



Station Hill Phase 3A

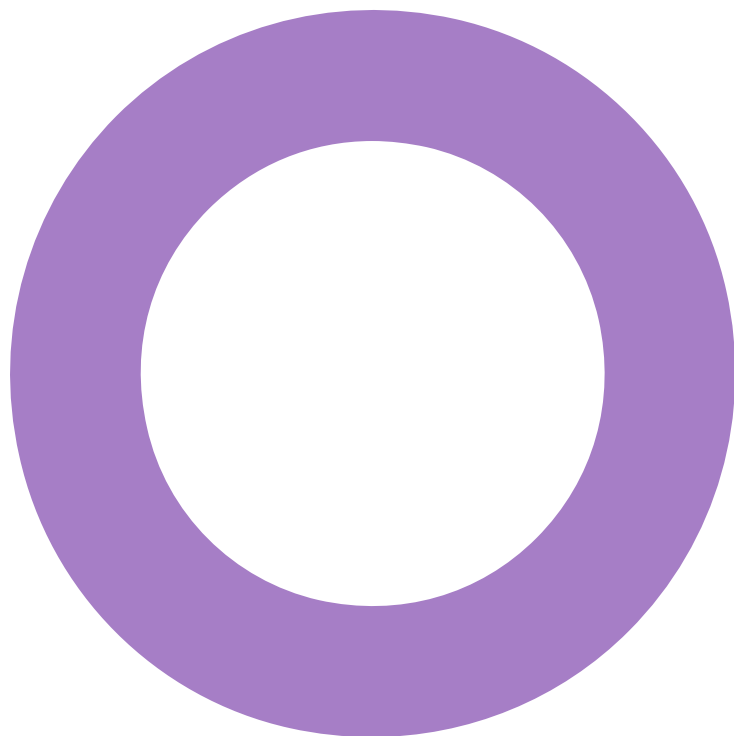
Plot A/B & D Energy Statement

Revision 02
February 2026

**Station Hill Phase 3A.
Reading.**
SH Reading Master LLP.

SUSTAINABILITY
ENERGY STATEMENT

REVISION 02 – 20 FEBRUARY 2026



Audit sheet.

Rev.	Date	Description of change / purpose of issue	Prepared	Reviewed	Authorised
01	11/12/2025	Draft Energy Statement	V. Petrone	J. Pollard	J. Drane
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02	20/02/2026	Final issue for planning	V. Petrone	J. Drane	M. Wilkinson

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Executive summary.

This document is submitted on behalf of SH Reading Master LLP (hereafter referred to as the ‘Applicant’) in support of a Reserved Matters application pursuant to Outline Planning Permission ref. 192032, relating to Station Hill, Phase 3A (Plots A, B and D), Reading, hereafter referred to as the “Proposed Development”. The application seeks approval of the reserved matters for the development of Plots A, B and D, comprising the erection of two buildings to deliver residential units (Use Class C3), including affordable housing, ground floor flexible commercial accommodation (Use Class E), residential amenity spaces, associated landscaping and public realm works, including Station Hill Gardens and enhancements to Station Hill Square, new pedestrian routes, cycle parking, servicing, refuse storage, plant and ancillary infrastructure, and all other associated works.

The Energy Statement summarises the regulatory and planning policies applicable to the Proposed Development and benchmarks the performance of the Proposed Development in terms of energy and overheating against these targets.

Proposed Development.

The proposed development comprises two residential buildings across Plots A, B and D, delivering 600 build-to-rent homes, including 75 affordable homes, alongside new flexible ground-floor retail and café uses, resident amenities and extensive landscaped public realm. The scheme will provide new north-south pedestrian routes linking Garrard Street, Greyfriars Road, Friars Walk and Reading Station, together with a new central garden, play space and enhancements to Station Hill Square, completing this phase of the Station Hill Masterplan.

Approach to energy.

The Energy Strategy has been developed using a ‘fabric first’ approach through the ‘Be Lean’, ‘Be Clean’, ‘Be Green’ energy hierarchy.



Figure 1: Energy hierarchy.

Be Lean – Passive Design and Energy Efficiency.

The following passive design and energy efficiency measures have been incorporated into the design:

- Highly insulated building fabric with careful attention to optimise glazing ratios.
- Airtight construction (i.e. low air permeability) in the Development.
- Highly efficient mechanical and electrical systems.

Be Clean – Supplying Energy Efficiently.

Since 2022, Reading Borough Council (RBC) and its partners have been exploring the potential for a district heat network across the borough, and they now engaged in Detailed Project Development for an initial phase of the proposed network. The Section 106 (S106) Planning obligations for the hybrid consent (Sch. 6, Paragraph 10.1, 10.3 and 10.4) intends for Phase 3A to provide a Decentralised Energy System. The feasibility and appropriateness of this approach and the potential integration of the Reading District Heating Scheme was discussed with RBC at the pre-application stage.

The scheme offers a long-term opportunity for decarbonised heat supply through technologies such as water source, ground source and air source heat pumps. However, due to the scheme extended implementation timeline, uncertainty around connection infrastructure and cost and the misalignment between the project’s delivery programme and the anticipated rollout of the district network, there is a requirement for our scheme to move forward with our proposed heating solution. Furthermore, district heating systems can result in significant

distribution losses via the buried infrastructure associated with energy distribution, often proving less efficient in terms of carbon reduction than providing an efficient on-site generation strategy. It is also worth noting that if the district energy system connects to high-risk buildings, under the Building Safety Act the system will also be subject to HSE approval, thus delaying implementation further.

It is therefore not proposed to connect to external district energy networks or make provision for a future connection. Correspondence on these discussions is provided in Appendix B.

Be Green – Low and Zero (LZC) Technologies.

Hoare Lea have undertaken a detailed review of different energy technologies in terms of sustainability, energy, carbon, technical feasibility and maintenance and operation, (including Ground Source Heat Pumps) which demonstrate how the proposed decentralised heating system via Exhaust Air Heat Pumps (EAHP) offers the lowest energy bills for the residents and is therefore the most suitable system for the Proposed Development. The findings of this review have been summarised in Section 6.1.

The heating and cooling energy for the Proposed Development will be generated via an ‘all electric / combustion-free’ engineered solution utilising Exhaust Air Heat Pumps (EAHPs) serving each individual dwellings heating and hot water. In addition, the provision of solar photovoltaic (PV) panels will be provided on available roof space, with 93m² allocated to the amenity areas for the Part L2 calculation.

Both heat pumps and PV are a form of low and zero carbon technology, therefore the output from these form part of the third stage of the energy hierarchy.

Site wide energy assessment outcome.

The Proposed Development has been assessed for CO₂ emissions using Building Regulations Approved Document Part L (2021) compliant software and methodology. Regulated emissions were determined for the site and savings are depicted in Figure 2. This shows a site total percentage reduction in regulated emissions of 65% after incorporation of heat pumps and PV.

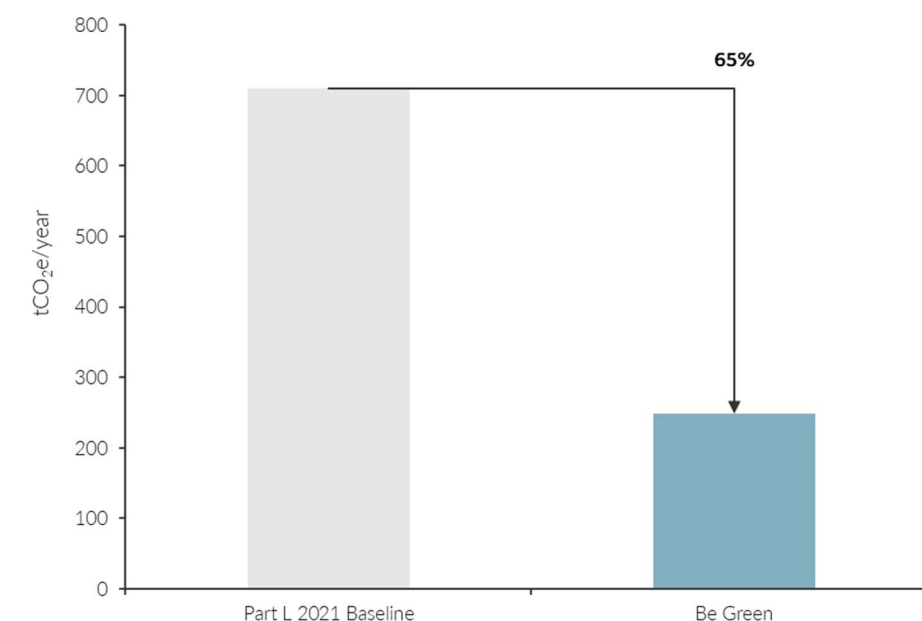


Figure 2: Site wide (Domestic and Non-Domestic) energy assessment results.

Alongside this the Applicant is committed to achieving zero carbon for the domestic elements in line with RBC Local Plan policy. The residential element of the development achieves a 72% reduction over Part L 2021, which is above the S106 agreement requirement (Sch 6, paragraph 8.1) “to ensure a minimum of 35% improvement in regulated emissions over the target emissions rate as set out in the 2013 Building Regulations is provided for in each and every Housing Unit that is provided as part of the First 2021 Development”.

The remaining emissions to offset to 100% are to be paid by financial offset based on a rate of £1800 per tonne.

Approach to overheating.

The Proposed Development has been assessed in line with Approved Document O of the Building Regulations (2021) to reduce potential overheating risk and reliance on air conditioning systems. A ‘cooling hierarchy’ was used to inform the design to minimise heat gain and overheating.

Façade noise levels exceed the thresholds of the noise intrusion criteria stated in Planning Condition 101, limiting the opportunities to mitigate overheating via open windows for most apartments. Consequently, the dwellings have been designed to meet the thermal comfort requirements with windows closed at all times.

All of the sample dwellings tested comply with the CIBSE TM59 criteria for mechanically ventilated spaces, satisfying the requirements of ADO 2021 and Local Plan Policy CC3, and will be provided with mechanical ventilation with heat recovery with a boost operation mode and summer bypass to provide trim cooling through tempered air. In addition, residents will be provided with guidance on how to reduce the overheating risk within their homes.

1. Introduction.

1.1 Purpose of the report.

This document is submitted on behalf of SH Reading Master LLP (hereafter referred to as the ‘Applicant’) in support of a Reserved Matters application pursuant to Outline Planning Permission ref. 192032, relating to Station Hill, Phase 3A (Plots A, B and D), Reading. The application seeks approval of the reserved matters for the development of Plots A, B and D, comprising the erection of two buildings to deliver residential units (Use Class C3), including affordable housing, ground floor flexible commercial accommodation (Use Class E), residential amenity spaces, associated landscaping and public realm works, including Station Hill Gardens and enhancements to Station Hill Square, together with new pedestrian routes, cycle parking, servicing, refuse storage, plant and ancillary infrastructure, and all other associated works, in accordance with the approved Station Hill Masterplan.

This Energy Statement has been prepared to demonstrate how the energy related aspects of the Proposed Development meet the requirements of pertinent national and local planning policy. Consideration has been given to the following in line with Reading planning policy requirements:

- Energy efficiency of the building;
- Baseline annual predicted energy demand of the Development (regulated and unregulated);
- Baseline annual predicted carbon emissions of the Development (regulated and unregulated);
- The Target Emission Rate (TER);
- The contribution of each proposed renewable energy technology;
- Cost information of technically feasible low or zero carbon renewable technologies, including additional insulation, low carbon decentralised energy, heat pumps etc;
- Feasibility of district or community heating;
- Summary of the benefits of various energy technologies;
- The total estimated reduction in the Development’s baseline carbon and/or energy emissions.

1.2 Proposed Development.

The proposed development comprises two residential buildings across Plots A, B and D, delivering 600 build-to-rent homes, including 75 affordable homes, alongside new flexible ground-floor retail and café uses, resident amenities and extensive landscaped public realm. The scheme will provide new north-south pedestrian routes linking Garrard Street, Greyfriars Road, Friars Walk and Reading Station, together with a new central garden, play space and enhancements to Station Hill Square, completing this phase of the Station Hill Masterplan.

The site occupies a highly accessible location immediately south of Reading Station, within Central Reading, and forms part of the wider Station Hill regeneration area. Over the past four years, Phases 1 and 2 have been successfully delivered, providing new homes, a landmark office building, public spaces and improved pedestrian connections that have transformed the area around the station. Phase 3A represents the next stage of this comprehensive development, building on this success to complete key movement routes, public realm spaces and development plots within the approved masterplan framework.

Phase 3A is brought forward pursuant to the 2021 Outline Planning Permission, which establishes the parameters for detailed development across the site. That consent allows for up to 750 homes within Phase 3A (Plots A, B and D). The current proposals deliver 600 homes, representing a deliberate reduction from the maximum permitted in order to prioritise apartment quality, generous resident amenity, landscaped terraces and high-quality public realm. Together, the wider Station Hill redevelopment, including Phase 1, will bring around 1,000 new residents into the heart of Reading, supporting the vitality of the town centre and reinforcing Station Hill as a thriving, mixed-use neighbourhood.

The new homes will be professionally managed as part of a build-to-rent model, consistent with earlier phases at Station Hill, and will be supported by a comprehensive range of shared amenities, active frontages and car-free living (with the exception of servicing and accessible parking). In combination with the delivery of Station Hill Gardens, improvements to surrounding streets and the completion of Station Hill Square, Phase 3A will play

a critical role in realising the final vision for Station Hill as a well-connected, inclusive and high-quality place to live, work and spend time.

Table 1Error! Reference source not found. sets out the floor areas modelled and the site total Gross Internal Area (GIA), in line with the Planning Consultant’s Planning Statement. Modelled floor areas include apartments Net Internal Area (NIA) and heated/occupied spaces only.

Table 1: Area Summary.

	Floor Area m ²
Dwellings (NIA)	35,287
Non-residential areas (GIA)	14,135
Site Total (GIA)	55,534

1.3 Site location.

The application site (Figure 3) forms part of the wider Station Hill Masterplan and is located immediately south of Reading Station. Part of the site is currently occupied by Xafinity House and a temporary car park and hard standing. The surrounding area comprises the completed Phase 1 and Phase 2 developments at Station Hill, including residential buildings (Ebb & Flow), One Station Hill, public realm and key pedestrian connections.



Figure 3: Site location (Credit: Gensler).

2. Policy context and drivers.

2.1 National policy.

National Planning Policy Framework.

