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**Energy Statement:
Condition 79a**

Peabody Trust, Catalyst by Design
and Hill Residential Limited

St Ann's Phase 1B/2

Final v4

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We are able to advise at all stages of projects from planning applications to handover.

Our emphasis is to provide innovative and cost effective solutions that respond to increasing demands for quality and construction efficiency.

This report has been prepared by Hodkinson Consultancy using all reasonable skill, care and diligence and using evidence supplied by the design team, client and where relevant through desktop research.

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Executive Summary

This energy statement has been prepared in support of the Reserved Matters Application (RMA) for St Ann's Phases 1B and 2, in the London Borough of Haringey. It addresses condition 79a of the masterplan consent (HGY2022/1833) and is presented in line with the London Plan Energy Hierarchy: Be Lean, Be Clean, Be Green, and Be Seen.

The application for Phases 1B and 2 proposes to deliver 464 homes and a small ground floor commercial unit. The overriding objective of the strategy proposed in this energy statement is to effectively balance the need to reduce CO₂ emissions (in accordance with condition 79a) alongside the affordability of heat, climate change adaption, and the provision of high-quality buildings.

Challenging CO₂ reduction requirements are set via condition 79a of the masterplan consent, in addition to the newer requirements set within the 2022 GLA Energy Assessment Guidance. The Phase 1B and 2 energy strategy addresses these whilst adhering to the site heat network connection principles set out in the masterplan energy strategy. Heat demands for all homes will be met almost entirely from air source heat pumps. No gas-fired heating is proposed to be installed. A summary of the proposed energy strategy is set out, below.

- > Energy demands are to be reduced substantially through fabric 'Be Lean' measures in order for the London Plan energy efficiency targets for both residential and commercial uses to be achieved. This includes the use of MVHR in all properties, low U-values and air tightness targets, and a bespoke approach to thermal bridging performance;
- > A holistic approach which balances further considerations such as daylighting, overheating, air quality and noise to ensure resident comfort. The requirements of the newly introduced Part O have been considered, with an accompany overheating report describing how the overheating strategy has been developed;
- > A balanced strategy for the generation and delivery of decentralised heating. The Developer is committed to the delivery of heat which is both low in CO₂ and reasonably priced. A strategy has therefore been proposed which both meets the ambition of a single site heating network, but also ensures 95% heat delivered is low carbon (and renewable) by using roof-mounted air source heat pumps. A small contribution (5%) is provided from electric boilers;
- > All available roofspace has been set aside for the application of photovoltaic (PV) panels. This represents 0.78kW/dwelling which is considered substantial for a development of this type and size.
- > Residual Regulated CO₂ emissions up to a 100% reduction are to be offset for the development to be zero carbon. The offsetting contribution has been calculated at £222,366.

The summary tables, below, outline the indicative Regulated, Unregulated and Total CO₂ savings at each stage of the hierarchy for Phases 1B and 2. The residential calculations have been presented both against a

Part L 2013 baseline (using SAP 10 emission factors) and a Part L 2021 baseline, to reflect the specific CO₂ targets set within condition 79a and the 2022 GLA Guidance, respectively.

Part L 2013 Calculations - Summary

Summary Table: Phases 1B & 2	
	Regulated CO ₂ (tonnes/yr)
Residential	
Baseline (TER)	443.2
Following <i>Be Lean</i> Measures	294.3
Following <i>Be Clean</i> Measures	166.6
Following <i>Be Green</i> Measures	95.3
% Improvement	79%

Part L 2021 Calculations - Summary

Summary Table: Phases 1B & 2			
	Regulated CO ₂ (tonnes/yr)	Unregulated CO ₂ (tonnes/yr)	Total CO ₂ (tonnes/yr)
Residential			
Baseline (TER)	379.1	147.1	526.1
Following <i>Be Lean</i> Measures	307.3	147.1	454.4
Following <i>Be Clean</i> Measures	70.7	147.1	217.7
Following <i>Be Green</i> Measures	77.8	147.1	224.9
% Improvement	79%	-	57%
Commercial Space			
Baseline (TER)	0.44	0.27	0.71
Following <i>Be Lean</i> Measures	0.36	0.27	0.63
Following <i>Be Clean</i> Measures	0.36	0.27	0.63
Following <i>Be Green</i> Measures	0.24	0.27	0.50
% Improvement	47%	-	29%

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1. INTRODUCTION

- 1.1** This Energy Statement has been prepared by Hodkinson Consultancy, a specialist energy and environmental consultancy for planning and development.
- 1.2** The document sets out the energy strategy on behalf of Peabody Trust, Catalyst by Design and Hill Residential Limited (the 'Developer') for Phases 1B and 2 of the St Ann's development, located in the London Borough of Haringey.
- 1.3** Phases 1B and 2 will provide 464 dwellings and a small commercial unit. The latter is expected to be delivered as a shell, with relevant assumptions made where appropriate in this energy strategy.
- 1.4** The site already benefits from an outline planning consent (HGY2022/1833) for Phases 1B and 2, with a masterplan Energy Statement prepared by XCO2 (V4, May 2022) which sets out the site-wide strategy. Condition 79 (part a) of this consent requires that an energy strategy is submitted with each reserved matters application (RMA) and that it achieves the following CO₂ reductions:
- > A minimum residential 26% reduction at the Be Lean stage (over Part L 2013)
 - > A minimum residential 76% reduction overall (over Part L 2013);
 - > Achieve a standard of zero-carbon, in accordance with planning policy.
- 1.5** Condition 79a also requires this Phase 1B and 2 energy strategy to align with the most up to date planning policy framework, which includes the 2022 GLA Energy Assessment Guidance. The full wording of Condition 79a and a summary of this 2022 guidance are set out in chapter three of this report.
- 1.6** The proposed energy strategy aligns with the following principles, set out in the masterplan Energy Statement:
- > Implementing Be Lean energy efficiency measures to reduce energy consumption, through improvements to building fabric performance and auxiliary systems;
 - > Connection of all apartments to the site heating network. A Phase 1B and 2 energy centre will be provided in block G, with 95% of annual heating demands supplied from roof-mounted air source heat pumps (ASHPs);
 - > Provision of photovoltaic (PV) panels across the application area, applied on appropriate roofspaces.
 - > Remaining regulated CO₂ emissions to be offset to achieve a standard of zero carbon.

- 1.7** Calculations have both been undertaken against a Part L 2013 baseline (using SAP 10 emission factors) and against a Part L 2021 baseline.
- 1.8** The energy strategy provides a route to compliance within the described framework. Any future adaptation, deviations, or alterations because of design developments will be expected to meet the overall objectives set within the framework addressed by this statement.
- 1.9** This statement has been developed with the knowledge that all buildings in Phases 1B and 2 are expected to be constructed under Part L 2021.

Aims

- 1.10** The aims of this energy strategy can be summarised as follows:
- > To provide comfortable high-quality homes that people aspire to live in;
 - > To be low carbon from the outset, with plans for further decarbonisation;
 - > To provide consistency with the wider development by connecting into the site heat network;
 - > To take account of specific site characteristics that link to the energy strategy, for instance acoustics and air quality;
 - > To supply a resilient supply of reasonably-priced heat to residents;
 - > To address the requirements of the outline planning consent and, as a far as practicable at this stage, relevant Building Regulations.

