduced against a Part L 2021 compliant scheme through onsite measures alone by:

Cumulative Regulated CO ₂ Savings		
	%	t/yr
Site wide	25.7	27.82

The tables on the following pages summarise the implementation of the energy hierarchy for the proposed scheme and detail the CO₂ emissions and savings against the baseline scheme for each step of the hierarchy.

Overall, the proposed development has been designed to comply with the energy policies set out by North Hertfordshire District Council and Welwyn Hatfield Borough Council. The cumulative saving of 25.7% is delivered by fabric measures and PVs alone.

DOMESTIC CUMULATIVE SAVINGS

Table 9: CO₂ emissions after each step of the Energy Hierarchy for the domestic part of the development

	Carbon dioxide emissions for domestic buildings (tonnes CO ₂ per annum)	
	Regulated	Unregulated
Baseline	108.27	66.91
After energy demand reduction	104.52	66.91
After heat network/CHP	104.52	66.91
After renewable energy	80.45	66.91

Table 10: Regulated CO₂ savings from each stage of the Energy Hierarchy for the domestic part of the development

	Regulated domestic carbon dioxide savings	
	Tonnes CO ₂ per annum	% over baseline
Savings from energy demand reduction	3.75	3.5%
Savings from heat network/CHP	0.00	0.0%
Savings from renewable energy	24.07	22.2%
Cumulative on-site savings	27.82	25.7%

APPENDIX A – OVERHEATING RISK MITIGATION – DESIGN GUIDANCE



**CODICOTE ROAD, WELWYN
OVERHEATING RISK MITIGATION DESIGN GUIDANCE
28/06/2026**



	01			
Prepared by	JS			
Checked by	LW			
Date	28/05/2026			
Project ref.	10.275			

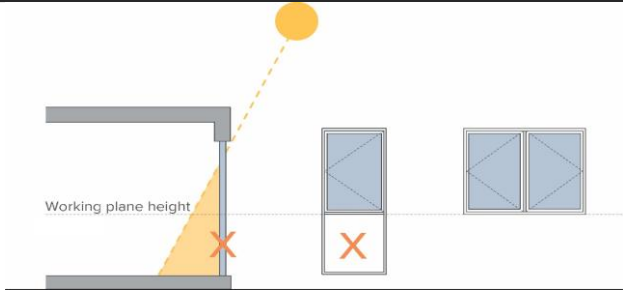
ACCEPTABLE STRATEGIES FOR MITIGATING OVERHEATING RISK

ACCEPTABLE STRATEGIES FOR LIMITING GAINS

EFFECTIVE GLAZING DESIGN

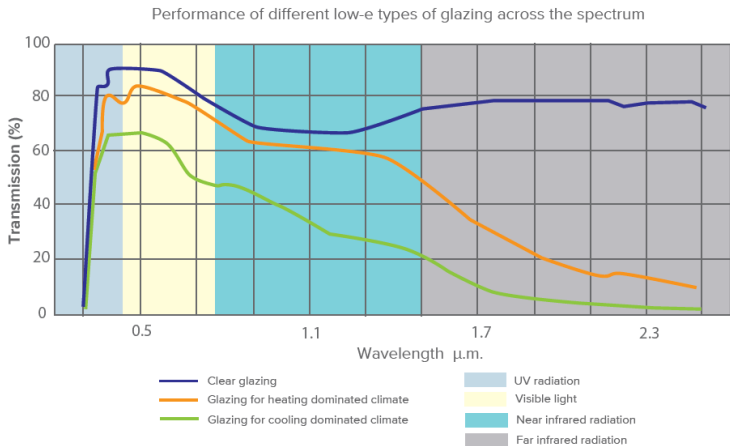
- Reduced glazing area, ideally an indicative glazing proportion is 15/25% of the Treated Floor Area (TFA).
- Floor to ceiling, vertical glazing does little for daylighting in the bottom third of the window whilst still losing heat and producing gains.
- Horizontal aspect glazing provides better daylighting for the same amount of glazing area.
- If for aesthetic reasons floor to ceiling glazing is used then a potential opaque panel for the bottom pane could be a good strategy.