The National Planning Policy Framework (December 2024) sets out the Government’s planning policies for England and how these should be applied. It provides a framework within which locally prepared plans for housing and other developments can be produced.

Building Regulations: Approved Document Part L (2021).

Approved Document Part L of the Building Regulations (2021, England edition), (ADL 2021), is the part of the Building Regulations relating to the conservation of fuel and power in buildings. ADL 2021 has two parts, Part L1 relates to dwellings and Part L2 relates to buildings other than dwellings.

Approved Document Part L of the Building Regulations is the mechanism by which government is driving reductions in the regulated CO₂ emissions from refurbished, change of use and new buildings. For new buildings ADL 2021 has four performance metrics as follows:

- Primary energy target;
- CO₂ emissions target;
- Fabric Energy Efficiency (FEE) target;
- Minimum standards for fabric and fixed building services.

Building Regulations: Approved Document Part O (2021).

Approved Document Part O of the Building regulations (introduced in December 2021) addresses overheating risk within dwellings. It sets out the requirement for overheating to be considered in all new residential buildings in England in line with the CIBSE TM59 methodology. The key requirements are as follows:

- Reasonable provision must be made to limit unwanted solar gains in summer and provide an adequate means to remove heat from the indoor environment;
- Mechanical cooling may only be used where insufficient heat is capable of being removed from the indoor environment without it;
- Internal blinds cannot be used to help achieve compliance as part of the dynamic assessment;
- Information must be provided to the building owner/user at handover to allow them to use the overheating mitigation strategy effectively.

NATIONAL POLICY



LOCAL POLICY



2.2 Local policy.

Reading Borough Council Local Plan.

The Reading Borough Local Plan was adopted in November 2019 and provides planning policies for Development in Reading up to 2036. The Local Plan replaces previous Development plans, the Core Strategy, Reading Central Area Action Plan and Sites and Detailed Policies Document, which no longer apply.

The Local Plan is currently being updated, following a review in March 2023. A consultation on Scope and Content of the Local Plan Partial Update (under Regulation 18) took place between November 2023 and January 2024, and the Local Plan Partial Update was submitted to the Secretary of State on 9th May 2025.

The relevant policy requirements to the Proposed Development's energy strategy have been summarised in the list below:

- **CC1: Presumption in favour of sustainable Development**

A positive approach to considering Development proposals will be taken that reflects the presumption in favour of sustainable Development contained in the National Planning Policy Framework (NPPF).

Planning law requires that applications for planning permission must be determined in accordance with the Development plan unless material considerations indicate otherwise.

- **CC2: Sustainable design and construction**

Proposals for new developments, including the construction of new buildings and the redevelopment and refurbishment of existing building stock, will be acceptable where the design of buildings and site layouts use energy, water, minerals, materials, and other natural resources appropriately, efficiently and with care and take account of the effects of climate change.

- **CC3: Adaptation to climate change**

All developments will demonstrate how they have been designed to adapt to climate change and to mitigate the risk of overheating. The following measures shall be incorporated into the development, unless it can be demonstrated that requirements are not suitable, feasible or viable:

- New buildings shall be orientated to maximise the opportunities for both natural heating and ventilation and reducing exposure to wind and other elements.
- Proposals involving both new and existing buildings must be designed to maximise resistance and resilience to climate change by including measures such as solar shading, thermal mass, appropriate heating and ventilation of the building and appropriately coloured materials in areas exposed to direct sunlight, green and brown roofs, green walls, etc.
- Use of trees and other planting, to cool the urban environment through shading of amenity areas, buildings and streets and to help to connect habitat, integrated soft surfaces designed with native plants that are carefully selected, managed and adaptable to meet the predicted changed climatic conditions;
- All developments must address the risks of overheating through passive cooling and energy efficiency measures in the first instance; and
- All developments must minimise the impact of surface water runoff from the development in the design of the drainage system, and incorporate mitigation and resilience measures for any increases in river flooding levels as a result of climate change

- **CC4: Decentralised energy**

Developments must demonstrate how consideration has been given to securing energy for the development from a heat network or, where this is not possible, a non-fossil fuel source.

Any Development of more than 20 dwellings and/or non-residential development of over 1,000m² must demonstrate how a connection will be made to a suitable low carbon heat network where available in the vicinity, unless it can be demonstrated that the scheme is not suitable, feasible or viable. Where no such network is available, heat and/or cooling must be supplied from low carbon sources and be connectable to future heat networks. Where there is an existing low carbon heat network present within the vicinity of an application site, further developments of 10 dwellings or more or non-residential developments of 1,000m² or more will be expected to link into the existing low carbon heat network or demonstrate why this is not feasible.

- **H5: Standards for new homes**

New build housing should be built to the following standards, unless it can be clearly demonstrated that this would render a Development unviable:

- All new-build housing will be required to achieve net-zero development as defined in Policy CC2s.
- If homes are not designed to be carbon neutral, they must at least achieve a 35% improvement in dwelling emission rates compared to the 2013 Building Regulations. Additionally, developers will be required to contribute £1,800 per tonne for carbon offsetting in Reading, based on a rate of £60 per tonne over 30 years.
- All other housing will achieve 19% improvement in dwelling emission rates over the target emission rate, aligning with the former Code for Sustainable Homes Level 4. In cases where this 19% reduction is not achievable onsite, carbon offsetting through planning contributions might be permitted, with further details to be specified in the Local Plan.

Reading Sustainable Design and Construction SPD (2019).

The Reading Council Sustainable Design and Construction Supplementary Planning Document is intended to guide developers and decision-makers on the implementation of key sustainability policies set out in the Reading Local Plan, namely CC2-CC5, EN18 and H5. It brings together relevant national guidance and provides practical advice on forms of sustainable design and construction, as well as waste minimisation that will meet these policy requirements.

The SPD requires an Energy Statement to be submitted with all major Developments. Energy Statements should:

- Demonstrate how the energy related aspects of the Proposed Development actually meet the requirement of policies CC2, CC4 and H5.
- Provide the specification for meeting the required energy targets including a calculation of the carbon emissions for a Development. These shall be calculated as detailed in ADL 2021 of the building regulations and the relevant BREEAM Standard or Zero Carbon Homes, where required.
- Explain how the carbon dioxide reductions will be achieved and importantly, which renewable energy technologies/low carbon energy sources have been considered and dismissed, clearly explaining the reasons for this.
- State the S106 contribution required to achieve zero carbon homes in line with the stated calculation.

The sustainable design checklist for residential Developments for 'Energy and carbon' is as follows.

Aim: To conserve energy, in particular carbon dioxide emissions and maximise the use of energy efficient techniques.

1. How has the Development been designed to optimise the use of the energy from the sun and limit heat losses?
2. How has the Development been designed to optimise natural daylighting, energy efficient lighting, external lighting and natural ventilation?
3. How will the design of the building make efficient use of energy? (e.g. use of thermally massive materials, levels of insulation, energy efficient white goods and use of green/ brown roofs etc.).
4. Has local energy generation from renewables and/or decentralised energy been considered as part of the scheme?
5. How have cycle storage facilities been considered?
6. Does the Development meet the requirements of policies H5? Is this clearly illustrated?
7. Is a Section 106 contribution required? If so, what amount?

3. Approach to energy.

3.1 The Energy Hierarchy.

The energy strategy for the Proposed Development has adopted the energy hierarchy approach to reduce demand for energy prior to the consideration of integrating Low or Zero Carbon (LZC) technologies, since controlling demand is the most effective way of reducing energy requirements and CO₂ emissions.

Lean measures are adopted first, ensuring energy demand is minimised through good fabric performance, orientation, optimised glazing ratios and efficient services provision. Opportunities to connect to district heat network or community heating and cooling is then explored. Finally, the feasibility of low or zero carbon technologies are investigated, and appropriate technologies adopted for the Proposed Development.



Figure 4: Energy Hierarchy Process

The following sections detail the passive design and energy efficiency measures that have been considered, and those that will be implemented at the Proposed Development. The effectiveness of the adopted measures has been assessed against a Building Regulations compliant baseline referred to as the notional dwelling or notional building. The percentage reduction for each stage is reported for regulated energy.

Currently, unregulated energy is not included within the ADL 2021 assessments but can form a significant part of overall energy consumption and CO₂ emissions from developments. Reductions in unregulated energy use will be implemented where possible, with focus especially on the laundry white goods, which are expected to account for the largest contribution to these. The Proposed Development will endeavour to include the use of energy efficient appliances such as:

- Energy star rated small power equipment
- Energy efficient lifts
- Voltage optimisation and power factor correction.

3.2 Definitions.

The following definitions should be understood throughout this strategy:

- Energy demand – the ‘room-side’ amount of energy which must be input to a space to achieve comfortable conditions. In the context of space heating, this is the amount of heat which is emitted by a radiator, or other heat delivery mechanism.
- Energy consumption – the ‘system-side’ requirement for energy (fuel). In the context of a space heating system using a gas boiler, this is the amount of energy combusted (e.g. gas) to generate useful heat (i.e. the energy demand).
- Regulated CO₂ emissions – the CO₂ emissions emitted as a result of the combustion of fuel, or ‘consumption’ of electricity from the grid, associated with regulated sources (those controlled by ADL 2021 of the Building Regulations).
- Unregulated energy includes small power electricity use (computers, plug in devices) and catering energy consumption.

3.3 Disclaimer.

The appraisals within this statement are based on ADL 2021 calculation methodology and should not be understood as a predictive assessment of likely future energy requirements or otherwise. Occupants may operate their systems differently, and / or the weather may be different from the assumptions made by ADL 2021 approved calculation methods, leading to differing energy consumption in practice.

3.4 Modelling sample.

The set of sample dwellings for the ADL 2021 Part L1 (SAP) is provided in Appendix A. The sample assessed under ADO 2021 modelling is detailed in Section **Error! Reference source not found.** All the non-residential areas have been modelled to assess compliance with ADL 2021 Part L2.

4. Approach to overheating.

Dwellings that overheat cause significant discomfort and stress to the occupants and reduce sleep quality. There are several reasons for the increase in overheating risk in dwellings. Contributing factors include the increase in single aspect building forms (that don't allow sufficient crossflow ventilation), the trend towards larger areas of glazing, climate change, the urban heat island effect and inadequate means of ventilation.

Increased overheating in newer building stock led to the introduction of Building Regulations Approved Document O 2021. All dwellings must comply with the regulations to demonstrate that the risk of overheating has been dealt with.

4.1 Cooling hierarchy.

The 'cooling hierarchy' sets out prioritised measures for minimising overheating risk, illustrated in Figure 5 below. The design response for the Proposed Development against each of the hierarchy items are summarised in table opposite.

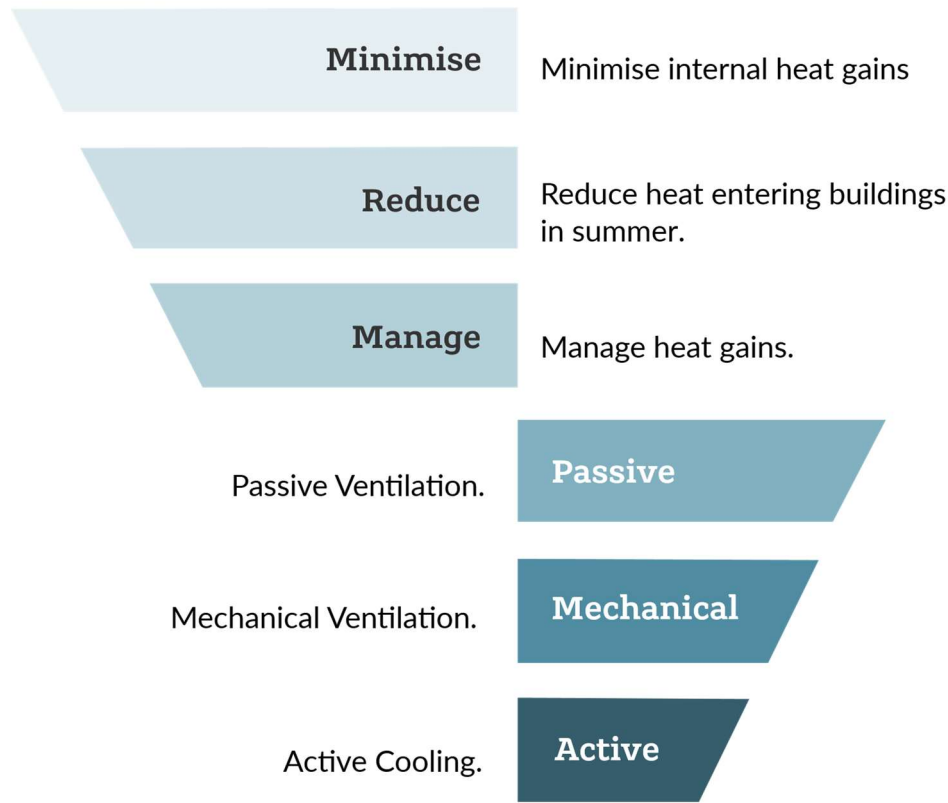


Figure 5: Cooling hierarchy.

Table 2: Cooling Hierarchy Design Responses

Cooling Hierarchy	Design Response
Minimise Internal Heat gains	- Specification of efficient lighting - All pipework to be fully insulated to prevent heat gains.
Reduce heat entering buildings in summer	- Provision of balconies where possible on the southern elevations - Minimum 225mm deep recess on each window - Suitable g-value
Manage heat gains	- Layout of the internal rooms configured to balance occupancy with peak solar gains. Window areas minimised on the southern and western elevations. - Individual dwelling heating systems – no heat gains from communal pipework - Heat gains modelled in line with CIBSE TM59
Mechanical Ventilation	- Nilan Compact P unit to provide mechanical ventilation with heat recovery. Flow rates between 70-90l/s. - MVHR with summer bypass, will enter boost mode and summer bypass will activate when the room temperature is above 22°C to provide trim cooling.
Active Cooling	- Since passive ventilation cannot be relied upon due to the noise constraints of the site, additional measures are required. - When the bypass function is not enough to lower the temperature to comfort levels, the unit will provide active cooling via the EAHP.