2. DEVELOPMENT OVERVIEW

- 2.1** The development site is located at St Ann's Hospital in the London Borough of Haringey. The location of Phases 1B and 2 is shown in red, in Figure 1 below.

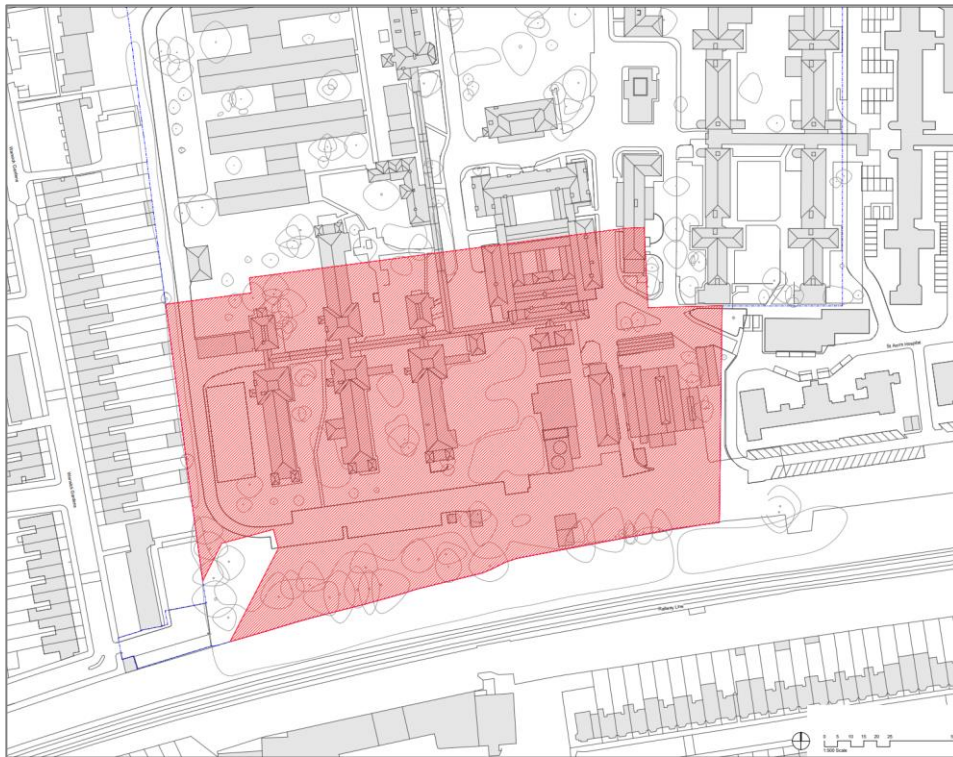


Figure 1: Site Location – Map data © 2023 Google

- 2.2** Phases 1B and 2 of the development, as proposed, are shown in Figure 2, below.



Figure 2: Proposed Site Layout – Lambert Smith Hampton (June 2023)

Planning History & Condition 79a

- 2.3 A hybrid planning consent was granted in 2022 for the site (HGY2022/1833). This consisted of detailed consent for Phase 1A and outline consent for Phases 1B, 2 and 3. This Phase 1B and 2 application represents the first RMA delivered in line with this outline consent.
- 2.4 Condition 79a of the decision notice relates to the energy strategy proposals for RMAs. Part b of condition 79 addresses post-completion requirements and is therefore not covered by this Energy Statement.
- 2.5 The Condition 79a wording is as follows:

'Prior to the commencement of above ground works to the relevant phase a Revised Energy Strategy for the relevant phase shall be submitted and approved in writing by the Local Planning Authority. This phase shall achieve the minimum requirements in line with the most up to date planning policy

framework at the time of submission and shall achieve no less than a reduction in carbon emissions of 76% (residential) compared to a Building Regulations Part L 2013 compliant building with SAP10 carbon factors, or higher where revised policy requirements are in place at the time of submission.

The strategy will set out:

- > Confirmation of how this phase will meet the zero-carbon policy requirement in line with the Energy Hierarchy;*
- > How the development aims to achieve minimum carbon reductions at the Be Lean Stage of 26% for the domestic new build;*
- > Strategy to reduce thermal bridging;*
- > Confirmation and details of how the proposed phase will form part of a sitewide network in future phases;*
- > The proposed heating, renewable energy and ventilation strategies (including their efficiency, output, location and pipework layout);*
- > A metering strategy.*

The final agreed energy strategy shall be installed and operation prior to the first occupation of the development. The development shall be carried out strictly in accordance with the details so approved and shall be operated and maintained as such thereafter. The solar PV array shall be also installed with monitoring equipment prior to completion and shall be maintained at least annually thereafter.'

2.6 The proposals for Phases 1B and 2 are described as follows:

'Application for the approval of reserved matters respect of appearance, landscaping, layout and scale relating to Phases 1b and 2 associated with the outline component of planning permission HGY/2022/1833 for "Outline planning permission (with all matters reserved except for access) for Phases 1B, 2 and 3, for: (a) the erection of new buildings for residential development (Use Class C3) and a flexible range of non-residential uses within Use Class E, F1/F2; (b) provision of associated pedestrian and cycle accesses; (c) landscaping including enhancements to the St Ann's Hospital Wood and Tottenham Railsides Site of Importance for Nature Conservation (SINC); and, (d) car and cycle parking spaces and servicing spaces.'

3. PHASE 1B/2 ENERGY REQUIREMENTS

3.1 The approved masterplan Energy Statement (XCO2, May 2022) set out a series of Be Lean, Be Clean, and Be Green measures. As required by Condition 79a of the consent, this RMA energy strategy will align with the masterplan Energy Statement in accordance with the following requirements:

- > Meeting a reduction of 26% beyond the Part L 2013 CO₂ baseline through energy efficiency measures alone for residential areas;
- > Connection to the ASHP-led site heat network, with an energy centre provided within the Phases 1B/2 application area. The consented energy strategy utilised three energy centres across the site;
- > Provision of solar PV panels across the site where appropriate roofspaces are located;
- > An overall reduction in Regulated CO₂ emissions of at least 76% over Part L 2013 for residential areas;
- > Provision of a zero carbon development through the aforementioned strategy and carbon offset payments (at £95/tonne) for 30 years.

3.2 Condition 79a also requires RMA energy strategies to achieve the requirements of the most up to date planning policy framework at the time of submission. The following documents informed the planning policy basis for the 2022 masterplan Energy Statement:

- > The London Plan (2021);
- > GLA Energy Assessment Guidance (2020);
- > Haringey Local Plan, Strategic Policies (2013);
- > Haringey Local Plan, Development Management DPD (2017).

3.3 The London Plan and aforementioned Haringey policy documents remain the most applicable to this RMA. A revised version of the GLA Energy Assessment Guidance was issued in 2022, with the requirements therefore being applicable to this Phase 1B and 2 RMA energy strategy. In addition to the existent requirements, these can be summarised as follows:

- > CO₂ reduction targets set within Policy SI2 of the London Plan are to be shown over a Part L 2021 baseline (10% & 15% reductions at Be Lean stage for residential and non-residential areas respectively, and a 35% reduction overall);
- > The Energy Use Intensity (EUI) and space heating demand of the application are to be reported;

- > A benchmark CO₂ reduction of 50%+ is also noted as being achievable for residential-led developments.