Elevation	Glazed Area
North	10 – 15%
East	10 – 20%
South	20 – 30%
West	10 – 20%

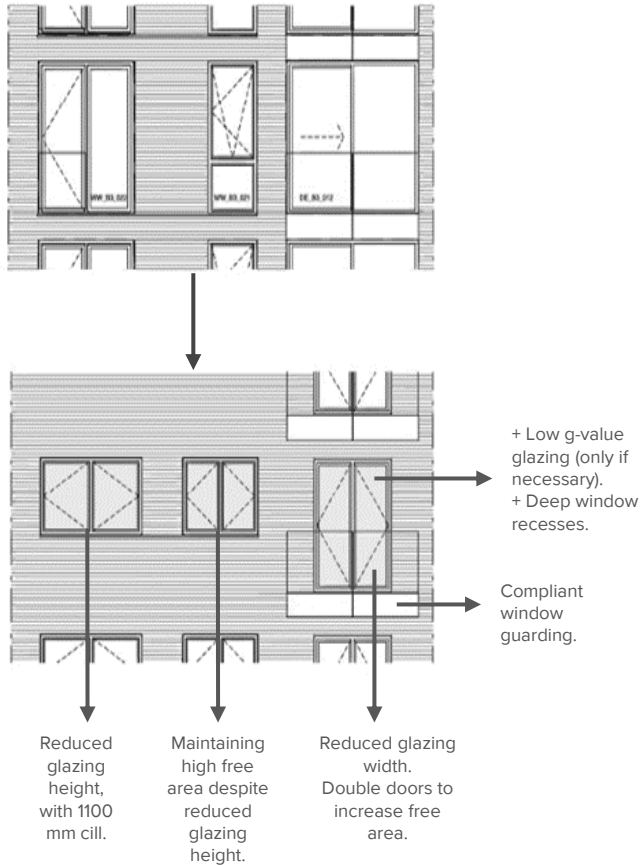


LOW G-VALUE GLAZING

- Low g – value glazing commonly has a value of below 0.63 (regular double glazing), the further reduction can be used to limit solar gains.
- However, reducing the g-value will also reduce beneficial heat gains during winter and impact the energy efficiency of the development. Furthermore it can also have any impact on internal daylight availability. For these reasons a limit of 0.5 / 0.4 (solar controlled) is recommended as the lowest to target.



The example below shows an effective way of upgrading the glazing design to combat overheating issues.

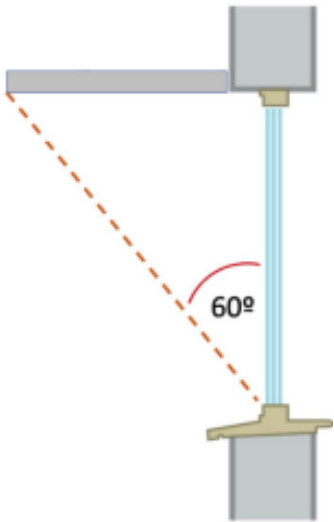


ACCEPTABLE STRATEGIES FOR MITIGATING OVERHEATING RISK

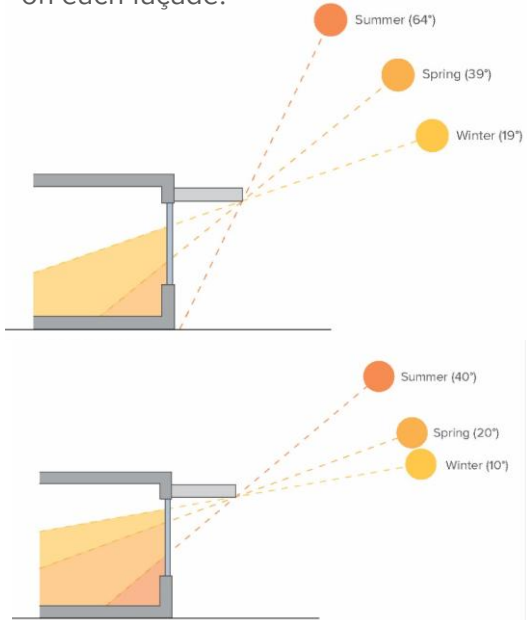
ACCEPTABLE STRATEGIES FOR LIMITING GAINS

✓ FIXED SHADING DEVICES

- Including shading elements in the external façade design is an effective way to control excessive solar radiation.
- It is important that shading is considered holistically and is integrated early in the design.
- The proposed strategies should not significantly impact winter sun, to ensure the building can still benefit from passive solar gains.
- As a rule of thumb, the overhang or fixed shading should subtend an angle of 60° to the lower edge of the glazing.