In summary, all dwellings will be served by mechanical ventilation with heat recovery, with a boost operation mode and trim cooling via the EAHP. In addition, residents will be provided with guidance on how to reduce the overheating risk within their homes. The need for these measures was established through an Overheating Risk Assessment carried out in line with CIBSE TM59 methodology. The assessment results are described in the section below and demonstrate how these measures contribute to mitigating the risk of overheating for the Proposed Development, satisfying the requirements of ADO 2021 and Local Plan Policy CC3.

4.2 Early-stage modelling (Kaleidoscope).

An initial qualitative overheating modelling was carried out early in the design to identify the overheating risk and the worst performing units using *Kaleidoscope*, a machine learning tool which allows to predict indoor thermal conditions.

The initial design iteration presented glazing ratios between 35-65%. Two alternative options with different glazing extents and window recesses depths were then developed and assessed as shown in Figure 6, and the results were used to inform subsequent design decisions.

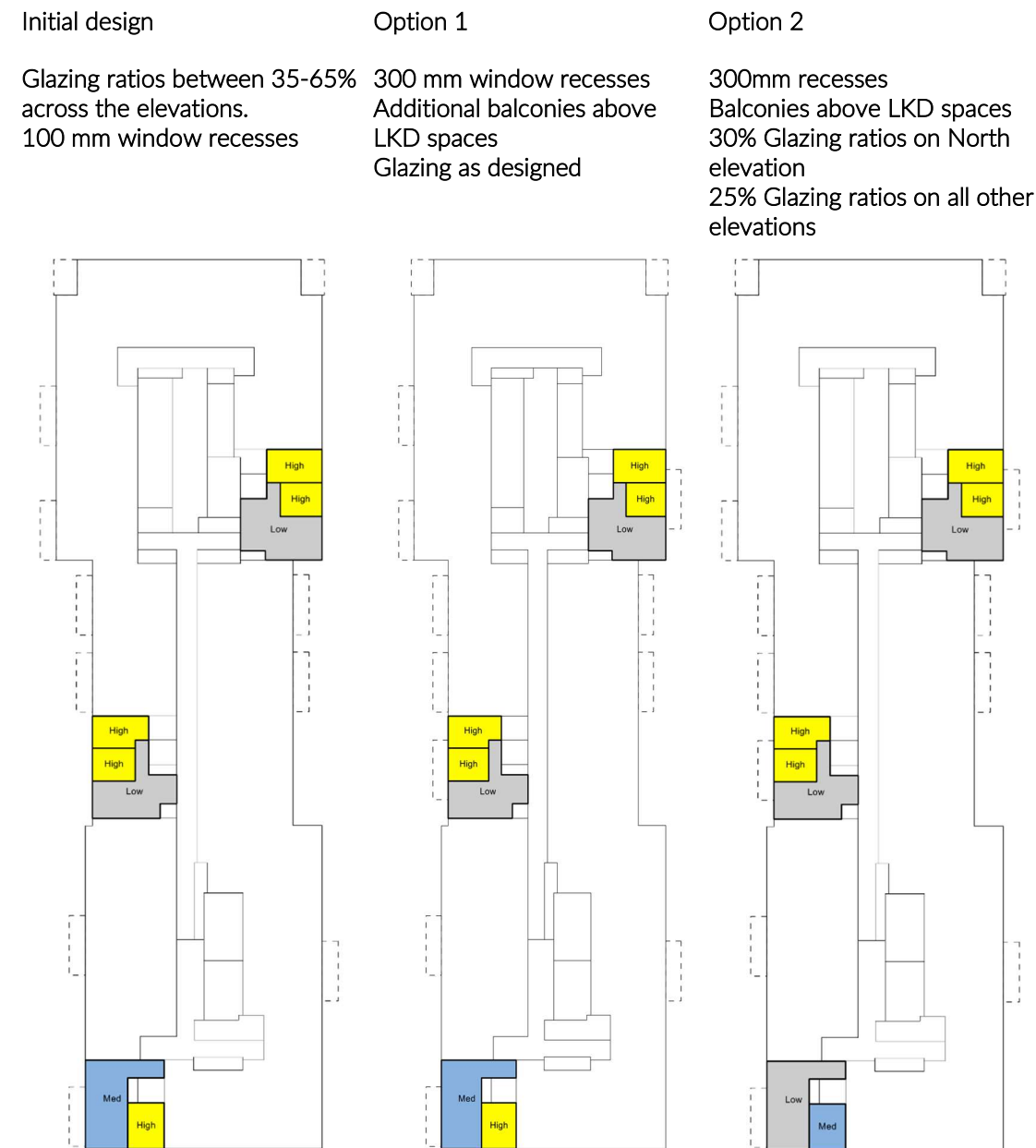


Figure 6: Initial qualitative overheating modelling.

4.3 Passive design measures.

Throughout the pre-planning process, modelling of the Proposed Development has been workshopped with the design team to feedback the results and develop and influence the façade in response to mitigating dwelling overheating. The information in this section highlights the options considered throughout the design, with a summary of those incorporated, alongside those which weren't incorporated and the reasons behind their exclusion.

4.3.1 Glazing Ratios.

In areas where daylighting requirements are exceeded it is often found that mitigating the risk of overheating becomes more challenging. South and west facing kitchen/living spaces were found to be the most high-risk zones, due to this the glazing ratios on each elevation were optimised to balance daylighting and solar gains and glazing reductions have been applied where suitable to do so.

The apartment sample for the ADO 2021 analysis includes those units that are expected to perform the worst in terms of overheating, Figure 7 and Figure 8 show a screenshot of the overheating model highlighting the sample selected.

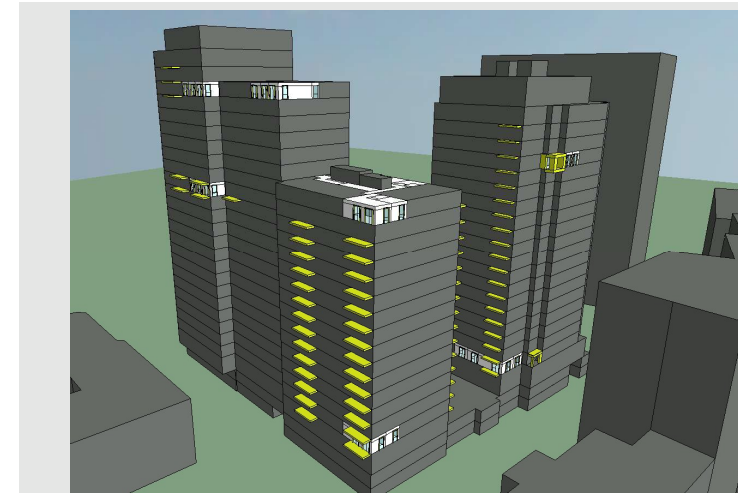


Figure 7: South-west view of the overheating model.

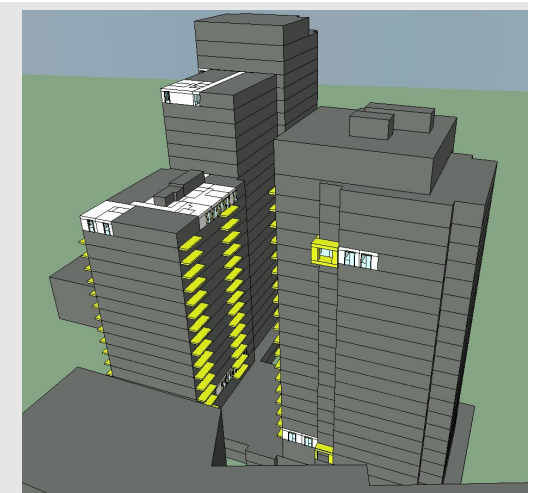


Figure 8: South-east view of the overheating model

Figure 9 shows one of the windows on the south elevations (Unit 06). As shown in Figure 10, a portion of glazing has been swapped for an opaque panel, it should be noted that the dimensions of the casement have not been changed.

Initial Design

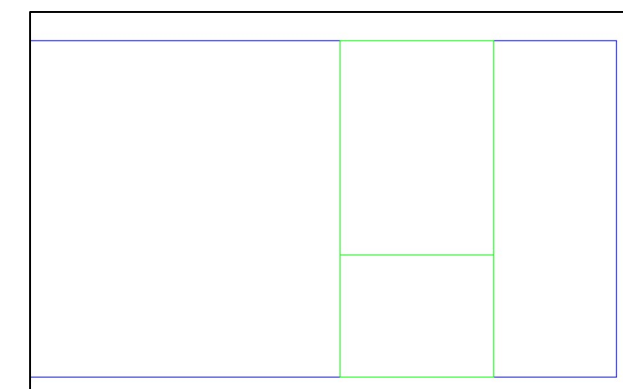


Figure 9: Window casement in the initial design.

Glazing Reduction

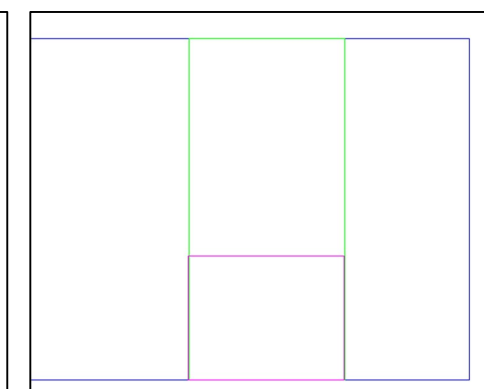


Figure 10: Window casement after the glazing reductions.

Another example can be seen in Figure 11 and Figure 12 depicting the reduction in glazing for the balconies in Unit 04.

Initial Design

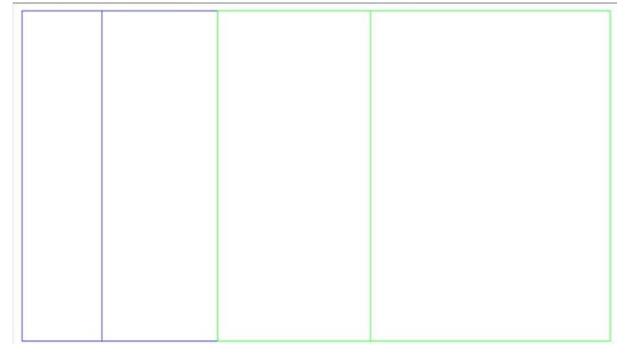


Figure 11: Window casement in the initial design.

Glazing Reduction

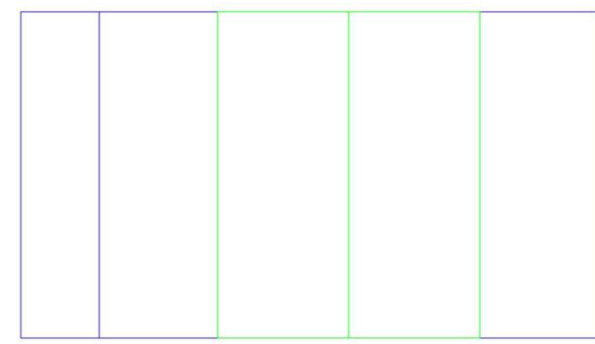


Figure 12: Window casement after the glazing reductions.

4.3.2 Glazing G-value.

The g-value of glazing controls how well the glass transmits heat from the sun. By reducing the g-value less heat will enter the space. A g-value of 0.35 has been applied throughout the Proposed Development in order to control solar transmittance on the most exposed section.

4.3.3 Balconies.

External balconies, whether inset or bolt-on provide the spaces below with a good amount of shading, especially to southern façades. This will reduce overheating and therefore energy consumption, while also providing external amenity for the residents. It is for this reason that balconies have been included in the design.

The proposed design includes a mixture of projecting and recessed balconies. Overhangs have been used where possible to minimise solar gains within the most exposed façades. Figure 13 below shows an example of the shading provided by the overhanging balconies; this image has been extracted from the IES 2024.1.0 model of the sample unit selection.

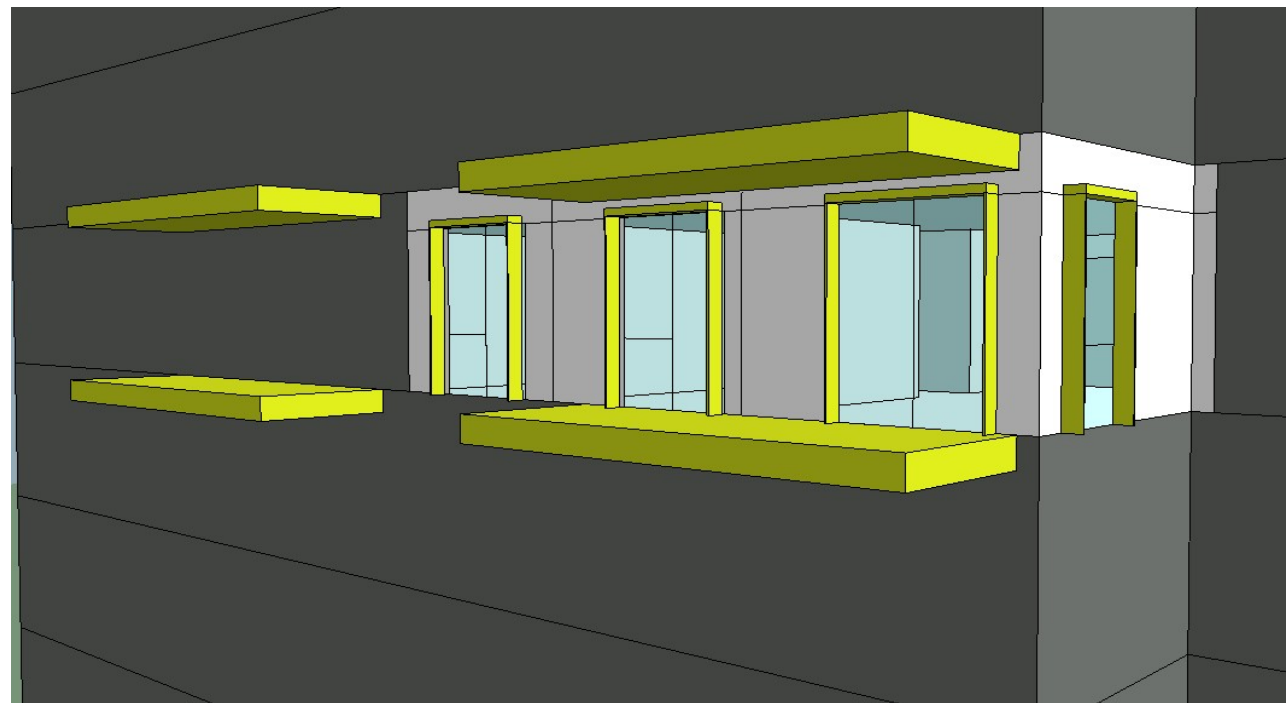


Figure 13: Screenshot of the IES model showing the balconies

4.3.4 External Shading.

When used strategically external shading can be provided by elements of the façade itself. The windows are recessed by minimum 225mm, this recess provides considerable shading to the glazing, shown below in Figure 14.