3.4 Separate reports on overheating risk and whole life-cycle carbon are submitted in support of this application. Where applicable, elements from these assessments will be noted in this report.

Summary of Requirements

3.5 To meet all the requirements of Condition 79a, this Energy Statement will show that the proposed Phase 1B and 2 energy strategy will:

- > Achieve a 26% reduction in CO₂ over Part L 2013, using SAP 10 emission factors, from Be Lean measures for residential areas;
- > Achieve a 10% reduction in CO₂ over Part L 2021 from Be Lean measures (15% for the commercial unit);
- > Achieve an overall 76% reduction in CO₂ over Part L 2013, using SAP 10 emission factors for the residential areas;
- > Achieve an overall 35% reduction in CO₂ over Part L 2021 (for both residential and commercial areas);
- > Offset any remaining CO₂ emissions up to a standard of zero carbon, using the offsetting methodology set out within the S106 (£95/tonne for 30 years).

3.6 Separately, the commercial space will need to meet the minimum energy requirements for an 'Excellent' rating under BREEAM 2018.

4. METHODOLOGY AND BASELINE

Energy hierarchy

4.1 The energy hierarchy will be followed by:

- > Considering energy efficiency, Be Lean, measures to help deliver low energy usage and manage overheating risk following the GLA's cooling hierarchy;
- > Applying the heating infrastructure hierarchy, Be Clean, to exploit local energy resources;
- > Considering renewables, Be Green, energy generation technologies to offset energy use onsite;

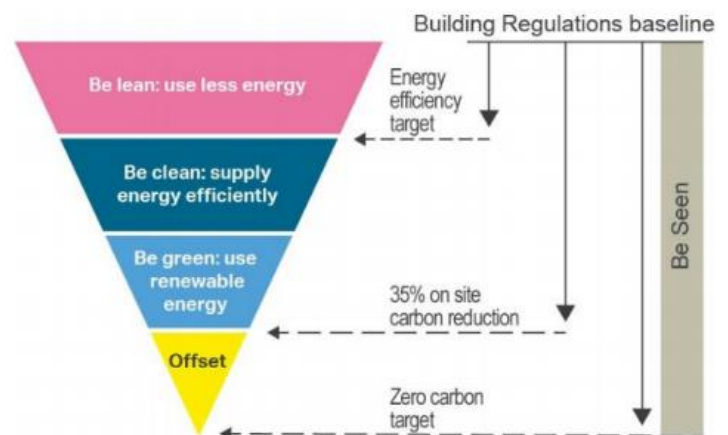


Figure 3: 2021 London Plan Energy Hierarchy (GLA)

- > Offsetting any remaining regulated CO₂ emissions to net zero carbon emissions through a cash in lieu contribution or relevant alternative proposal;
- > Confirming an ability to measure, monitor and verify energy performance for Be Seen.

4.2 This report first establishes a baseline assessment of the energy demands and associated CO₂ emissions based on Part L (2013) of the Building Regulations. The Part L (2013) baseline has been reported to align with CO₂ reductions required under condition 79a. This baseline, like the performance of the proposed energy strategy at various stages of the energy hierarchy, has been recalculated in line with SAP 10 emission factors.

4.3 The Be Lean and Be Green results are also displayed against the Part L 2021 baseline, in order to demonstrate compliance with the requirements of the 2022 GLA Energy Assessment Guidance.

Residential

4.4 The estimated annual energy demand for the residential portion of the development has been calculated using Standard Assessment Procedure (SAP) methodology. SAP calculates the Regulated energy demands associated with hot water, space heating and fixed electrical items.

4.5 SAP calculations have been carried out for representative home types. These encompass houses and exposed floor, mid floor, top floor and corner flats, at different orientations, and therefore represent a fair aggregation of the unit mix of the site.

- 4.6** To provide energy demands across the entirety of Phases 1 and 2, the accommodation schedule has been used to extrapolate the energy performance across the whole application area.
- 4.7** The unregulated energy demands, discussed further in *Be Seen*, for the residential units have been calculated using the methodology outlined in the SAP 10.2 document. This calculates the CO₂ emissions associated with appliances and cooking and are calculated using the BRE methodology.

Non-domestic

- 4.8** The estimated energy demand for the commercial unit has been calculated using Simplified Building Energy Model (SBEM) software, using the National Calculation Method (NCM 2021 Edition). SBEM calculates the Regulated energy demands associated with hot water, space heating and fixed electrical items, as well as unregulated energy demands. Operational unregulated energy demands associated with non-residential items outside of the commercial space (i.e. electric vehicle charging, external lighting, corridors, and lifts) are accounted for separately. They are presented as the landlord's energy demands at the *Be Seen* stage, in line with the London Plan Energy Hierarchy.
- 4.9** A sample SBEM calculation has been carried out on the commercial unit. The sample calculation has been extrapolated to gain energy demand estimates representative of the total area to be provided.
- 4.10** As stated earlier the commercial unit is expected to be delivered as a shell and as such suitable assumptions to achieve the planning targets have been applied for the purposes of this statement. The services would not be provided by the developer but designed for, should they be installed by tenants.

Baseline Emissions

- 4.11** Part L 2013 (using SAP 10 emission factors) and Part L 2021 baseline calculations have been carried out to establish the Regulated CO₂ emissions by which this energy strategy will be compared against.
- 4.12** The Part L 2013 calculations were undertaken using SAP 2012 software, with TER/DER outputs then amended to represent SAP 10 emission factors. The Part L 2021 calculation were undertaken using SAP 10.2 software.
- 4.13** The tables below show the Regulated, Unregulated and Total baseline CO₂ emissions rates for Phases 1 and 2.

Table 1: TER Baseline Case – Part L 2013

Part L 2013 Baseline CO ₂ emissions (kg CO ₂ per annum)	
	Regulated CO ₂ (tonnes/yr)
Residential	
Baseline (TER)	443.2

Table 2: TER Baseline Case – Part L 2021

Part L 2021 Baseline CO ₂ emissions (kg CO ₂ per annum)			
	Regulated CO ₂ (tonnes/yr)	Unregulated CO ₂ (tonnes/yr)	Total CO ₂ (tonnes/yr)
Residential			
Baseline (TER)	379.1	147.1	526.1
Non-Residential			
Baseline (TER)	0.44	0.27	0.71

5. BE LEAN: DEMAND REDUCTION

- 5.1 This section describes how the development has been designed to achieve the *Be Lean* requirements of condition 79a and the 2022 GLA Energy Assessment Guidance. The indicative specifications presented in this chapter present a route of achieving these requirements.
- 5.2 Throughout the design process, the developer has considered building form and massing, and what impacts these have on energy use, daylighting and overheating. The objective of this consideration is to carefully balance these sometimes-opposing objectives.

Residential

Insulation Standards

- 5.3 All dwellings will incorporate enhanced insulation in the building envelope (walls, roofs, floors and glazing) to achieve U-values which may be similar to the following:
- > Glazing with a U-value of 0.80 W/m².K ;

- > External wall U-value of 0.18 W/m².K;
- > Corridor assumed to be unheated. A corridor wall U-value of 0.20 W/m².K has been used in the Energy Statement calculations;
- > Party walls will be fully insulated and sealed (achieving an effective U-Value of 0.00 W/m².K);
- > Exposed/ground floor U-values of 0.13 W/m².K;
- > A main roof U-value of 0.10 W/m².K.