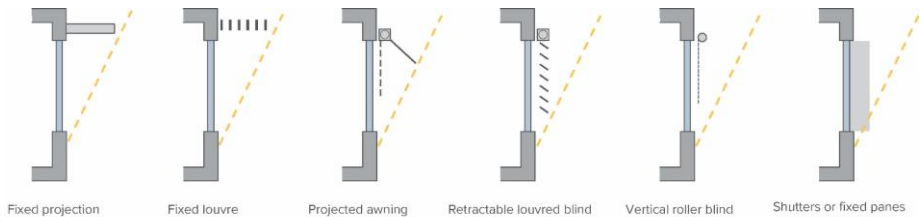
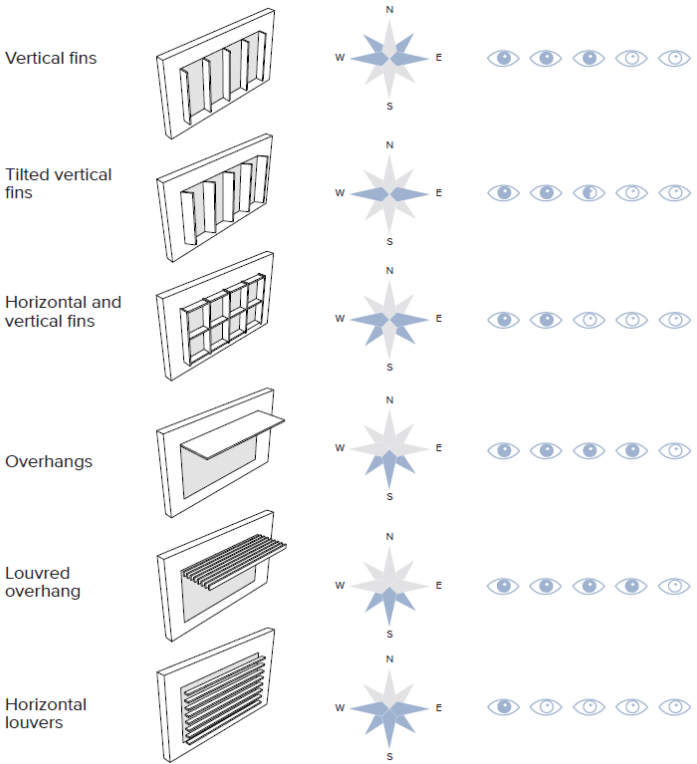


- However shading strategies should be different on each façade.



Solar Orientation	Ideal horizontal shading blocking solar angles
North	Shading not applicable / necessary
North east	Shading not applicable / necessary
East	Vertical shade angled north 50° if possible; OR
South east	60° with vertical shade on south edge
South	50-55°
South west	45° if possible; OR
West	55° with vertical shade on south edge
North west	Vertical shade angled to north
	Shading not applicable/necessary

- Shading strategy options



ACCEPTABLE STRATEGIES FOR MITIGATING OVERHEATING RISK

ACCEPTABLE STRATEGIES FOR LIMITING GAINS



LIMITING INTERNAL GAINS

- Heat gains from electrical appliances, lighting and activities like cooking can raise internal temperatures and contribute to increase overheating risk.
- Measures such as specifying highly energy efficient LEDs should be considered to reduce these gains.
- Moreover, reducing pipe run distances for hot water systems.



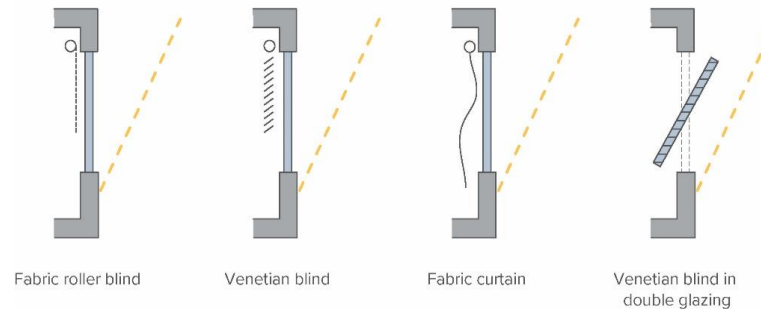
INTERNAL BLINDS AND CURTAINS

- Although internal blinds and curtains will provide some reduction in solar gains, they cannot be taken into account when considering compliance with Part O.
- The effectiveness of internal blinds is dependent on the behaviour of the occupants and can therefore vary significantly.