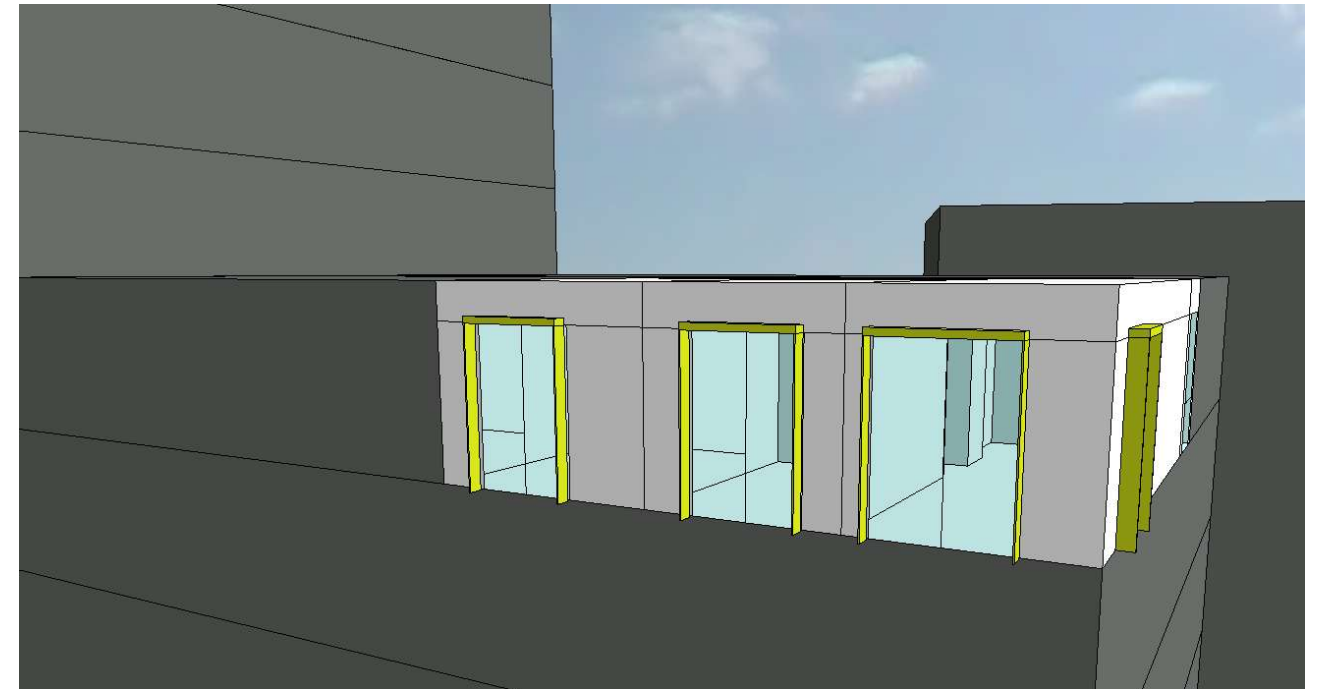


Figure 14: Screenshot of the model showing the window recesses.

4.3.5 Natural Ventilation.

The type of opening can have a significant effect on mitigating overheating. Windows or doors with a high amount of opening free area can enable passive ventilation and therefore will remove heat from the spaces. The design team has included side-hung windows and balcony doors. However due to the noise constraints on the site, and as per the outline consent, ventilation via openable window cannot be relied upon to mitigate the risk of overheating for the purpose of compliance, more details are provided in Section 4.4.1.

4.3.6 Increased Thermal Mass.

A higher thermal mass can have a benefit regarding mitigating overheating if the thermal mass is exposed. Due to the residential use, there is a need to conceal services, which reduces the possibility of incorporating exposed internal thermal mass. Ceiling heights have been maximised within the constraints of the overall building's height and massing.

4.3.7 Passive Design Measures Summary.

The following passive design measures have been included across the Proposed Development, where deemed viable by the design team:

- Recessed and projecting balconies.
- Window recesses.
- Fully operable side-hung windows and doors.
- Glazing reductions (where feasible in line with the daylight requirements).
- Solar control glass (g-value of 0.35).
- Increased thermal mass.

Furthermore, opaque panels in the lower part of the window units have been incorporated throughout the Development to minimise the overheating risk and/or ventilation loads.

4.4 Site constraints.

4.4.1 Acoustic Requirements.

Planning condition 101, issued as part of the outline application states that:

“No residential floorspace shall be first occupied within any Plot in Phase 3 until a detailed scheme, informed by an assessment of the current noise environment, for protecting the residential development within the relevant Plot from the external noise environment of the area has been submitted to and approved, in writing, by the Local Planning Authority. The scheme itself shall be designed, specified and constructed so that the sound insulation performance of the structure and the layout of the residential development are such that the indoor ambient noise levels do not exceed the values detailed in Table 4 of BS 8233: 2014 and that the individual noise events do not exceed 45 dB LAmax,F more than 10 times a night. Where opening windows will lead to an internal noise level in creased of 5 dB(A) or greater above BS 8233: 2014 recommended internal levels, the scheme shall include provision of alternative mechanical ventilation with minimum performance equivalent to a mechanical heat recovery (MVHR) system with cool air bypass as an alternative means of cooling and ventilation. Nosie from the systems should not result in BS 8233 internal levels being exceeded. Thereafter, the development shall not be carried out other than in accordance with the approved scheme which shall be completed before any part of the accommodation within the relevant Plot is first occupied.”

An acoustic assessment of the site has been carried out by Hoare Lea and as stated in the Stage 2 Report (ref. 1016199-HLE-RP-AC-Stage 2 Acoustic Report), the noise levels mean that it is not possible to achieve the required noise intrusion levels, in line with the requirements of the above planning condition via open windows to the majority of the Proposed Development. Therefore, provisions for alternative means of mechanical ventilation will need to be made to meet the overheating requirement with closed windows.

4.5 Overheating assessment.

An Overheating Risk Assessment has been undertaken on a sample of dwellings of the Proposed Development. The dwellings were selected to be representative for variation in orientation, glazing ratio, layout and floor level.

The overheating assessment has been undertaken following guidance in “*CIBSE TM59 2017: Design Methodology for the Assessment of Overheating Risk in Homes*” to demonstrate compliance with Approved Document O of the Building Regulations 2021. The CIBSE TM59 guidance stipulates that modelling must be undertaken with the weather file most appropriate to the location for the project, for the 2020s, high emissions scenario 50th percentile, in this instance the London Heathrow design summer year (DSY1) weather files have been used.

4.6 Compliance criteria.

Table 3 provides a summary of the overheating risk criteria applicable to the Proposed Development.

Table 3: Summary of CIBSE TM59 assessment criteria.

CIBSE residential overheating criteria	
Predominantly <u>Mechanically</u> Ventilated Dwellings (i.e. where opportunities to open windows may be limited due to acoustic or air quality constraints):	
Fixed Criterion:	For living rooms, kitchens, and bedrooms: Internal temperatures should not exceed 26°C for more than 3% of annual occupied hours (Jan – Dec).

4.7 Overheating assessment results.

Table 4 and Table 5 below provide a summary of the inputs and results of the overheating assessment demonstrating how the Development achieves full compliance against the mechanically ventilated criteria.

A full breakdown of the results is provided in Appendix E – Overheating model inputs and results.

Table 4: Mechanical Ventilation with Tempered Air CIBSE TM59 Results

9no Sample Dwellings	CIBSE TM59 Mechanical ventilation criteria Pass	Full Compliance %
19No. Bedroom zones	19	100%
11No. Livingroom/kitchen zones	11	100%

Table 5: Mechanical Ventilation with Tempered Air CIBSE TM59 Results – Communal corridors

Communal corridors	CIBSE TM59 Corridor criteria Pass	Full Compliance %
17No. Communal corridors	17	100%

4.8 Overheating conclusion.

The overheating assessment results show that all units assessed meet the CIBSE TM59 fixed criterion for mechanically ventilated dwellings, demonstrating how the passive measures included in the current design (e.g. window recesses, balconies, glazing ratios, window g-value), in conjunction with the proposed mechanical strategy, are able to mitigate the overheating risk, satisfying the requirements of ADO 2021 and Local Plan Policy CC3.

Due to the intrusion noise requirements under Planning Condition 101, while natural ventilation via open windows is possible, it cannot be relied upon to mitigate overheating; therefore, all dwellings will be provided with mechanical ventilation with heat recovery via EAHP, with a boost operation mode and summer bypass to provide trim cooling. When this provision alone may not be enough to achieve adequate comfort levels, the EAHP can also provide active cooling, further contributing to the Proposed Development’s resilience against climate change.

5. Be Lean.

Passive design and energy efficiency measures form the basis for the reduction in overall energy demand and carbon emissions for the Proposed Development. This energy strategy aims to reduce the energy demand initially by optimising the envelope and building services within the Development.



5.1 Domestic.

5.1.1 Passive Design.

Passive Design measures are those which reduce the demand for energy within buildings, without consuming energy in the process. These are the most robust and effective measures for reducing CO₂ emissions as the performance of the solutions, such as wall insulation, is unlikely to deteriorate significantly with time, or be subject to change by future property owners. In this sense, it is possible to have confidence that the benefits these measures provide will continue at a similar level for the duration of their installation.

- 

Fabric performance.
A ‘fabric first’ approach has been taken in order to reduce the energy demand and CO₂ emissions from the Proposed Development. Passive design measures are those which reduce the demand for energy within buildings, without consuming energy in the process.
- 

Natural daylight and lighting.
The Proposed Development will be provided with low-energy, efficient LED light fittings throughout. The lighting specification for the Proposed Development will be carried out in conjunction with lighting control systems, as appropriate on a zone-by-zone basis. External lighting will also be energy efficient and will be linked to daylight sensors and / or presence detectors to prevent unnecessary use. As well as the reduced energy requirement that will be achieved by implementing these strategies, the contribution to the cooling requirements and internal heat gains will be reduced. This will further reduce the total energy requirements and CO₂ emissions of the Proposed Development.

Table 6 summarises the proposed fabric performance for the Proposed Development.

Table 6: Building fabric parameters for the Proposed Development- Dwellings.

Building fabric element	Unit	Parameter
Roof U-value	W/(m ² K)	0.12
Ground/exposed floor U-value	W/(m ² K)	0.10
External opaque wall U-value	W/(m ² K)	0.14
Sheltered wall	W/(m ² K)	0.18
Window U-value, including framing, glazing and spacers.	W/(m ² K)	1.20
Window g-value	-	0.35
Window frame factor	-	20%
Door U-value (non-glazed entrance doors)	W/(m ² K)	1.00
Door U-value (internal doors)	W/(m ² K)	2.00
Spandrel panel U-value	W/(m ² K)	1.20
Air Permeability	m ³ /h/m ² @50Pa	3.00
Thermal Bridging γ-value	Notional (2021) psi values	

5.1.2 Building Services Efficiency Measures.

The building services strategy plays an important role in reducing a building’s operational energy use. Incorporating efficient technologies, such as heat pumps, and mechanical ventilation with heat recovery, contributes to reducing both the energy demand and CO₂ emissions of the building. The solution proposed is individual EAHPs for each apartment providing heating and hot water, via Nilan Compact P unit, which is Passivhaus certified; a copy of the unit’s certification and datasheet is provided in Appendix B.

- 

Space heating and cooling.
EAHPs (Nilan Compact P) have been considered serving each individual dwellings heating and hot water. The same unit will also provide trim cooling for ADO 2021 compliance.
- 

Mechanical ventilation.
All fresh air requirements for ventilation will be via mechanical means to enable incorporation of high efficiency heat recovery via Nilan Compact P unit.

Openable windows are also provided for purge ventilation for use at occupants’ discretion.

Providing fresh air minimises the risk of stale air and limits the risk of condensation and mould growth. Coupled to a heat exchanger, the warmth in extracted air can be recovered and delivered to the supply air. Thus, mechanical ventilation with heat recovery reduces space heating demand.
- 

Domestic hot water (DHW).
All spaces will include the use of water-efficient fixtures and fittings including WCs with low flush volume, flow restrictors in the taps of wash hand basins, and aerated shower heads to limit overall water consumption in line with Building Regulations Part G.

Table 7 below provides a summary of the building services parameters and inputs used for the residential energy modelling.

Table 7: Building services parameters for the Proposed Development - Dwellings.

Building services element	Unit	Parameter
<i>Ventilation</i>		
Mechanical ventilation present?		Yes – MVHR-located within the heated envelope
Mechanical ventilation data type		Balanced mechanical ventilation with heat recovery
Specific Fan Power	W/(l/s)	0.76
MVHR Efficiency		86%
Ducts insulation		Rigid insulation
No. Fans		No additional fans to that integral to the MVHR
<i>Cooling</i>		
Cooling present?		Yes-cooling module fitted on the MVHR unit
<i>Lighting</i>		
no. fittings		varies
Power	W	10
Capacity	lm	630
Efficacy	lm/W	63
<i>Space heating</i>		
Individual or communal?		Individual
Heating controls		2506-Time and temperature zone control (main heating) 2704-Programmer and room thermostat (underfloor heating)
Source		EAHP-Nilan Compact P Underfloor heating in the bathrooms
Efficiency		As per specification document
<i>Renewables</i>		
PV		No PV allowance for the residential element
Orientation		n/a
Elevation		n/a
Overshading		n/a
<i>Water and DHW</i>		
Water use	l/p/day	≤125
Shower flow rate	l/min	8
DHW Heat source		Same as space heating
Waste Water Heat Recovery		Excluded

5.2 Non-domestic.

5.2.1 Passive Design.

Passive Design measures are those which reduce the demand for energy within buildings, without consuming energy in the process. Please refer to Section 5.1.1 for the passive design measured considered.

Table 8 shows the fabric parameters for the non-residential areas of the building.

Table 8: Building fabric parameters for the Proposed Development – Non-residential.