Air Tightness & Ventilation

5.4 Air tightness standards will conform to, and exceed, Approved Document Part L requirements. By reducing air leakage loss and convective bypass of insulation, an improvement of design air permeability rate from 8 m³/h.m² to 3.0 m³/h.m² or less (for houses) or 2.5 m³/h.m² (for flats) will further reduce space heating requirements.

5.5 Mechanical Ventilation Heat Recovery (MVHR) is expected to be installed in all dwellings. These systems will remove stale air and odours from kitchens and wet rooms, whilst retaining the heat within the home, as shown in the figure below. In this way substantial energy savings will be made.

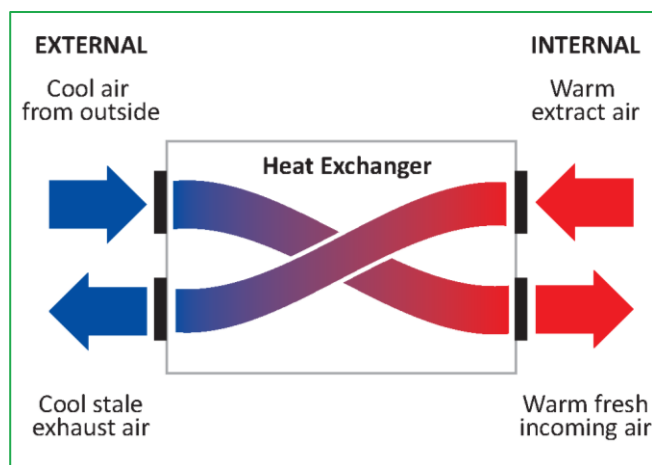


Figure 4: MVHR in operation

5.6 The overheating analysis, detailed within the accompanying overheating report, proposes the use of MVHR units which are compatible with peak lopping systems for those dwellings most affected by external noise. This pertains to roughly one fifth of Phase 1B and 2 dwellings. The highest efficiency MVHR units (in terms of heat recovery and specific fan power) currently available are not compatible

with these systems. As such, two performance standards have been targeted for MVHR performance in this energy strategy. These are shown in the table, below.

Table 3: MVHR Performance

MVHR Performance – Phase 1B and 2 Dwellings		
	Noise-Affected Dwellings	All Other Dwellings
Dwellings with 1 wet room + kitchen	SFP – 0.68 W/l/s Heat Recovery – 87%	SFP – 0.61 W/l/s Heat Recovery – 93%
Dwellings with 2 wet rooms + kitchen	SFP – 0.85 W/l/s Heat Recovery – 86%	SFP – 0.66 W/l/s Heat Recovery – 93%

- 5.7** Additionally, all homes will have openable windows and therefore the ability to naturally ventilate should the occupant desire.

Thermal Bridging

- 5.8** In well insulated buildings, as much as 30% of heat loss can occur through thermal bridges, which occur when highly conductive elements (e.g. metal studs) in the wall construction enable a low resistance escape route for heat. The Developer is committed to delivering a development which prioritises the conservation of energy through lean design, and has therefore placed particular importance on the development of construction details which minimise the effect of thermal bridges. The figure below illustrates the benefits of reducing thermal bridges.

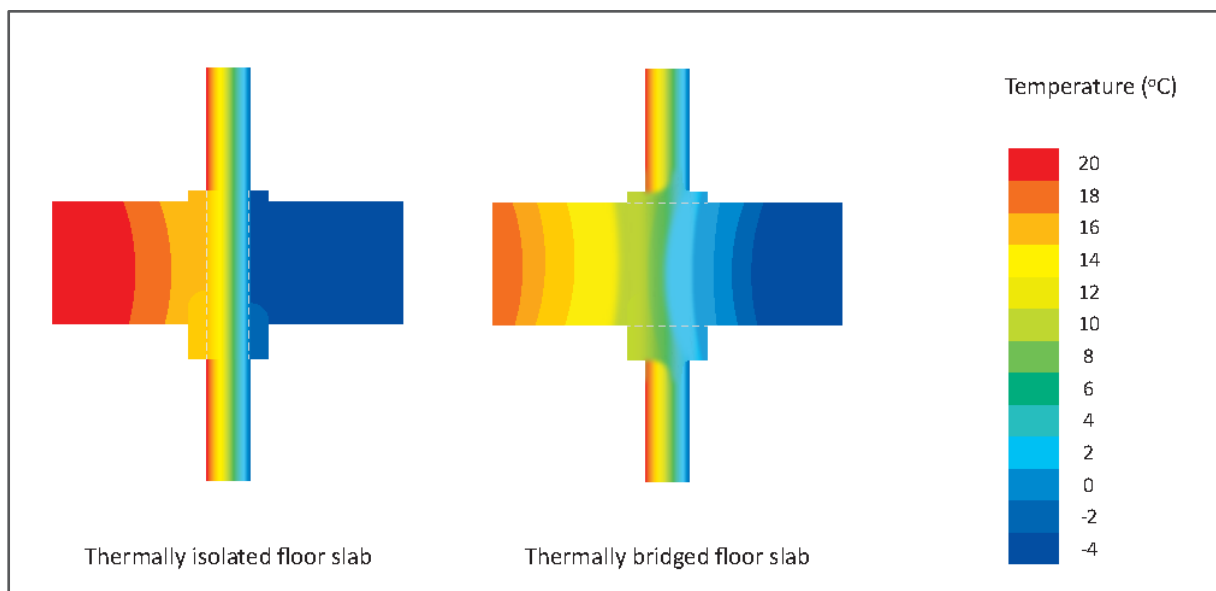


Figure 5: Thermal Bridging

- 5.9** Detailed modelling of all major junctions will be undertaken at design stage. The results of initial assessments will be used to inform the design process and further modelling will continue to take place until the required performance is met.
- 5.10** The targets set at this stage have been based on initial analysis of details under development for Phase 1A, as well as results from similar projects Hodkinson Consultancy have worked on. This results in an equivalent average Y-value of 0.15 W/mK.

Space Heating & Hot Water

- 5.11** The space heating requirement will be reduced by the fabric, air tightness and ventilation measures detailed above. Heating and hot water will be delivered to each apartment via connection to the proposed St Anns's site heat network.
- 5.12** In line with the 2020 GLA Energy Assessment Guidance, the improvement of the Be Lean case over the baseline under Part L 2013 has been formulated using a 100% contribution to heat demand from communal gas boilers. An efficiency of 95% has been used and a Heat Loss Factor of 1.05 (in line with SAP 2012 methodology and the consented masterplan energy strategy). Characteristics associated with the actual planned heat network will be incorporated at the Be Clean stage.
- 5.13** The Be Lean calculation methodology in the 2022 GLA Guidance requires the Part L 2021 baseline to be based on individual gas boilers (as per the Part L 2021 notional building). This method has been followed for demonstrating compliance with the 2022 GLA Guidance requirements.
- 5.14** The houses will be heated by individual ASHPs, in line with the consented energy strategy. These have been reflected in the Be Green stage calculations. Insulated hot water cylinders will also be provided in these homes.