FOLIAGE

- Although foliage such as tree cover will provide some reduction in solar gains, they cannot be taken into account when considering compliance with Part O.



ACCEPTABLE STRATEGIES FOR MITIGATING OVERHEATING RISK

ACCEPTABLE STRATEGIES FOR REMOVING EXCESS HEAT

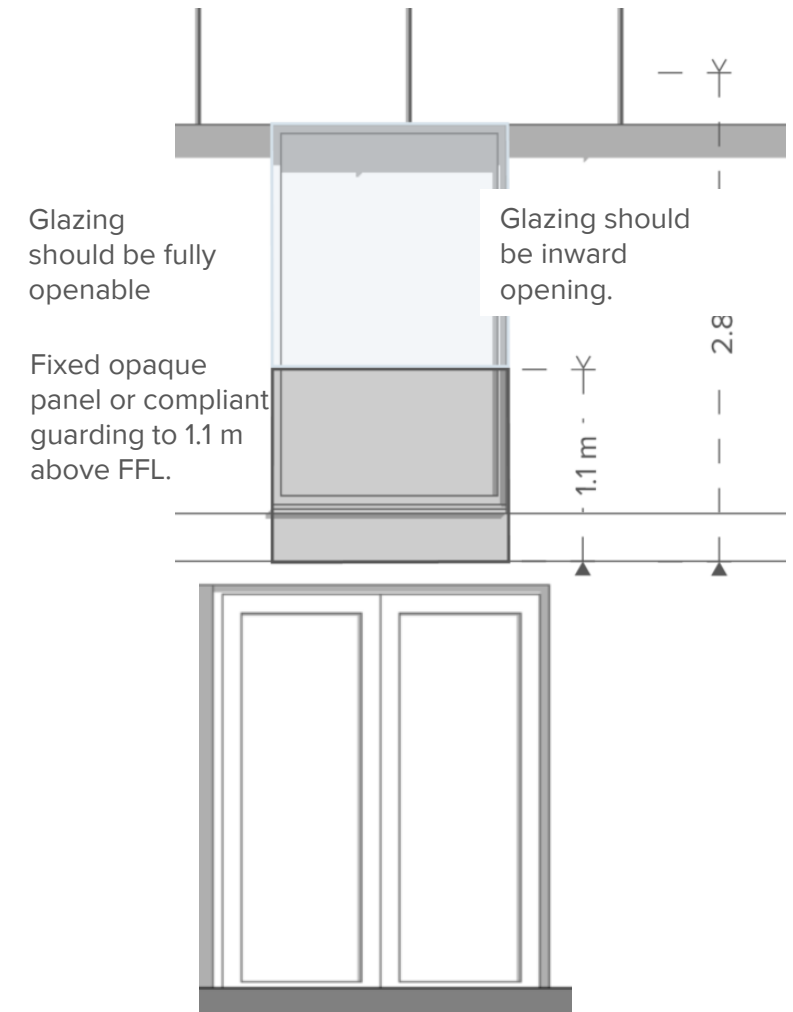
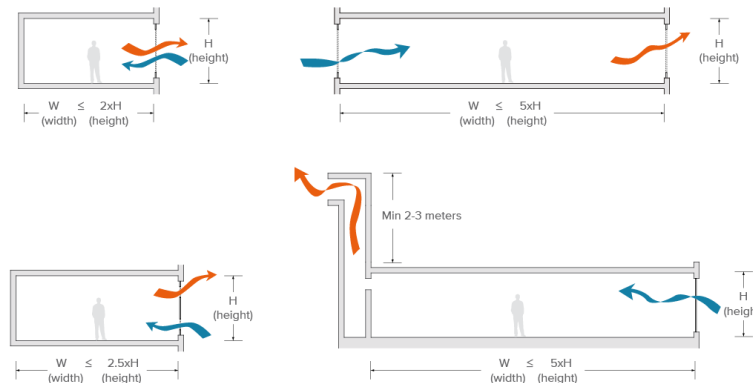
✓ WINDOW OPENING TYPE

- Window sizes were discussed earlier for reducing solar gains and should be followed. The amount of that glazing area which is openable should be maximised. To help mitigate overheating the overall openable area of the window should be 50-90% of the glazing.

✓ VENTILATION STRATEGIES

- Cross ventilation is a preferred opening strategy as it will not only harness buoyancy but also wind driven ventilation.
- If cross ventilation is not feasible then stack ventilation could be a good alternative which would help increase the buoyancy effect.
- If neither strategy is possible and single sided is the only solution then the type of window chosen can play a considerable role as they will offer different free areas
- Use inward opening panes to avoid additional restrictions on opening.