Building fabric element	Unit	Parameter
Roof U-value	W/(m²K)	0.12
Ground/exposed floor U-value	W/(m²K)	0.10
External opaque wall U-value	W/(m²K)	0.14
Sheltered wall U-value	W/(m²K)	0.18
Solid curtain wall and insulated metal panels U-value	W/(m²K)	1.40
Window U-value, including framing, glazing and spacers.	W/(m²K)	1.20
Window g-value	-	0.35
Window frame factor	%	10%
Glazed curtain wall U-value	W/(m²K)	1.20
Glazed curtain wall g-value	-	0.35
Glazed curtain wall frame factor	%	10%
Glazed doors U-value	W/(m²K)	1.60
Glazed door g-value	-	0.35
Glazed door frame factor	%	30%
Door U-value (non-glazed entrance doors)	W/(m²K)	1.60
Door U-value (Vehicle access doors)	W/(m²K)	1.30
Air Permeability	m³/h/m²@50Pa	3.00
Thermal Bridging	%	25%

5.2.2 Building Services Efficiency Measures.

The building services strategy plays an important role in reducing a building’s operational energy use. Incorporating efficient technologies, such as heat pumps, and mechanical ventilation with heat recovery, contributes to reducing both the energy demand and CO₂ emissions of the building.



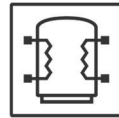
Space Heating and Cooling.

Variable Refrigerant Flow (VRF) system will be serving the amenity areas and the retail units, that will be heated and cooled. WCs and staff facilities zones will be heated through direct electric panels. All other areas will not be heated/cooled.



Mechanical Ventilation.

A centralised A/C system will provide fresh air requirements to the amenity spaces and retail units. The rooms heat will be recovered to reduce the heating demand through heat exchangers (recuperators).



Domestic Hot Water (DHW).

Amenity spaces will be served by electrical storage heaters, while the retail spaces will be served by Air Source Heat Pump (ASHP).

Table 9 below provides a summary of the building services strategy for the non-residential spaces

Table 9: Building services parameters for the Proposed Development – Non-residential area.

Building services element	Unit	Parameter
<i>Ventilation</i>		
Mechanical ventilation present?		Yes-Mechanical ventilation for the amenity spaces and retail units
Mechanical ventilation		Centralised A/C
Specific Fan Power	W/(l/s)	1.60
MVHR		Plate heat exchanger (recuperator)
MVHR Efficiency		75% - Amenity areas 80% - Retail units
Local fans	W/(l/s)	FCU: 0.4
<i>Cooling</i>		
Cooling present?		Yes-VRF to amenity spaces and retail units
Cooling system		Air Source Heat Pump (VRF)
SEER		4.0
<i>Lighting</i>		
Light typology		LED
Light efficacy	Lm/W	≥97
Lighting control		AUTO-ON-DIMMED (Amenity areas-Retail units) AUTO-ON-OFF (Staff facilities-Circulation areas-Cycle store-Bin store- Car park-WCs) MAN-ON-AUTO-OFF (Reception areas-Plantrooms)

Building services element	Unit	Parameter
		None (Storage)
Photoelectric option		Daylight dimming-standalone sensor
Parasitic power	W/m ²	≤0.1
<i>Space heating</i>		
Heating present?		Yes-Amenity spaces, retail units, WCs and staff facilities
Heating systems		VRF (ASHP) for the amenity spaces and the retail units Direct electric for WCs and staff facilities
Source		Electric
Efficiency		VRF (ASHP): 3.5 – Amenity areas VRF (ASHP): 4.0 – Retail units Direct electric heating: 1.0
<i>Renewables</i>		
PV	m ²	93m ² total array size, allocated to amenity areas
Orientation	°	180
Elevation	°	30
Efficiency	%	20
Rated power (from IESVE)	kWdc	18.60
Overshading		0.5
<i>Water and DHW</i>		
DHW Heat source		ASHP – Retail units Direct electric – Amenity areas and staff facilities
Waste Water Heat Recovery		Excluded
Delivery efficiency	%	100%

6. Be Clean.

This stage of the energy hierarchy refers to the use of heat networks or on-site Combined Heat and Power (CHP) in order to provide energy and reducing consumption from the national grid and gas networks, through the generation of electricity, heating and cooling on-site.



6.1 Network and technologies.

In line with policy aspirations, the following sections summarise the considerations of the low-carbon energy supply measures that have been considered, and those which will be implemented at the Proposed Development.



Combined heat and power (CHP)

Changes to the carbon factor of grid electricity have meant that previously favoured systems such as Combined Heat and Power (CHP) are becoming much less carbon efficient. In fact, CHP systems are now expected to lead to greater carbon emissions than conventional gas-fired boilers due to their lower efficiency.

Due to the decarbonisation of the electricity grid, alongside air quality concerns, CHP is not proposed.



Heat and Energy Networks

Offsite heating network



Since 2022, Reading Borough Council (RBC) and its partners have been exploring the potential for a district heat network across the borough, and they now engaged in Detailed Project Development for an initial phase of the proposed network. The Section 106 (S106) Planning obligations for the hybrid consent (Sch. 6, Paragraph 10.1, 10.3 and 10.4) intends for Phase 3A to provide a Decentralised Energy System. The feasibility and appropriateness of this approach and the potential integration of the Reading District Heating Scheme was discussed with RBC at the pre-application stage.

The scheme offers a long-term opportunity for decarbonised heat supply through technologies such as water source, ground source and air source heat pumps. However, due to the scheme extended implementation timeline, uncertainty around connection infrastructure and cost and the misalignment between the project's delivery programme and the anticipated rollout of the district network, there is a requirement for our scheme to move forward with our proposed heating solution. Furthermore, district heating systems can result in significant distribution losses via the buried infrastructure associated with energy distribution, often proving less efficient in terms of carbon reduction than providing an efficient on-site generation strategy. It is also worth noting that if the district energy system connects to high-risk buildings, under the Building Safety Act (BSA) the system will also be subject to HSE approval, thus delaying implementation further.

In response to the BSA, the residential buildings (Plots A/B and D) are required to be separated from the commercial building (Plot C), to ensure that the latter is not classified as a Higher Risk

building. On this basis, connection of the commercial or communal spaces in Blocks A, B and D to the DHN or the future Plot G would not be appropriate. It is also impractical and unviable to create such a connection for a small number of commercial units.

It is therefore not proposed to connect to external district energy networks or make provision for a future connection for the Proposed Development.

7. Be Green.

The ‘Be Green’ step of the energy hierarchy explores the feasibility of Low and Zero Carbon (LZC) technologies to allow for the production of renewable energy onsite in order to meet the remaining energy demand through LZC technologies as far as possible.



7.1 Network and technologies.

The Section 106 intends for Phase 3A to provide a Decentralised Energy System. The feasibility and appropriateness of this approach was discussed with RBC at the pre-application stage.

In line with policy aspirations, the following sections summarise the considerations of the low-carbon energy supply measures that have been considered. Hoare Lea have undertaken a detailed review of the different energy technologies to determine the best strategy for the Proposed Development in terms of sustainability, energy, carbon, technical feasibility and maintenance and operation.

Table 10: Energy scenarios

Scenario
Option 1: RBC DHN
Option 2: Communal GSHP
Option 3: Communal ASHP (Ambient loop)
Option 4: Communal ASHP (LTHW loop)
Option 5: Individual ASHP (Split System)
Option 6: Individual exhaust air heat pump (Combined MVHR)
Option 7: Individual exhaust air heat pump (Compact)

7.2 SAP review.

In order to appraise the energy strategy options, a series of ADL 2021 Part L1 assessments have been carried out to compare the carbon savings of the seven options.

For each of the scenarios, the apartment used within the assessments is based on a sample taken from a similar residential development. The modelling inputs used for the assessments are detailed within the report and include fabric, thermal energy (system types, efficiencies, and control methodology) ventilation and lighting.

Following the Standard Assessment Procedure (SAP) outlined in the ADL 2021, the following results, summarised in Table 11 are observed when comparing the Dwelling Emission (DER) Rate with the ADL 2021 Target Emission Rate (TER) for each option.

The RBC target for residential dwellings is to achieve zero carbon (100% improvement over the baseline set up in ADL 2021), with any remaining emissions to be offset with a payment.

Table 11: Part L1 comparison results

Scenario	Can this deliver the energy demand?	% Improvement over ADL 2021	Estimated EPC Ratings	Estimated Typical Energy Costs for 2 Bed (SAP)	Billed via
Option 1	TBC*	TBC*	TBC*	TBC*	TBC*
Option 2	No	71-75%	77-81 EPC C-B	£451 + Service charge	Service charge
Option 3	Yes	67-72%	77-81 EPC C-B	£451 + Service charge	Service charge
Option 4	Yes	58-63%	77-81 EPC C-B	£454 + Service charge	Service charge
Option 5	Yes	61-66%	77-81 EPC C-B	£451 + Service charge	Service charge
Option 6	Yes	67-72%	80-83 EPC C-B	£385	Electricity supplier
Option 7	Yes	68-73%	81-86 EPC B	£381	Electricity supplier

*At the time of writing this report no data has been provided from RBC to calculate an expected carbon improvement.

As can be seen in Table 11, all scenarios tested achieve good carbon reductions against the ADL 2021 Part L1 notional building, well above the minimum target set by the Local Plan. However, without further improvements only EAHP meet the EPC B rating which is a minimum requirement for any funder in this asset class currently. In addition, EAHP offer the lowest energy bills for residents which is the primary measure in creating the most sustainable homes for residents and therefore they have been proposed as the most suitable system. At the time of writing there is little detail on the Reading district energy network, but it is expected that at best the performance will be comparable to a communal system.

7.3 Ground Source Heat Pumps.

A Decentralised Energy System heated by a Ground Source Heat Pump (GSHP) has been carefully considered, however the feasibility of this solution is constrained by the site.

A ground source system would require extensive below ground works to bury and install the system on site; based on current estimated peak and annual loads, the Development will require 110No. 300mm boreholes to meet the demands. There is a significant Thames Water tunnel running beneath the site with an exclusion zone along each side and the urban density of the site means that the Proposed Development has a relatively small footprint and area available to install boreholes. The available areas have the capacity to only house approximately 22No. boreholes, which means that the system would only be able to cover 20% of the building load, meaning an additional system would also be required.

Compared to the proposed solution, GSHPs would result in higher energy bills for the residents, and a lower energy performance, estimated to achieve EPC band C, below the policy and current market requirements.

Furthermore, Environmental Agency licences will be required for an open loop system, which would need to be reviewed every 10 years, impacting the delivery programme.

7.4 Low and zero carbon technology assessment.

Renewable or zero carbon technologies harness energy from the environment and convert this to a useful form. Many renewable technologies are available; however, not all of these are commercially viable or suitable.



Photovoltaics.

PV panels harness energy from daylight and convert it into useful energy in the form of electricity. A PV system requires viable roof space in order for the array to be installed and function effectively.

A 93 m² PV array is proposed for the Development, it will serve the amenity areas of the Proposed Development, to assist with compliance against Part L2.



Solar Thermal.

Solar Thermal Panels are similar to PV Panels in that they harness energy from solar irradiation. This technology however converts solar into thermal energy that can offset the demand on hot water generation systems.

Solar thermal systems are not proposed for the Development as preference will be to assign available roof space to a photovoltaic array.



Ground Source Heat Pumps

GSHP utilise either water extracted from an aquifer (open loop) or water circulated within underground pipework (closed loop) as the heat source in a refrigeration process. This enables them to produce hot water, typically at 45° C, that can be used as a means of space heating in buildings. Due to the relatively constant temperature of the ground at depth, they produce heat more efficiently than an air-source heat pump and usually with lower carbon emissions than a gas-fired boiler. GSHPs require boreholes to be excavated on site and licences from the Environment Agency for both abstraction and discharge.

Site constraints substantially affect the feasibility of GSHPs for the Proposed Development, resulting in lower energy performance and the need for a secondary system. Therefore, GSHPs are not proposed for the Development.



Air Source Heat Pumps.

ASHP use thermodynamic principles to convert heat from the air into useable heat within the building. Unlike some other sources of renewable energy, heat pumps do require energy (typically electricity or gas) to pump and compress refrigerant through the system. However, under the Renewable Energy Directive 2009/28/EC they are classified as renewable technologies provided that the final energy output significantly exceeds the primary energy input required to drive the heat pump. ASHP need to be located externally with access to the ambient air, typically at roof level.

ASHP (Variable Refrigerant Flow -VRF) are proposed for the non-domestic areas of the Development. The viability and technical performance of ASHP are not currently considered as advantageous as the EAHP solution for the Proposed Development, therefore ASHP are not currently being proposed to serve the domestic units.



Exhaust Air Source Heat Pumps.

An EAHP is a system which absorbs heat from the waste air (or exhaust air) leaving a building. Heat is extracted from the exhaust air and is upgraded into useful heat energy for space heating and domestic hot water. This system requires a dwelling with low heat demand.

EAHPs are considered an appropriate technology for the domestic units in the Proposed Development.



Wind Turbine.

Wind turbines provide high efficiency and capacity of electricity generation. However, are not generally considered appropriate for town centre applications due to noise which may be a nuisance to neighbouring properties. Further, small wind turbines are known to provide only limited carbon reductions in reality, and this technology is best suited to large, stand-alone wind farm proposals.

Considering the impacts described and the visual impact of wind turbines on the character and appearance of the area, the use of wind turbines will not be proposed for the Development.



Biomass.

Biomass boilers burn wood fuel or other bio-fuel sources to generate heat. These boilers can operate at high efficiencies, comparable to condensing gas boilers. However, they require a large fuel store to maintain continuous operation during the winter months. As such, area take for such plant is high. Furthermore, security of fuel supply is an important consideration.

As this technology would lead to in an increase of local NOx emissions from the Proposed Development, resulting in a reduction in the local air quality, together with compromising the all-electric scheme aspirations, the use of biomass boilers at the Proposed Development is considered to be unsuitable.

7.5 Domestic summary.

The proposed strategy, consisting of an EAHP per apartment providing its own heating and domestic hot water, offers multiple advantages for the residents, the most significant being lowest running costs and energy bills compared with other technologies, and it is the only option which meets EPC band B. It is an efficient and rapidly evolving technology that is becoming common practice across the residential sector, and provides local control for residents, minimising wasted energy and losses compared with a central system which relies on an extensive distribution network across the Development, and offering reduced chances of leaks and operational issues. This solution also frees up approximately 400m² of roof space for additional PV and green roof provision, enhancing ecology and air quality for the community. It is therefore considered the most appropriate solution for the Proposed Development.