Lighting & Appliances

- 5.15** Energy efficient lighting will be installed in 100% of internal fittings in the homes. A targeted efficiency of 80 lm/W has been assumed in the SAP calculations.
- 5.16** It is very difficult to design and construct homes to reduce the unregulated electricity demands, because this is almost entirely dependent on the occupant of a home and can vary substantially. However, the Developer is committed to ensuring that all efforts are made to enable the residents to minimise their unregulated electricity consumption.

Limiting the Risk of Summer Overheating

- 5.17** Minimising the risk of summer overheating is important to ensure that homes are adapted to climate change and remain comfortable to occupy. An overheating report has also been provided as part of this application, summarising the methods and central aims of the overheating mitigation strategy.
- 5.18** The Developer has adopted a holistic approach to the development of the energy strategy presented in this report. It is recognised that the varying implications of energy, overheating, daylighting, and noise cannot be considered only in isolation. It is a key aim to develop a strategy which ensures one of these elements does not get prioritised at the expense of another.
- 5.19** Detailed dynamic overheating modelling has been undertaken on Phases 1B and 2 with results and detailed mitigation strategies presented in the accompanying overheating report. As a summary, the strategies are as follows:
- > Solar control glazing (low g-value) to reduce uncomfortable solar heat gains across all blocks. A g-value of 0.42 has been used for South, East and West facades, with a value of 0.50 being used for North facades. This represents a reasonable balance between passive solar gains in winter months and reduced solar filtration in summer months;
 - > Shading to a significant proportion of the windows from the presence of balconies on the above homes. The balconies will provide solar shading during the summer months when the sun is high in the sky, but allow the beneficial winter solar gains when the sun is lower in the sky;
 - > MVHR in all dwellings to assist in background ventilation. Noise-affected dwellings may be provided with peak topping systems to temper incoming air during especially hot periods;
 - > Openable windows to allow for purging of internal heat.

Commercial Unit

- 5.20** The commercial unit is to be provided as a shell for future fit-out. The specification for the space has therefore assumed that the tenant will be responsible for fit out and how it is used. This impacts all services and the consideration of overheating.
- 5.21** The unit will need to achieve the required energy credits for a BREEAM 'Excellent' (2018) rating. This has been factored into the indicative specification, below.

Insulation Standards

- 5.22** The following fabric specification has been assumed:
- > Glazing (assumed to be curtain walling) with a U-value of 1.00 W/m².K;

- > Louvre panels with a U-value of $0.25 \text{ W/m}^2\cdot\text{K}$;
- > External wall U-value of $0.18 \text{ W/m}^2\cdot\text{K}$;
- > Ground floor U-value of $0.09 \text{ W/m}^2\cdot\text{K}$.

Ventilation & Air Permeability

- 5.23** It is expected that MVHR will be utilised to maximise space heating savings. For this report it has been assumed to achieve a Specific Fan Power of $\leq 1.2 \text{ W/l/s}$ and a heat recovery efficiency of 85%. The system will utilise variable speed control, CO_2 sensors, and summer bypass.
- 5.24** Air leakage is to be minimised and an air permeability of below $3.0 \text{ m}^3/\text{hr/m}^2$ will be targeted.

Limiting the Risk of Summer Overheating

- 5.25** The design limits solar gains in line with Part L requirements. Solar control glazing with a g value of 0.25 has been used in this energy strategy, however this may be revisited post-planning.

Lighting

- 5.26** One of the major energy demands within commercial spaces is likely to be lighting. Specified lighting throughout these areas is therefore assumed to be LEDs and designed to CIBSE Illuminance levels. Demand reducing lighting controls, occupancy sensors and daylight dimmers will also be specified where appropriate, allowing light output to be automatically adjusted to suit prevailing conditions. Zoning of lighting circuits also allows greater benefit to be made of natural daylight in the areas where it is available, without compromising light levels further away from windows.
- 5.27** A target LED lamp efficacy of 110 lm/W and a light output ratio of 1 have been assumed in these calculations.

Heating and Cooling

- 5.28** The consented energy strategy does not require the commercial space to connect to the site network. It has therefore been proposed that individual ASHPs will provide space heating and cooling to this space.
- 5.29** In line with GLA guidance, a space heating COP of 2.86 has been used at the Be Lean stage. An enhanced COP will be reflected in the Be Green calculations. Cooling is proposed to be delivered from the same system, with an Energy Efficiency Ratio (EER) of 4.0 assumed.

- 5.30 The hot water demand to the unit is anticipated to be low, therefore this may be delivered instantaneously from an electric water heater.

CO₂ Emissions at Be Lean Stage

- 5.31 The tables below show the indicative CO₂ emissions if the aforementioned energy efficiency measures were adopted.

Part L 2013 Baseline – Condition 79a

Table 4: Regulated emissions following Be Lean measures – Part L 2013 Baseline

Phases 1B & 2 – Part L 2013 (SAP 10 Emission Factors)	
	Regulated CO ₂ (tonnes/yr)
Residential	
Baseline (TER)	443.2
Following <i>Be Lean</i> Measures	294.3
% Improvement	34%

Part L 2021 Baseline – 2022 GLA Guidance

Table 5: Regulated and Total emissions following Be Lean measures – Part L 2021 Baseline

Phases 1B & 2 – Part L 2021			
	Regulated CO ₂ (tonnes/yr)	Unregulated CO ₂ (tonnes/yr)	Total CO ₂ (tonnes/yr)
Residential			
Baseline (TER)	379.1	147.1	526.1
Following <i>Be Lean</i> Measures	307.3	147.1	454.4
% Improvement	19%	-	14%
Commercial Space			
Baseline (TER)	0.44	0.27	0.71
Following <i>Be Lean</i> Measures	0.36	0.27	0.63
% Improvement	19%	-	12%

- 5.32 The above tables show that the following requirements are achieved:

- > A 26% reduction in CO₂ over Part L 2013, using SAP 10 emission factors, from Be Lean measures for residential areas;

- > A 10% reduction in CO₂ over Part L 2021 from Be Lean measures for residential areas;
- > A 15% reduction in CO₂ over Part L 2021 from Be Lean measures for the commercial space.

5.33 Further calculations including Dwelling Emission Rate (DER) worksheets on representative dwelling types can be seen in Appendices A, B, and C. BRUKL worksheets for the non-residential space are provided in Appendix C.

6. BE CLEAN: HEATING INFRASTRUCTURE

- 6.1** In line with the outline planning consent the application of heat networks as a Be Clean measure has been evaluated.
- 6.2** Returning to the aims of energy strategy as set out in the introduction, the following key points can be extracted in relation to the supply of heat for Phases 1B and 2:
- > To be low carbon from the outset, with a trajectory of further decarbonisation;
 - > Provision of a resilient supply of low-cost heat to residents;
 - > To address the requirements of the existing consent and consider any Building Regulations impacts.
- 6.3** The development of the proposed strategy for the generation and delivery of heat has kept these three aims central.