- Allow for security measures for ground floor and easily accessible bedrooms if a passive strategy is adopted (e.g. fixed or lockable louvred shutters, fixed or lockable window grilles or railings).
- These must be compliant with protection from entrapment requirements:
 - Not allow the passage of a 100mm diameter sphere.
 - Any hole which allows the passage of an 8mm diameter rod should also allow the passage of a 25mm diameter rod. Such holes should not taper in a way that allows finger entrapment.
 - Any looped cords must be fitted with child safety devices.

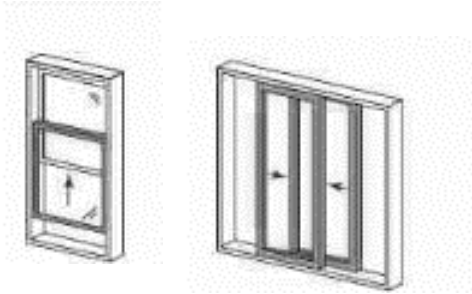


Double doors should ideally be side hung with both panes openable, as opposed to sliding.

ACCEPTABLE STRATEGIES FOR MITIGATING OVERHEATING RISK

ACCEPTABLE STRATEGIES FOR REMOVING EXCESS HEAT

✓ WINDOW OPENING TYPE



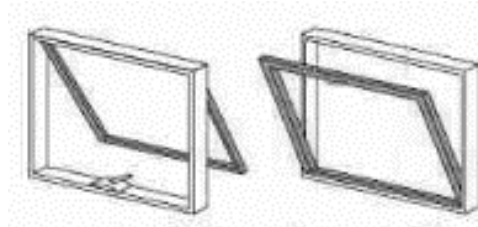
SASH / SLIDING

Advantages

- Max 45% free area
- Leeward side
- Openable at either top or bottom

Disadvantages

- Maintenance



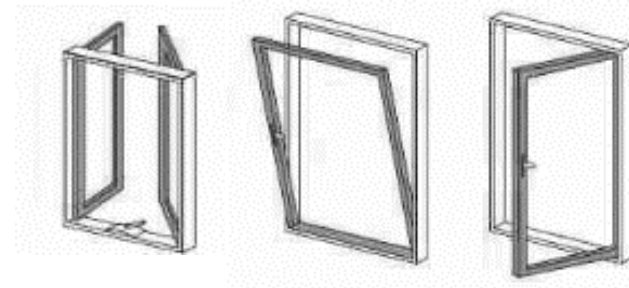
TOP/ BOTTOM HUNG

Advantages

- Max 45% free area
- Windward & leeward side of building
- Inward opening, bottom hung often good for night vent

Disadvantages

- Security (bottom hung)
- Vulnerable to high winds
- Security issues (top hung)



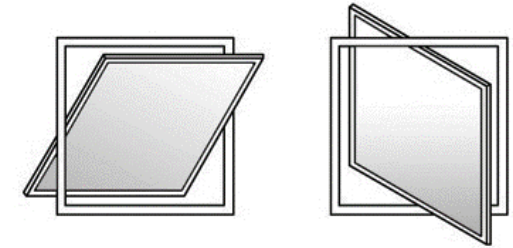
CASEMENT + TILT & TURN

Advantages

- Max 90% free area
- Windward (outward opening) & leeward (inward opening)
- Various opening types
- Easy maintenance

Disadvantages

- Larger frames due to complex mechanisms



PIVOT

Advantages

- Max 90% free area
- Windward & leeward side of building
- Horizontal good for single aspect (bit of stack effect)

Disadvantages

- Maintenance
- Wing wall effect
- No rain protection

ACCEPTABLE STRATEGIES FOR MITIGATING OVERHEATING RISK

ACCEPTABLE STRATEGIES FOR REMOVING EXCESS HEAT

✓ VENTILATION/NOISE LOUVRES

- Movable in order to maximise solar gains in winter.
- Better option if daylight is reduced by overhang etc.

If required due to external noise levels noise attenuation louvres can be installed but the size should be carefully considered by the design team and specialist manufacturer to ensure the required dB reduction is achieved for the required air flow.