7.6 Non-domestic summary.

The non-domestic areas (amenity spaces and retail units) will be heated and cooled by highly efficient VRF systems served by ASHPs. The same arrangement will also supply hot water to the retail units; the amenity areas will have direct electric hot water provision. A 93m² PV array will be installed on the roof and allocated to the amenity areas, contributing to the site energy efficiency and carbon reductions. In response to the BSA, the residential buildings (Plots A/B and D) are required to be separated from the commercial building (Plot C), to avoid classification of the latter as a Higher Risk building. For this reason and given the impracticality and poor value of connecting a small number of commercial units, connection of the commercial or communal spaces in Blocks A, B and D to the DHN or the future Plot G is not considered appropriate. The proposed strategy is therefore the most suitable for the Proposed Development.

8. Energy strategy and CO₂ emissions assessment.

Implementing the energy strategy outlined in this report will enhance the efficiency of the Proposed Development, leading to significantly reduced carbon emissions. These emissions will continue to decline over time, corresponding with the ongoing decarbonisation of the UK's power grid.

The Reading policy target for major new build residential is *Zero Carbon (or if unachievable, a minimum 35% improvement in the dwelling emission rate over the target emission rate, as defined in the 2013 Building Regulations and planning contribution to offset remaining carbon emissions to zero).*

This is also reflected in the Planning Obligations under Section 106 (S106) for the Proposed Development, (Sch 6, paragraph 8.1), which require “*to ensure a minimum of 35% improvement in regulated emissions over the target emissions rate as set out in the 2013 Building Regulations is provided for in each and every Housing Unit that is provided as part of the First 2021 Development*”.

8.1 New build residential regulated CO₂ emissions assessment.

Regulated CO₂ emissions have been assessed in SAP.10. The results are reported in Table 12 below, demonstrating significant site overall savings against the baseline notional compliant development emissions. An overall reduction in regulated CO₂ emissions of 72% is achieved over the ADL 2021 notional baseline, exceeding the S106 35% target, and improving on Phase 1 which achieved a 30% reduction.

Remaining offset requirement is for 179.7 tCO₂, estimated at £323,460 offset payment to be secured through S106 agreement.

Table 12: ADL 2021 results for Regulated Emissions

	Annual Emissions Rate, (kgCO ₂ e/m ² /year)	Total Annual Emissions (tCO ₂ e/year)	Reduction
	Residential Dwellings	Residential Dwellings	
Baseline (TER)	13.4	638.7	
Be Green (DER/BER)	3.8	179.7	72%
S106 target			35%
RBC policy target			100%
Offset Payment			£323,460 (28%)

*Offset payment has been estimated based on £1,800/tCO₂e to be agreed through S106 agreement.

8.2 Regulated energy assessment.

Regulated energy consumption has been assessed in SAP.10 for dwellings and IES VE Compliance using the NCM methodology for the non-domestic spaces. The results are reported in Table 13 below, demonstrating significant overall site savings against the notional baseline development consumption.

Table 13: ADL 2021 results for Regulated Energy

	Annual Regulated Energy Rate (kWh/m ² /year)			Annual Regulated Energy (kWh/year)			% reduction
	Residential Dwellings	Non- Domestic Areas	Site total	Residential Dwellings	Non- Domestic Areas	Site total	
Baseline	133.1	37.1	105.6	4,696,324	1,308,789	6,005,112	
Proposed	37.4	35.9	37.0	1,321,324	1,266,570	2,587,893	57%

Table 14 and Table 15 provide an overview of Proposed Development's performance against the notional building baseline from ADL 2021, showing that both the dwellings and the non-residential areas achieve a substantial improvement.

Table 14: Dwellings – ADL 2021 Summary Results.

	CO ₂ emissions			Primary Energy			Fabric energy efficiency			SAP Rating	EPC Rating-
	TER	DER	Variance	TPER	DPER	Variance	TFEE	DFEE	Variance		
	kgCO ₂ /m ² /yr	kgCO ₂ /m ² /yr	%	kWh/m ² /yr	kWh/m ² /yr	%	kWh/m ² /yr	kWh/m ² /yr	%		
Block AB	13.77	3.88	71.80%	75.85	41.18	45.70%	27.49	26.96	1.93%	81-87	B
Block D	12.47	3.49	72.03%	68.55	37.01	46.01%	24.95	24.78	0.67%	84-87	B

Table 15: Non-residential areas – ADL 2021 Summary Results.

	CO ₂ emissions			Primary Energy		
	TER	DER	Variance	TPER	DPER	Variance
	kgCO ₂ /m ² /yr	kgCO ₂ /m ² /yr	%	kWh/m ² /yr	kWh/m ² /yr	%
Amenity areas	4.59	4.45	3.05%	50.10	48.59	3.01%
Retail units	13.13	12.80	2.51%	143.09	139.23	2.70%

A full breakdown of the SAP modelling results is provided in Appendix C, and the summary of the BRUKL report is provided in Appendix D.

8.3 Unregulated energy and CO₂ emissions assessment.

Baseline unregulated energy has been estimated using SAP 10 methodology for dwellings. For the non-residential areas the ‘equipment’ figure within the BRUKL report has been used.

An overall target energy consumption for the dwellings has been set at 50 kWh/m²/year for both regulated and unregulated energy consumption. Whilst the landlord will provide low energy appliances and smart metering to enable low energy consumption, the final consumption will be down to occupants within the dwellings and their use of small power which falls outside the control of the building landlord.

Table 16: ADL 2021 results for Unregulated Energy

	Dwelling Unregulated Energy	Amenity Unregulated Energy	Site Total	Dwelling CO ₂ emissions	Amenity CO ₂ emissions	Site Total
	kWh/m ² /year			kgCO ₂ e/m ² /year		
Baseline	52.9	170.6	86.6	7.2	23.2	11.8
Predicted Target	12.6	170.6	57.8	1.7	23.2	7.9

9. Conclusions.

The Proposed Development is the next step of the Station Hill masterplan, and in combination with the delivery of Station Hill Gardens, improvements to surrounding streets and the completion of Station Hill Square, Phase 3A will play a critical role in realising the final vision for Station Hill as a well-connected, inclusive and high-quality place to live, work and spend time.

The energy strategy outlined in this report is capable of delivering substantial carbon reductions; the residential element of the development is projected to achieve a 72% reduction in regulated emissions compared with ADL 2021, which exceeds the S106 requirement agreement (Sch 6, paragraph 8.1) for a minimum 35% improvement in regulated emissions over the ADL 2021 rate. The sitewide regulated emissions reduction, following the incorporation of heat pumps and PV, is projected at 65%, as demonstrated in this report.

The project team has engaged with Reading Borough Council to consider potential integration with the Reading District Heating Scheme. However, due to the heating scheme extended implementation timeline, uncertainty regarding connection infrastructure and cost, and the misalignment between the project's delivery programme and the anticipated rollout of the district network, connection to the district heat network has not been deemed appropriate for the Proposed Development. District heating systems can also incur significant distribution losses associated with the buried infrastructure, often proving less efficient in terms of carbon reduction compared with an efficient on-site generation strategy. It is also worth noting that if the district energy system serves high-risk buildings, under the Building Safety Act the system will also be subject to HSE approval, which would be likely to delay implementation further. Careful consideration has also been given to creating a Decentralised Energy System heated by GSHP, however the feasibility of this solution is heavily constrained by the site.

The proposed residential energy strategy consists of an EAHP installed in each apartment to provide heating and domestic hot water, an efficient and rapidly evolving technology which is increasingly adopted across the residential sector and offers multiple advantages for the residents. The most significant are the lowest running costs and energy bills compared with alternative technologies, full local control for residents and improved energy efficiency, minimising distribution losses compared with a centralised system. The proposed strategy has also the ability to achieve EPC band B, delivering a best-in-class and market leading Development.

The non-domestic areas (amenity spaces and retail units) will be heated and cooled by highly efficient VRF systems served by ASHPs. The same arrangement will also supply hot water to the retail units while the amenity areas will have direct electric hot water provision. A 93m² PV array will be installed on the roof and allocated to the amenity areas, contributing to the site energy efficiency and carbon reductions.

In response to the BSA, the residential buildings (Plots A/B and D) are required to be separated from the commercial building (Plot C), to avoid classification of the latter as a Higher Risk building. For this reason and given the impracticality and poor value of connecting a small number of commercial units, connection of the commercial or communal spaces in Blocks A, B and D to the DHN or the future Plot G is not considered appropriate. The proposed strategy is therefore the most suitable for the Proposed Development.

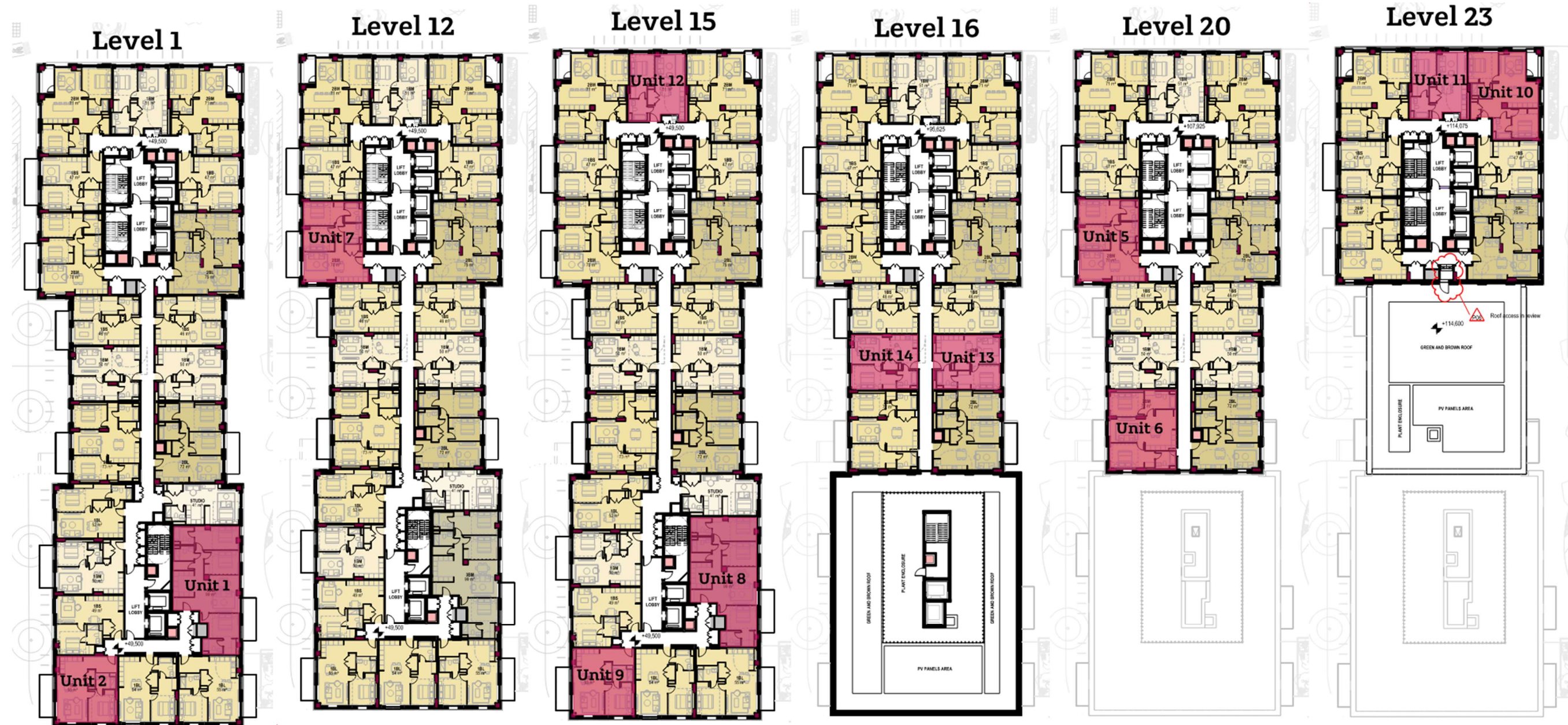
Table 17 below summarises how the Energy Strategy for Phase 3A of the Station Hill North Development complies with the policy requirements detailed in Section 2.2 of this report.

Table 17: Policy compliance

Policy Requirement	Compliance achieved	Notes
BREEAM Very Good	✓	For retail spaces
Zero Carbon for domestic elements with a minimum 35% onsite reduction	✓	Residential areas achieve 72% onsite reduction against the minimum target set at 35% (S106)
ADL 2021	✓	Targets achieved using current carbon factors

Appendix A – SAP (ADL 2021 Part L1) sample dwellings.

Block AB.



Block D.



Appendix B – Residential heat pump strategy.

Correspondence with RBC about the District Heat Network.

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From: Vigar, Stephen <Stephen.Vigar@reading.gov.uk>
Sent: 21 November 2025 13:07
To: Watkins, Tanith; Burfoot, Ben; Don Messenger; Kurt Gagen
Cc: Rackham, Samuel; Eatough, Richard
Subject: Discuss Station Hill Energy - 24/1493/PRE - ONLINE
When: 27 November 2025 12:30-13:30 (UTC+00:00) Dublin, Edinburgh, Lisbon, London.
Where: Microsoft Teams Meeting

Dear Don

I have arranged for a meeting - online - with Ben Burfoot and colleague Tanith Watkins 12.30pm next Thursday 27th.

As discussed, we are not yet convinced by the justification for not progressing Ground Source Open loop system. It is not necessary to balance heat extraction with cooling plant heat injection for this kind of heat pump as the water is flowing end so the heat is continually replenished. Also there is the ability to reject heat from cooling from phase 2. There is currently a legal obligation to go down this route and this would be our strong preference.

If you are wishing to deviate from this we would need to vary the terms of the S106. We would be unlikely to agree to this without a convincing technical justification for how the alternative individual ASHP proposal is equal or superior to a communal GSHP or ASHP system connected to Phase 2 in a network and with opportunity to connect more widely to a town-wide heat network in due course.