Masterplan Heating Strategy

- 6.4** A site heat network for St Ann's was committed to within the masterplan Energy Statement (XCO2, May 2022), with all phases connecting. In line with this commitment, Phases 1B and 2 will connect to this network. An indicative primary pipe route for the site network has been provided in Appendix F.
- 6.5** The masterplan energy strategy concluded that due to the phasing of land ownership and availability, a single centralised energy centre would not be compatible with the site heat network. Because of this, three energy centres (for Phase 1A, 1B/2, and 3) were planned for the network. This Phase 1B and 2 energy strategy will therefore include the provision of an energy centre to meet the Phase 1B and 2 heat demands. It should be noted that Phases 1B and 2 are not yet under the ownership of the applicant.
- 6.6** The masterplan energy strategy also reviewed the potential for the site to connect to an external heat network (also known as District Energy Network, or DEN). The most promising was identified to be the planned network originating from the Energy from Waste (EfW) facility at Edmonton EcoPark, however the current programme for extension does not guarantee a supply of heat in time for Phase 1B and 2. Therefore, as per the Phase 1A strategy set out through the masterplan energy strategy, space will be set aside within the Phase 1B and 2 energy centre to ensure a future connection is not prohibited.
- 6.7** The S106 document under the masterplan consent provides further information on the timelines and requirements of the feasibility study for a future DEN connection.

Network Parameters

- 6.8** As set out in the masterplan Energy Statement, the site heat network will generate heat from the following sources:
- > ASHPs – 95% of heat demand (primary source);
 - > Electric boilers – 5% of heat demand.
- 6.9** The Phase 1B and 2 energy centre will be located within block G, with ASHPs located on the roof. The ASHPs and boilers installed in block G will meet the heating demand requirements for the full RMA application area. A proposed roof plan and energy centre layout is shown in Appendix G.
- 6.10** A Seasonal Coefficient of Performance (SCOP) of 3.23 for the heat pumps has been assumed in the Energy Statement calculations, which aligns with the propane-based heat pumps such as the Thermonova models which are currently under consideration.
- 6.11** All Phase 1B and 2 apartments are to be connected to the site network via heat interface units (HIUs).
- 6.12** No further hydraulic separation is currently planned for the network, other than the HIUs. Network losses are being addressed by the design team, with principles set out from CIBSE CP1 adhered to.
- 6.13** A distribution loss factor of 1.05 has been used in the SAP calculations (as per SAP 2012 default allowances). Whilst it is understood that this may underestimate actual network losses, even with an excellent design adhered to, this factor has been used to be consistent with the masterplan energy calculations. The design team are therefore working to establish a heat loss target which suits the design better.
- 6.14** With the electricity grid projected to continue to decarbonise into the 2020s and 2030s, the heat pumps will ensure the site continues to improve its carbon performance even after occupation.
- 6.15** Precise details of the operational model for the heat network have still to be finalised. However, it is anticipated that specialists will be contracted to maximise the quality of the heating service to residents and minimise heat costs.

CO₂ Emissions at Be Clean Stage

6.16 The tables below show that the reductions at the Be Clean stage. DER worksheets are shown in Appendix D.

Table 6: Be Clean Emissions – Part L 2013 Baseline

Phases 1B & 2 (using SAP 10 Emission Factors)	
	Regulated CO ₂ (tonnes/yr)
Residential	
Baseline (TER)	443.2
Following <i>Be Lean</i> Measures	294.3
Following <i>Be Clean</i> Measures	166.6
% Improvement	62%

Table 7: Be Clean Emissions – Part L 2021 Baseline

Phases 1B & 2			
	Regulated CO ₂ (tonnes/yr)	Unregulated CO ₂ (tonnes/yr)	Total CO ₂ (tonnes/yr)
Residential			
Baseline (TER)	379.1	147.1	526.1
Following <i>Be Lean</i> Measures	307.3	147.1	454.4
Following <i>Be Clean</i> Measures	70.7	147.1	217.7
% Improvement	81%	-	59%
Commercial Space			
Baseline (TER)	0.44	0.27	0.71
Following <i>Be Lean</i> Measures	0.36	0.27	0.63
Following <i>Be Clean</i> Measures	0.36	0.27	0.63
% Improvement	19%	-	12%

Table 8: EUI and Space Heating Demand

Building Use	Energy Use Intensity (kWh/m ² /year)	Space Heating (kWh/m ² /year)	Methodology Used
Residential Total	41.53	11.67	SAP 10.2 Methodology
Non-residential	46.55	3.62	SBEM Methodology

7. BE GREEN: RENEWABLE ENERGY TECHNOLOGIES

- 7.1 The final part of the Energy Hierarchy is Be Green which seeks for renewable energy technologies to be specified to provide, where feasible, a further reduction in expected CO₂ emissions.
- 7.2 Connection to the site heat network have been specified in Section 6 as a Be Clean measure. Heat pumps have already been provided as the lead heat source for the heat network, therefore the energy strategy has already demonstrated a significant commitment to the inclusion of low carbon technologies.

Solar Thermal Panels

- 7.3 Solar thermal panels generate heat for hot water. They would therefore conflict with the heat network and would not enable any substantial further reductions in CO₂ emissions.

Wind Turbines

- 7.4 Small rooftop wind turbines are designed to generate electricity from the wind for use within each dwelling. However, urban rooftop wind turbines do not generally perform sufficiently well to warrant their installation, due to the low and turbulent wind conditions present.

ASHPs

- 7.5 Individual ASHPs are expected to be used for the commercial unit and houses. For the Be Green calculations, a proposed space heating COP of 4.3 has been used for the commercial unit. The houses have utilised a space heating COP of 3.6.

Photovoltaic (PV) Panels

- 7.6 Unlike solar thermal panels, solar PV panels are not constrained by the presence of a site heat network. The Developer has thus assessed the appropriateness of the Phase 1B and 2 roof spaces to determine where PV panels can be accommodated.
- 7.7 It has been calculated that a total of 362.8kWp of installed capacity could be accommodated across the Phase 1B and 2 roof spaces. This has an estimated annual output of 309,655 kWh.
- 7.8 361.2 kWp will be allocated to the residential units, with 1.6 kWp allocated for the commercial unit. Panels are to be positioned at an angle of 5-10 degrees towards a southerly direction. An indicative roof plan showing the locations of PV panels has been provided in Appendix H.

CO₂ Emissions at Be Green Stage

7.9 The tables below show the Regulated, Unregulated and Total CO₂ emissions following the aforementioned Be Green measures. Worksheets and BRUKL outputs are shown in Appendix E.

Part L 2013 Baseline – Condition 79a

Table 9: *Be Green Emissions: Part L 2013 Baseline*

Summary Table: Phases 1B & 2	
	Regulated CO ₂ (tonnes/yr)
Residential	
Baseline (TER)	443.2
Following <i>Be Lean</i> Measures	294.3
Following <i>Be Clean</i> Measures	166.6
Following <i>Be Green</i> Measures	95.3
% Improvement	79%

Part L 2021 Baseline – 2022 GLA Guidance

Table 10: *Be Green Emissions: Part L 2021 Baseline*

Phases 1B & 2			
	Regulated CO ₂ (tonnes/yr)	Unregulated CO ₂ (tonnes/yr)	Total CO ₂ (tonnes/yr)
Residential			
Baseline (TER)	379.1	147.1	526.1
Following <i>Be Lean</i> Measures	307.3	147.1	454.4
Following <i>Be Clean</i> Measures	70.7	147.1	217.7
Following <i>Be Green</i> Measures	77.8	147.1	224.9
% Improvement	79%	-	57%
Commercial Space			
Baseline (TER)	0.44	0.27	0.71
Following <i>Be Lean</i> Measures	0.36	0.27	0.63
Following <i>Be Clean</i> Measures	0.36	0.27	0.63
Following <i>Be Green</i> Measures	0.24	0.27	0.50
% Improvement	47%	-	29%

7.10 The above tables show that the following requirements are achieved:

- > A 76% reduction in CO₂ over Part L 2013, using SAP 10 emission factors, for residential areas;
- > A 35% reduction in CO₂ over Part L 2021 for residential areas;
- > A 35% reduction in CO₂ over Part L 2021 for the commercial space.