✓ MECHANICAL VENTILATION

- Potential to introduce cooling coils into the MVHR to provide air tempering (reduces incoming temperature by 1 or 2°C).
- Reduce energy consumption in the summer and winter.
- Filters external air and pollution to improve indoor air quality.
- Heat recovery can lower heat demand.
- Bear in mind additional cost of installing and operating unit itself as well as additional space for ductwork/other design considerations.



✓ MECHANICAL COOLING

- To be used if all other options are not feasible.
- Can be installed as individual or communal chiller systems.
- Benefits include, improved air quality, humidity control and can also be a source of heating in the winter.



SUMMARY OF STRATEGIES FOR MITIGATING OVERHEATING RISK



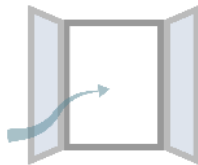
Limit glazing ratio to 25% of room area



Avoid full height glazing



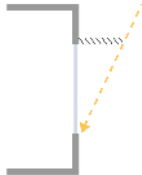
Maximise opportunities for cross ventilation



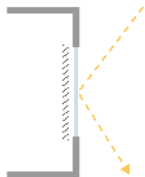
Allow for large opening areas (between 50 and 90%)



Consider secure night ventilation



Introduce external shading strategies, adapted to each façade



If external shading is not feasible, explore low g-value. Internal blinds not allowed under Part O



Specify LED lighting throughout the development



Specify insulation to LTHW pipework throughout the development

Although internal blinds and curtains will provide some reduction in solar gains, they cannot be taken into account when considering compliance with Part O.



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APPENDIX B – SAP RESULTS

The table below lists the dwelling archetypes modelled using the SAP 10.2 methodology, the TER and DER outputs, and the % CO₂ reduction achieved after the use less energy and renewable and low carbon energy measures have been applied.

The results from these archetypes have been weighted by unit count and floor area across the accommodation schedule, in order to predict the energy consumption and carbon dioxide emissions for the domestic spaces of the Development.

SAP Ref No.	TER (kgCO ₂ /m ² /yr)	Use less energy		Renewable and low carbon energy	
		DER (kgCO ₂ /m ² /yr)	% CO ₂ reduction	DER (kgCO ₂ /m ² /yr)	% CO ₂ reduction
2B End Terrace	11.47	10.92	4.8%	8.03	30.0%
2Ba End Terrace	11.17	10.65	4.7%	7.76	30.5%
3B	11.49	11.27	1.9%	8.83	23.2%
4B	9.79	9.31	4.9%	7.11	27.4%
GF Flat	12.74	11.39	10.6%	10.23	19.7%
MidF Flat	10.21	9.69	5.1%	8.57	16.1%
TopF Flat	10.91	10.31	5.5%	9.18	15.9%

APPENDIX C – SITE LAYOUT

Total Site Area 4.04 Hectares

KEY DI

-  Application Site Boundary Line
 Proposed Footpath
 1.8m Closeboarded Fence
 1.8m High Brickwork Boundary Wall.
 Plot Number
 Proposed Trees
 District Boundary Line



REV.	DATE	REVISIONS:	BY	REV.	DATE	REVISIONS:	BY
A	24/04/26	Client comment revisions	AM	N	06/07/26	Carports removed.	AM
B	28/04/26	Utilities and boundary revisions	AM	P	07/07/26	Layout revisions.	AM
C	31/05/26	Visitor parking added and apartment building revisions.	AM	Q	15/07/26	Layout revisions.	AM
D	08/05/26	Layout revisions.	AM				
E	20/05/26	Layout revisions.	AM				
F	21/05/26	Layout revisions.	AM				
G	28/05/26	Layout revisions.	AM				
H	04/06/26	Layout revisions.	AM				
J	04/06/26	Layout revisions.	AM				
K	16/06/26	Visitor parking revisions and bin and cycle stores added.	AM				
L	17/06/26	Layout revisions.	AM				
M	02/07/26	Revision to client's comment.	AM				

CLIENT: Howarth Homes		PROJECT: Codicote Road, Welwyn	
SCALE: 1:500 (A1 ORIGINAL)		DRAWING: Proposed Site Layout	
DRAWN: AM DATE: 20/04/26	25025	P101	Q



Broadmeade House, Farnham Business Park,
Weydon Lane, Farnham, Surrey GU9 8QT.
info@osparchitecture.com www.osparchitecture.com
Tel: 01252 267878

OS Licence No. AC0000851327

XCO2
56 Kingsway Place, Sans Walk
London EC1R 0LU

+44 (0)20 7700 1000
mail@xco2.com
xco2.com