We are unsure as to the technical possibility of the proposals for individual ASHPs in each flat. We do not have information on the heating proposals and what we presume a wet system would be connected to a very low power heat pump. Presumably this would be backed up with an immersion heater and this would mean that the residents are heating their flats using an immersion when the heat pump can't keep up. This is an expensive, high cost and high carbon way of heating and would not be a decentralised energy source. We are not clear on the data on the thermal performance of the flats or any sensible benchmarks for this. It is quite possible that for a small heat pump to provide sufficient heat for hot water and heating, very good fabric efficiency would be needed (almost Passivhaus level).

If we are to have a meaningful meeting, please provide

- detailed technical specifications for the building fabric efficiency
- detailed technical specifications for the ASHP units for both space heating and water heating
- modelled performance for the 'system' i.e. the building fabric in combination with the ASHP specification demonstrating performance across the full range of external air temperatures and likely heat demand.
- Details of any additional auxiliary back-up heating that is to be installed.

I would be grateful if you could ensure these details are sent to us by Tuesday. Also please confirm attendees.

Kind regards

Steve

Steve Vigar
Planning Applications Team Leader
Planning Section | Directorate of Economic Growth and Neighbourhood Services

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From: Vigar, Stephen <Stephen.Vigar@reading.gov.uk>
Sent: 09 December 2025 17:15
To: Don Messenger <don.messenger@dg9.co.uk>
Cc: Kurt Gagen <kurt.gagen@dg9.co.uk>; Eatough, Richard <Richard.Eatough@reading.gov.uk>; Burfoot, Ben <Ben.Burfoot@reading.gov.uk>
Subject: RE: Discuss Station Hill Energy - 24/1493/PRE - Without prejudice

Hi Don

I do appreciate the time pressures and we are actively reviewing the latest presentation this end.

As things stand there are some immediate points:

1. The coefficient of performance of the Nilan Compact P units is quoted as 2.30 which is low and does not meet the level required to be classified as renewable. It is not clear how this is a suitable alternative to GSHP/ASHP, which would achieve a higher COP. At the very least we would need reassurance that the alternative is a renewable alternative.
2. The argument you are making against GSHP mentions open loop but appears to refer mostly to the limitations of the closed loop option. For instance open loop would require fewer boreholes and it appears these might possibly be accommodated in the limited space available. Given the high output of open loop GSHP, it isn't clear why this is shown as not meeting the energy demand as a single source.
3. The system includes panel heaters and immersion heaters as backup. This may be less of an issue if used very rarely. But it isn't clear on the ability of the system to meet DHW and space heating demand without relying on direct electric back up.

My sense is that we may not be able to fully agree at pre-app stage and that there may remain some concerns that this is a less good option from an environmental perspective as we move into the formal application process. If you do intend to continue down this route we need to be very clear on the relative performance of the system secured under the S106 compared with the system you are proposing so that we can present the benefits/shortcomings clearly to Members at application stage. You would be asking for agreement to deviate from policy and, particularly in this case, to agree vary the S106 away from the agreed position. They would need to see a clear benefit of doing this in overall Planning terms.

Many thanks

Steve

Steve Vigar

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Hi Steve,

Further to our chat this morning, I thought it would be useful to respond on the final points you have raised. But thanks for working with us on this and understanding the position. We are speaking with TL in relation to the S106 point.

Trust the below is helpful, but if you have any queries then please let us know. It would be great to close this out asap.

best
Don

We remain of the opinion that Ground Source Heat would be technically possible, but we understand that if any of the boreholes would need to be located on land outside of the redline that it would be problematic to the extent that it is could potentially be a barrier to delivery of the development (noted and agreed). We can agree, based on the submitted details and what we know of the scheme as a whole, that there is insufficient space for a Closed Loop system and limited space for an Open Loop system. To achieve the ~100m distance required between inlet and outlet boreholes (open loop) would require either (i) siting of one or more boreholes on highway land which is not under the direct control of the developer with associated risk to delivery and possible future access and maintenance problems, or (ii) siting one or more boreholes on the Plot C land (Phase 3B) which has permission for an office tower which would be quite separate in terms of design, investment model (possibly future ownership) and operationally (agreed). An investor in Plot C is unlikely to agree to share a borehole with those involved in Plots A, B and D. This is agreed and it should be noted that given 1 borehole would only support a proportion of the load of either the resi or office, each party would need to provide their own system also. As an open loop system is subject to license from the Environment Agency this is not a certain solution.

This raises the policy question of connection to a future heat network, which is likely to be delivered in the town centre in the future in accordance with the proposed Government Network Zones set out in the upcoming regulations. It would be important to continue assessing whether there remains scope to provide a wet system which could connect to the Plot G (ONE Station Hill) network and also a future heat network to serve the commercial and communal spaces at the ground floor/lower ground floor levels of Plots A, B and D. We do not accept that a water pipe connected from the street or adjacent blocks would necessarily be restricted under the Building Safety Act. (The connection of Plot G would be supported in principle if and when the sustainability benefits/ costs are evidenced. This is already secured in the S106.

However, it would not be appropriate for the commercial or communal spaces in A, B and D to be connected. Under the fire regulations the sprinkler requirements are defined by the residential above them and as such these elements would be subject to the BSA. Regardless, it is also impractical and unviable for to create such a connection for a small number of commercial units.

The technical and contextual constraints still present a reduction in environmental performance in practical terms. As such it will be necessary to demonstrate a reasonable low carbon alternative which delivers on similar environmental objectives. The environmental objectives should include running cost for the resident ie the main outcome that will effect the occupants.

The coefficient of performance of the Nilan Compact P units is quoted as 2.30 which is relatively low, you have since confirmed that the seasonal COP would in fact be 3.7 and that the system would be a "low carbon source". The system includes panel heaters and immersion heaters as backup. This may be less of an issue if genuinely used very rarely but we would have concerns about the risks that this might not be the case if there were any performance gap. We note that the Nilan Compact P units are Passive House certified and energy A-rated. This suggests a good level of environmental performance in isolation but still remains heavily reliant on the thermal performance of the building itself. Evidence of performance would be very helpful in providing further justification for your proposal i.e. case studies showing real life application of units with impartial testimonials from other planning departments and or academic assessment.

We will prepare a list of schemes in the submitted energy statement. We would also be happy to arrange a site visit to a completed unit. Would this be useful?

If we are to accept the Nilan Compact P system for the individual flats this would be on the basis of the following:

1. It would be necessary to secure the particular model - the Nilan Compact P - (or a model of proven equivalent performance) under any future permission. Passive House certified (Correct- the Model type meets this certification. This has been used in our assessments and we would accept a planning condition to secure this. and A-rated.
2. It would be necessary to include a requirement to achieve a certain level of thermal performance (agreed and this is what we have proposed) so that the panel heater and immersion heaters would be very rarely used including enhanced air tightness and insulation levels closer to Passive House levels. In particular it appears that the air tightness and window performance quoted could be improved. Ideally the panel heaters would be omitted from the proposals altogether. Agreed and currently we have suggested parameters and note they are likely to be used 3.3% of the year. This is modelled will be shown in the submitted energy statement. It should be noted that both the panel heater and immersion also provide a low cost degree of resilience for a resident if the unit needs maintenance or similar. We are looking at whether the panel heat can be omitted as likely there will be an electric towel rail in the bathroom
3. We would need to be presented with a clear assessment of the likely heat demand (which would be linked to the above - both hot water and space heating. (Noted- this will be provided in the energy statement).
4. The scope for an increased role for other decentralised power sources such as Photovoltaics to boost the overall system performance should also be assessed and quantified. (Noted and agreed- this will be included in the energy statement.
5. The scope for a heat network serving the commercial and communal GF/LGF areas only should be assessed - links to Phase 2 as per the S106 and also to future town centre heat networks. See above notes.
6. The variation to the S106 being agreed - which remains subject to Committee approval.

Don Messenger
Senior Director
mobile: 07872 684 699
e-mail: don.messenger@dg9.co.uk

Exhaust Air Heat Pump certificate.

CERTIFICATE

Certified Passive House Component
Component-ID 2421ch03 and 2422ch03 and 2423ch03
valid until 31st December 2025

Passive House Institute
Dr. Wolfgang Feist
64283 Darmstadt
Germany



Category: **Compact unit**
Manufacturer: **Nilan A/S**
Denmark
Product name: **Compact P2 (Combi 400 Top)¹⁾**

Type of heat pump:
Heat exchanger: recuperative

This certificate was awarded based on the product meeting the following main criteria:
Ventilation unit
Heat recovery rate $\eta_{HR} \geq 75\%$
Specific electric power $P_{el,spec} \leq 0.45 \text{ Wh/m}^3$
Leakage $< 3\%$
Comfort Supply air temperature $\geq 16.5^\circ\text{C}$ at outdoor air temperature of -10°C

Heat pump ²⁾
Space heating 9 kWh/(m²a)
Space Heating + DHW 20 kWh/(m²a)
Space cooling (humid climate): 13 kWh/(m²a)
Space cooling (dry climate): 11 kWh/(m²a)

¹⁾ all certified units and operational modes are listed in detail in the appendix of this certificate
²⁾ limit values for final energy (electricity) demand
³⁾ the unit is equipped with ventilation unit.

Ventilation unit's performance: ^{1) 3)}

Airflow range
70...360 m ³ /h
Heat recovery rate
$\eta_{HR} = 81 \text{ and } 85\%$
Specific electric power
$P_{el,spec} = 0.24 \text{ and } 0.21 \text{ Wh/m}^3$
Humidity recovery rate
$\eta_x = -\%$

Heat pump's performance: ¹⁾

Heat Pump – space heating
7 kWh/(m ² a)
Heat Pump – Heating + DHW
15 kWh/(m ² a)
Cooling DRY
– kWh/(m ² a)
Cooling HUMID
– kWh/(m ² a)



CERTIFIED COMPONENT
Passive House Institute

www.passivehouse.com

Nilan A/S

Nilanvej 2, DK-8722 Hedensted, Denmark

☎ +45 76 75 25 00 | ✉ rbj@nilan.dk | 🌐 www.nilan.dk |

Ventilation performance for all three operational modes

	Heat recovery	Electric Efficiency [Wh/m ³]	Useful range of operation [m ³ /h]	Cert-ID
Nilan Compact P2 (2025) 139 m ³ /h	85%	0.21	70 ... 150	2421ch03
Nilan Compact P2 (2025) 276 m ³ /h	81%	0.24	120 ... 280	2422ch03
Nilan Compact P2 (2025) 398 m ³ /h	80%	0.39	180 ... 360	2423ch03

Heat pump performance

Space Heating and Domestic Hot Water (DHW) preparation

Mode No	Unit	Operation					External pressure Pa	Cert-ID
		Space air-heating kWh/(m ² a)	DHW kWh/(m ² a)	Total (SpH + DHW) kWh/(m ² a)	SPF	max. air flow m ³ /h		
1	139 m ³ /h	6.1	7.1	14.3	2.3	150	50	2421ch03
2	276 m ³ /h	6.2	6.1	14.2	2.4	280	50	2422ch03
3	398 m ³ /h	7.0	6.0	15.4	2.2	360	100	2423ch03

The listed final energy demand (electricity) for the HP system was derived from energy balance calculation of a reference building. For details see below, page 3.

The max. useful operational range with respect to air flow was derived from the pressure losses and external pressure capacity respectively, which the unit is able to deliver.

Cooling: the units operating in mode No 2 and 3 (279 and 398 m³/h) can provide about 1.5 to 2 kW air-cooling respectively. For mode No 1 no explicit measurements are available.

This cooling power helps to improve summer indoor comfort by reducing indoor temperatures in addition to passive cooling measures like shading and passive night cooling by cross ventilation.

		Operation				
		HUMID		DRY		Cert-ID
Mode No	Unit	kWh/(m²a)	m²	kW	m²	
1	139 m³/h	–	–	–	–	2421ch03
2	279 m³/h	–	–	1.6	–	2422ch03
3	398 m³/h	–	–	2.0	–	2423ch03

Appendix C – SAP summary results.

Block AB.

Table 18: SAP results summary - Block AB

Unit	Block	Dwelling Type Reference	GIA	Level	Multiplier	Total area	CO ₂ emissions			Primary Energy			Fabric energy efficiency			Overall compliance	SAP Rating	EPC Rating
							Target Emissions Rate (TER)	Dwelling Emission Rate (DER)	Variance	Target Primary Energy Rate (TPER)	Dwelling Primary Energy Rate (DPER)	Variance	Target Fabric Energy Efficiency (TFEE)	Dwelling Fabric Energy Efficiency (DFEE)	Variance			
-	-	-	m ²		-	m ²	kgCO ₂ /m ² /yr.	kgCO ₂ /m ² /yr.	%	kWh/m ² /yr	kWh/m ² /yr	%	kWh/m ² /yr	kWh/m ² /yr	%	-		-
Unit 1	Block AB	Unit 1-B-3BM	100.21	1	1	100.21	14.14	3.74	73.55%	76.82	39.22	48.95%	41.63	39.36	5.45%	YES	84	B
Unit 2	Block AB	Unit 2-B-1BL	55.44	1	13	720.72	13.8	4.01	70.94%	75.7	42.54	43.80%	27.22	28.02	-2.94%	NO	86	B
Unit 5	Block AB	Unit 5-A-2BM	70.05	20	9	630.45	13.16	3.66	72.19%	72.47	38.69	46.61%	29.09	28.41	2.34%	YES	86	B
Unit 6	Block AB	Unit 6-A-2BM	72.38	20	5	361.9	13.24	3.71	71.98%	72.66	39.12	46.16%	30.44	29.75	2.27%	YES	86	B
Unit 7	Block AB	Unit 7-A-2BM	70.05	12	11	770.55	13.07	3.64	72.15%	71.94	38.51	46.47%	28.64	28.13	1.78%	YES	86	B
Unit 8	Block AB	Unit 8-B-3BM	99.82	15	1	99.82	13.78	3.85	72.06%	74.91	40.34	46.15%	39.96	40.39	-1.08%	NO	83	B
Unit 9	Block AB	Unit 9-B-1BL	56.15	15	1	56.15	16.7	4.95	70.36%	91.3	51.99	43.06%	40.59	42.9	-5.69%	NO	83	B
Unit 10	Block AB	Unit 10-A-2BM	71.55	23	1	71.55	15.87	4.93	68.94%	87	51.42	40.90%	45.09	49.22	-9.16%	NO	81	B
Unit 11	Block AB	Unit 11-A-1BS	52.52	23	1	52.52	16.91	4.84	71.38%	93.08	51.09	45.11%	38.78	38.68	0.26%	YES	83	B
Unit 12	Block AB	Unit 12-A-1BS	52.52	12	22	1155.44	14.28	3.96	72.27%	78.93	42.11	46.65%	26.56	25.19	5.16%	YES	86	B
Unit 13	Block AB	Unit 13-AB-1BM	50.96	16	19	968.24	13.76	3.89	71.73%	75.99	41.44	45.47%	23.92	23.24	2.84%	YES	87	B
Unit 14	Block AB	Unit 14-AB-1BM	50.96	16	19	968.24	13.76	3.92	71.51%	75.99	41.7	45.12%	23.92	23.24	2.84%	YES	87	B
Block compliance					103	5955.79	13.77	3.88	71.80%	75.85	41.18	45.70%	27.49	26.96	1.93%	YES		

Block D.