8. BE SEEN

- 8.1** The London Plan introduces a fourth stage to the energy hierarchy; the Be Seen stage, which proposes monitoring and reporting of the actual operational energy performance of major developments for at least five years.
- 8.2** An effectively implemented post-construction monitoring regime can have several benefits including environmental (e.g. reduced grid infrastructure strain, carbon emissions reduction) and socio-economic (e.g. reduced occupants bills and raised awareness around energy use).
- 8.3** The Be Seen stage aims to monitor the actual energy and carbon performance of buildings and compare with the estimated figures put forward at both planning and as-built stages. This will assist with achieving a zero-carbon London and determining the effectiveness of the incumbent policies.
- 8.4** The figure below outlines the three stages for submission of information, and who is responsible for compiling all necessary outputs.

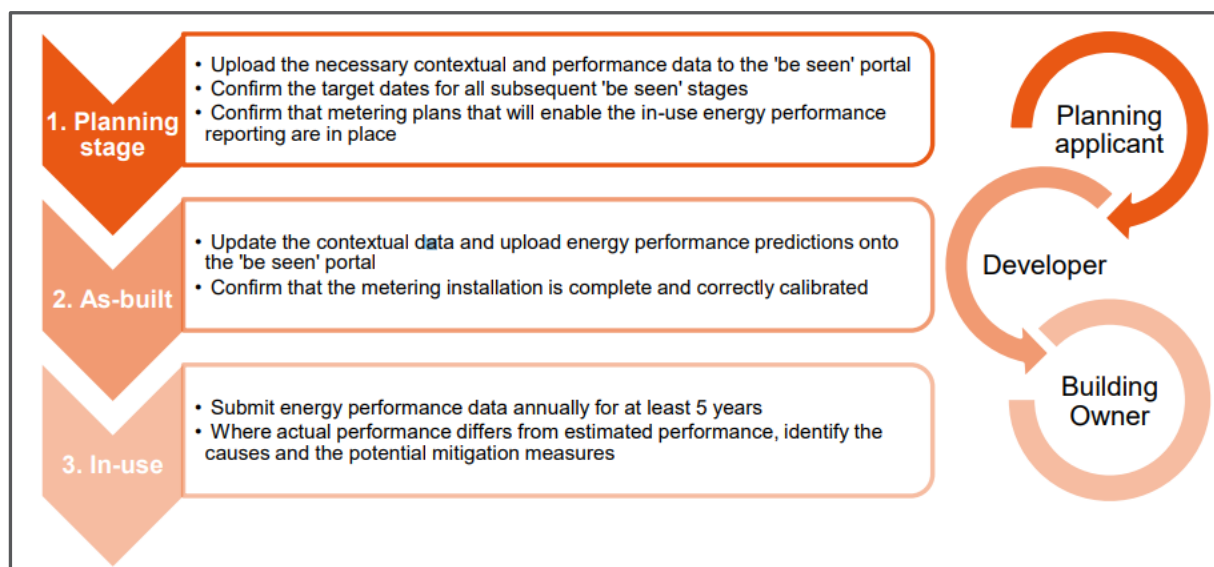


Figure 6: Be Seen Stages

- 8.5** In line with the 'Be Seen' guidance document (2021), the following data points are to be monitored:
- > Electricity consumption for dwellings (this encapsulates all energy used);
 - > Heat consumption from the communal heating network from Phase 1 and 2 dwellings;
 - > Electricity consumption for the commercial unit;

- > Electricity consumption for common areas;
 - > Generation from PV panels.
- 8.6** The metering and controls strategy will be further developed during the detailed design process. CO₂ emissions associated with these energy uses will also be accounted for.
- 8.7** A reduction in unregulated demands will also be encouraged. More information on e.g. supply of white goods can be found in the sustainability statement.
- 8.8** A Be Seen submission for Phases 1 and 2 will also be made via the GLA portal.
- 8.9** Due to the size of the commercial space and the fact it is shell-only at this stage, TM54 modelling has not been undertaken. SBEM modelling has been used for the commercial space energy calculations.
- 8.10** The principles of the TM54 methodology have been applied to determine non-residential ancillary energy demands for electric vehicle charging, external lighting, corridors, and lifts. As these energy demands are neither associated with the residential units or commercial space, they are categorised separately as landlord's unregulated energy demand. In line with the energy hierarchy, these ancillary energy demands are presented separately in the Be Seen stage. Table 8 below shows the residential, non-residential and landlord's unregulated energy demands.

Table 11: Unregulated Energy Demands

Unregulated Energy Demands (kWh/yr)	
Residential	1,081,496
Non-Residential	1,965
Landlord's	335,407
Total	1,418,868

9. ZERO CARBON

9.1 The development is required to be zero carbon, with a minimum 76% reduction in Regulated CO₂ beyond Part L 2013 delivered from on-site measures. Any residual CO₂ emissions are subject to an off-setting contribution, set at £95/tonne for a period of 30 years (as defined in S106 for the outline consent).

Phase 1B and 2 Offsetting Calculation

9.2 The table below shows the calculated carbon offsetting cost to the application, should the aforementioned Be Lean, Be Clean, and Be Green measures be adopted.

Table 12: Offset Calculation

Carbon Offset Payment		
	Residual CO ₂ (Tonnes)	Offset Payment (£95/tonne/30yrs)
Residential	77.8	£221,691
Commercial	0.24	£675
Total	78.02	£222,366

10.SUMMARY

- 10.1** This energy statement has been prepared in support of the Reserved Matters Application (RMA) for St Ann's Phases 1B and 2, in the London Borough of Haringey. It addresses condition 79a of the masterplan consent (HGY2022/1833) and is presented in line with the London Plan Energy Hierarchy: Be Lean, Be Clean, Be Green, and Be Seen.
- 10.2** The application for Phases 1B and 2 proposes to deliver 464 homes and a small ground floor commercial unit. The overriding objective of the strategy proposed in this energy statement is to effectively balance the need to reduce CO₂ emissions (in accordance with condition 79a) alongside the affordability of heat, climate change adaption, and the provision of high-quality buildings.
- 10.3** Challenging CO₂ reduction requirements are set via condition 79a of the masterplan consent, in addition to the newer requirements set within the 2022 GLA Energy Assessment Guidance. The Phase 1B and 2 energy strategy addresses these whilst adhering to the site heat network connection principles set out in the masterplan energy strategy. Heat demands for all homes will be met almost entirely from air source heat pumps. No gas-fired heating is proposed to be installed. A summary of the proposed energy strategy is set out, below.
- > Energy demands are to be reduced substantially through fabric 'Be Lean' measures in order for the London Plan energy efficiency targets for both residential and commercial uses to be achieved. This includes the use of MVHR in all properties, low U-values and air tightness targets, and a bespoke approach to thermal bridging performance;
 - > A holistic approach which balances further considerations such as daylighting, overheating, air quality and noise to ensure resident comfort. The requirements of the newly introduced Part O have been considered, with an accompany overheating report describing how the overheating strategy has been developed;
 - > A balanced strategy for the generation and delivery of decentralised heating. The Developer is committed to the delivery of heat which is both low in CO₂ and reasonably priced. A strategy has therefore been proposed which both meets the ambition of a single site heating network, but also ensures 95% heat delivered is low carbon (and renewable) by using roof-mounted air source heat pumps. A small contribution (5%) is provided from electric boilers;
 - > All available roofspace has been set aside for the application of photovoltaic (PV) panels. This represents 0.78kW/dwelling which is considered substantial for a development of this type and size.
 - > Residual Regulated CO₂ emissions up to a 100% reduction are to be offset for the development to be zero carbon. The offsetting contribution has been calculated at £222,366.