Table 19: SAP results summary - Block D

Unit	Block	Dwelling Type Reference	GIA	Level	Multiplier	Total area	CO ₂ emissions			Primary Energy			Fabric energy efficiency			Overall compliance	SAP Rating	EPC Rating
							Target Emissions Rate (TER)	Dwelling Emission Rate (DER)	Variance	Target Primary Energy Rate (TPER)	Dwelling Primary Energy Rate (DPER)	Variance	Target Fabric Energy Efficiency (TFEE)	Dwelling Fabric Energy Efficiency (DFEE)	Variance			
-	-	-	m ²		-	m ²	kgCO ₂ /m ² /yr.	kgCO ₂ /m ² /yr.	%	kWh/m ² /yr	kWh/m ² /yr	%	kWh/m ² /yr	kWh/m ² /yr	%	-		-
Unit 3	Block D	Unit 3-D-3BM	101.61	1	1	101.61	13.55	3.58	73.58%	73.86	37.53	49.19%	38.87	37.95	2.37%	YES	84	B
Unit 4	Block D	Unit 4-D-2BL	76.83	16	17	1306.11	10.97	3.08	71.92%	60.35	32.78	45.68%	20.4	20.84	-2.16%	NO	87	B
Unit 15	Block D	Unit 15-D-1BL	55.78	16	17	948.26	14.42	4.04	71.98%	79.28	42.79	46.03%	29.72	28.8	3.10%	YES	86	B
Block compliance					35	2355.98	12.47	3.49	72.03%	68.55	37.01	46.01%	24.95	24.78	0.67%	YES		

Appendix D – ADL 2021 Part L2 results.

Amenity spaces – BRUKL.

BRUKL Output Document

 HM Government

Compliance with England Building Regulations Part L 2021

Project name

One Station Hill-Phase 3A (Amenity areas)

As designed

Date: Thu Feb 12 15:19:28 2026

Administrative information

Building Details

Address: Garrard Street, Reading, RG1 1NR

Certification tool

Calculation engine: Apache
Calculation engine version: 7.0.28
Interface to calculation engine: IES Virtual Environment
Interface to calculation engine version: 7.0.28
BRUKL compliance module version: v6.1.e.1

Certifier details

Name: Hoare Lea
Telephone number: +441454201020
Address: 155 Aztec West, Almondsbury, Bristol, BS32 4UB

Foundation area [m²]: 434.61

The CO₂ emission and primary energy rates of the building must not exceed the targets

Target CO ₂ emission rate (TER), kgCO ₂ /m²·annum	4.59
Building CO ₂ emission rate (BER), kgCO ₂ /m²·annum	4.45
Target primary energy rate (TPER), kWh _{tp} /m²·annum	50.1
Building primary energy rate (BPER), kWh _{tp} /m²·annum	48.59
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	0.23	1.4	BL000191:Surf[2]
Floors	0.18	0.1	0.1	LP000026:Surf[7]
Pitched roofs	0.16	-	-	No pitched roofs in building
Flat roofs	0.18	0.12	0.12	BL000113:Surf[0]
Windows** and roof windows	1.6	1.24	1.6	BL000249:Surf[0]
Rooflights***	2.2	-	-	No roof lights in building
Personnel doors^	1.6	1.6	1.6	BL000249:Surf[0]
Vehicle access & similar large doors	1.3	1.3	1.3	LP00002B:Surf[1]
High usage entrance doors	3	1.6	1.6	BL000184:Surf[2]

U_{a, Limit} = Limiting area-weighted average U-values [W/(m²·K)]
U_{a, Calc} = Calculated area-weighted average U-values [W/(m²·K)]
U_{i, Calc} = Calculated maximum individual element U-values [W/(m²·K)]
* 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/(m²·K)
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

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m²]	13387	13387
External area [m²]	9582.9	9582.9
Weather	SWI	SWI
Infiltration [m³/hm²@ 50Pa]	3	3
Average conductance [W/K]	2513.48	2506.76
Average U-value [W/m²K]	0.26	0.26
Alpha value* [%]	25.73	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
10	Offices and Workshop Businesses
	General Industrial and Special Industrial Groups
	Storage or Distribution
24	Hotels
	Residential Institutions: Hospitals and Care Homes
	Residential Institutions: Residential Schools
	Residential Institutions: Universities and Colleges
	Secure Residential Institutions
66	Residential Spaces
	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	1.08	0.68
Cooling	1.49	1.18
Auxiliary	2.03	2.33
Lighting	7.27	9.26
Hot water	21.66	20.58
Equipment*	55.48	55.48
TOTAL**	33.54	34.04

* 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	0.57	0.07
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
Displaced electricity	0.57	0.07

Energy & CO₂ Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m²]	26.19	26.47
Primary energy [kWh _{tp} /m²]	48.59	50.1
Total emissions [kg/m²]	4.45	4.59

Retail units – BRUKL.

BRUKL Output Document

 HM Government

Compliance with England Building Regulations Part L 2021

Project name

One Station Hill-Phase 3A (Retail units)As designed

Date: Mon Feb 09 09:52:47 2026

Administrative information

Building Details

Address: Garrard Street, Reading, RG1 1NR

Certification tool

Calculation engine: Apache
Calculation engine version: 7.0.28
Interface to calculation engine: IES Virtual Environment
Interface to calculation engine version: 7.0.28
BRUKL compliance module version: v6.1.e.1

Certifier details

Name: Hoare Lea
Telephone number: +441454201020
Address: 155 Aztec West, Almondsbury, Bristol, BS32 4UB

Foundation area [m²]: 373.73

The CO₂ emission and primary energy rates of the building must not exceed the targets

Target CO ₂ emission rate (TER), kgCO ₂ /m²annum	13.13
Building CO ₂ emission rate (BER), kgCO ₂ /m²annum	12.8
Target primary energy rate (TPER), kWh _{tp} /m²annum	143.09
Building primary energy rate (BPER), kWh _{tp} /m²annum	139.23
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 _{area-limit}	U _{area-Calc}	U _{area-Calc}	First surface with maximum value
Walls*	0.26	0.43	1.4	BL0001B8:Surf[2]
Floors	0.18	0.1	0.1	BL0001B8:Surf[0]
Pitched roofs	0.16	-	-	No pitched roofs in building
Flat roofs	0.18	0.12	0.12	BL00025D:Surf[1]
Windows** and roof windows	1.6	1.6	1.6	BL0001B8:Surf[9]
Rooflights***	2.2	-	-	No roof lights in building
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	1.6	1.6	BL0001B8:Surf[9]

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

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Technical Data Sheet (Actual vs. Notional Building)		
Building Global Parameters		Building Use
	Actual	Notional
Floor area [m²]	747.5	747.5
External area [m²]	1203.5	1203.5
Weather	SWI	SWI
Infiltration [m³/hm²@ 50Pa]	3	3
Average conductance [W/K]	709.6	508.85
Average U-value [W/m²K]	0.59	0.42
Alpha value* [%]	25	10
* Percentage of the building's average heat transfer coefficient which is due to thermal bridging		
% Area	Building Type	
	Retail/Financial and Professional Services	
100	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	
	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	11.99	5.16
Cooling	5.35	4.49
Auxiliary	20.71	20.62
Lighting	15.4	21.74
Hot water	40.79	44.97
Equipment*	115.13	115.13
TOTAL**	94.24	96.98
* 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	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
Displaced electricity	0	0

Energy & CO ₂ Emissions Summary		
	Actual	Notional
Heating + cooling demand [MJ/m²]	230.4	126.45
Primary energy [kWh _{eq} /m²]	139.23	143.09
Total emissions [kg/m²]	12.8	13.13

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Appendix E – Overheating model inputs and results.

Overheating inputs and assumptions.

Table 15: Overheating inputs and assumptions.

Overheating assessment inputs							
Blinds	No blinds modelled in line with Part O requirements.						
Occupancy	Bedrooms: 24/7 Living room/Kitchen: 9am-10pm						
Max. occupancy density	1 Bed – 2 People, 2 Bed – 4 People, 3 Bed – 5 People						
Internal gains	Unit		Value				
Occupancy heat gains (Sensible)	W/person		75				
Occupancy heat gains (Latent)	W/person		55				
Communal corridor internal gains	W/m ²		0 (based on Exhaust Air Heat Pumps (EAHPs) in individual dwellings)				
Lighting gains	W/m ²		2				
Max. equipment gains – kitchen & living	W		450 (as per CIBSE TM59)				
Max. equipment gains – bedroom	W		80 (as per CIBSE TM59)				

Cooling	Combined EAHP and MVHR unit with cooling module.	Combined unit with EAHP and MVHR with summer bypass to provide trim cooling. Boost ventilation rates and trim cooling are activated when the room temperature is above 22°C, cooling the supply air by 10°C.					
Mechanical Ventilation	Flow Rate (l/s)		Bedroom	Living Room	Kitchen	Living room/Kitchen	Dwelling Total
		1B2P	20	N/A	N/A	60	80
		2B4P	20	N/A	N/A	30	70
		2B4P	20	N/A	N/A	50	90
		3B6P	20	N/A	N/A	30	90
		3B6P	20	15	15	N/A	90
	Summer Bypass	Yes					
	Operation	Boosted vent rates when internal temperature exceeds 22°C					
Natural Ventilation - Windows	Opening degree	Windows assumed always closed					

Natural Ventilation – Internal doors within dwellings	Opening degree	90°					
	Opening Area %	90%					
	Opening Profile	Open 8am to 11pm					

Overheating results.

CIBSE TM59 Mechanically ventilated scenario results.

Table 20: CIBSE TM59-Mechanically ventilated scenario results summary

Mechanical Ventilation Scenario	Fixed Criterion	Criteria failing
Room	Hours of exceedance	
	Target: ≤3%	Compliance
Unit 01-L01-AB-3B6P-Double bedroom 01	0.3	Pass
Unit 01-L01-AB-3B6P-Double bedroom 02	0.4	Pass
Unit 01-L01-AB-3B6P-Double bedroom 03	0.3	Pass
Unit 01-L01-AB-3B6P-Kitchen	0.8	Pass
Unit 01-L01-AB-3B6P-Living room	0.7	Pass
Unit 02-L01-AB-1B2P-Double bedroom	0.3	Pass
Unit 02-L01-AB-1B2P-Living room/Kitchen	1.1	Pass
Unit 03-L01-D-3B6P-Double bedroom 01	0.6	Pass
Unit 03-L01-D-3B6P-Double bedroom 02	0.8	Pass
Unit 03-L01-D-3B6P-Double bedroom 03	0.9	Pass
Unit 03-L01-D-3B6P-Living room/Kitchen	1.6	Pass
Unit 04-L16-D-2B4P-Double bedroom 01	1.1	Pass
Unit 04-L16-D-2B4P-Double bedroom 02	0.9	Pass
Unit 04-L16-D-2B4P-Living room/Kitchen	1.1	Pass
Unit 05-L21-AB-2B4P-Double bedroom 01	0.9	Pass
Unit 05-L21-AB-2B4P-Double bedroom 02	1.1	Pass
Unit 05-L21-AB-2B4P-Living room/Kitchen	1.9	Pass
Unit 06-L21-AB-2B4P-Double Bedroom 01	2	Pass
Unit 06-L21-AB-2B4P-Double bedroom 02	1.5	Pass
Unit 06-L21-AB-2B4P-Living room/ Kitchen	2.6	Pass
Unit 07-L14-AB-2B4P-Double bedroom 01	1.6	Pass
Unit 07-L14-AB-2B4P-Double bedroom 02	1.7	Pass
Unit 07-L14-AB-2B4P-Living room/Kitchen	1.6	Pass
Unit 08-L15-AB-3B6P-Double bedroom 01	0.6	Pass
Unit 08-L15-AB-3B6P-Double bedroom 02	0.6	Pass
Unit 08-L15-AB-3B6P-Double bedroom 03	0.6	Pass
Unit 08-L15-AB-3B6P-Kitchen	1.4	Pass
Unit 08-L15-AB-3B6P-Living room	1.3	Pass
Unit 09-L15-AB-1B2P-Double bedroom	0.6	Pass
Unit 09-L15-AB-1B2P-Living room/Kitchen	1.9	Pass

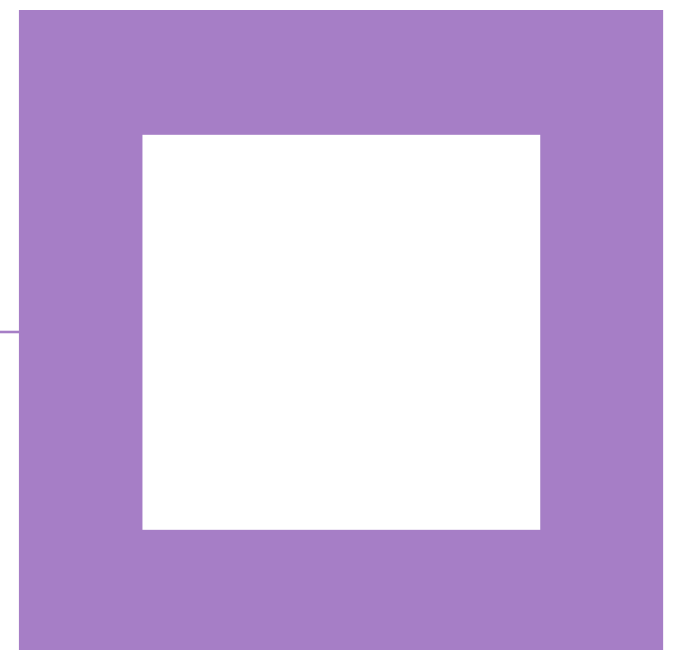


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Energy Statement