- 10.4** The summary tables, below, outline the indicative Regulated, Unregulated and Total CO₂ savings at each stage of the hierarchy for Phases 1B and 2. The residential calculations have been presented both against a Part L 2013 baseline (using SAP 10 emission factors) and a Part L 2021 baseline, to reflect the specific CO₂ targets set within condition 79a and the 2022 GLA Guidance, respectively.

Part L 2013 Calculations - Summary

Summary Table: Phases 1B & 2	
	Regulated CO ₂ (tonnes/yr)
Residential	
Baseline (TER)	443.2
Following <i>Be Lean</i> Measures	294.3
Following <i>Be Clean</i> Measures	166.6
Following <i>Be Green</i> Measures	95.3
% Improvement	79%

Part L 2021 Calculations - Summary

Summary Table: Phases 1B & 2			
	Regulated CO ₂ (tonnes/yr)	Unregulated CO ₂ (tonnes/yr)	Total CO ₂ (tonnes/yr)
Residential			
Baseline (TER)	379.1	147.1	526.1
Following <i>Be Lean</i> Measures	307.3	147.1	454.4
Following <i>Be Clean</i> Measures	70.7	147.1	217.7
Following <i>Be Green</i> Measures	77.8	147.1	224.9
% Improvement	79%	-	57%
Commercial Space			
Baseline (TER)	0.44	0.27	0.71
Following <i>Be Lean</i> Measures	0.36	0.27	0.63
Following <i>Be Clean</i> Measures	0.36	0.27	0.63
Following <i>Be Green</i> Measures	0.24	0.27	0.50
% Improvement	47%	-	29%

APPENDICES

Appendix A: Part L 2013 Calculations

Appendix B: GLA Emissions Spreadsheet (showing Part L 2021 calculations)

Appendix C: DER Worksheets (Part L 2013) & BRUKL Output (Part L 2021) – *Be Lean*

Appendix D: DER Worksheets (Part L 2013) – *Be Clean*

Appendix E: DER Worksheets (Part L 2013) & BRUKL Output (Part L 2021) – *Be Green*

Appendix F: Indicative primary Pipe Route

Appendix G: Block G Roof Plan and Energy Centre Layout

Appendix H: Phase 1B & 2 Roofplan – PV Areas

Appendix A

Part L 2013 Calculations (using SAP 10 Emission Factors)

Appendix A - Part L 2013 Conversion Calcs (SAP 2012 to SAP 10 Emission Factors)

BE GREEN								
	Weighting	Floor Area	2012 DER	SAP 10 DER	Total emissions (SAP 10)	2012 TER	SAP 10 TER	Total emissions (SAP 10)
Type 1	100	50.24	7.73	3.47	17,424.03	30.76	18.72	94,069.60
Type 2	54	71.49	7.66	3.44	13,282.53	26.05	15.83	61,117.05
Type 3	134	72.35	6.35	2.85	27,659.64	20.81	12.55	121,639.30
Type 4	44	91.51	7.41	3.33	13,393.91	22.59	13.71	55,204.90
Type 5	118	52.16	5.57	2.50	15,399.28	23.61	14.24	87,673.08
Type 6	12	115.96	10.93	4.91	6,826.42	23.39	14.26	19,844.41
Type 7	2	116.04	12.23	5.49	1,273.73	26.07	15.94	3,699.73
					95,259.54			
						443,248.09		
						78.51%		

BE CLEAN								
	Weighting	Floor Area	2012 DER	SAP 10 DER	Total emissions (SAP 10)	2012 TER	SAP 10 TER	Total emissions (SAP 10)
Type 1	100	50.24	13.85	6.22	31,245.23	30.76	18.72	94,069.60
Type 2	54	71.49	11.97	5.37	20,745.97	26.05	15.85	61,178.72
Type 3	134	72.35	10.61	4.76	46,180.05	20.81	13.19	127,837.19
Type 4	44	91.51	10.77	4.84	19,475.23	22.59	13.71	55,204.90
Type 5	118	52.16	11.48	5.15	31,708.29	23.61	14.24	87,673.08
Type 6	12	115.96	11.94	10.36	14,414.93	15.54	13.90	19,340.03
Type 7	2	116.04	13.83	12.38	2,873.27	17.27	15.58	3,615.65
					166,642.97			
						448,919.18		
						62.88%		

BE LEAN								
	Weighting	Floor Area	2012 DER	SAP 10 DER	Total emissions (SAP 10)	2012 TER	SAP 10 TER	Total emissions (SAP 10)
Type 1	100	50.24	16.49	12.19	61,245.25	20.97	18.72	94,069.60
Type 2	54	71.49	14.23	10.26	39,592.36	17.81	15.85	61,178.72
Type 3	134	72.35	12.79	8.89	86,212.11	15.08	13.19	127,837.19
Type 4	44	91.51	12.65	8.91	35,859.86	15.49	13.71	55,204.90
Type 5	118	52.16	13.46	9.38	57,736.78	16.36	14.24	87,673.08
Type 6	12	115.96	11.94	8.16	11,354.47	15.54	13.90	19,340.03
Type 7	2	116.04	13.83	9.88	2,291.88	17.27	15.58	3,615.65
					294,292.70	448,919.18		
						34.44%		

Appendix B

**GLA Emissions Spreadsheet
(showing Part L 2021
calculations)**

Appendix C

**DER Worksheets (Part L 2013) &
BRUKL Output (Part L 2021) –
Be Lean**

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



Property Reference	Type 1 - Option 5 (Gas Boiler)				Issued on Date	18/07/2023
Assessment Reference	St Ann's Type 1	Prop Type Ref	St Ann's Type 1			
Property	Type 1 - 1B - Top					
SAP Rating	84 B	DER	16.49	TER	20.97	
Environmental	90 B	% DER<TER	21.38			
CO ₂ Emissions (t/year)	0.69	DFEE	44.14	TFEE	59.39	
General Requirements Compliance	Fail	% DFEE<TFEE	25.68			
Assessor Details	Miss Eleanor Ballinger, Eleanor Ballinger, Tel: 02036031625, Eleanor@hodkinsonconsultancy.com				Assessor ID	M976-0001
Client						

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Top-floor flat, total floor area 50 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Mains gas (c)
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 20.97 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 16.49 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)59.4 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)44.1 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	OK
Openings	0.83 (max. 2.00)	1.00 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 2.50 (design value)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Community heating scheme -
Secondary heating system: None

5 Cylinder insulation

Hot water storage Nominal cylinder loss: 0.22 kWh/day
Permitted by DBSCG 0.35 OK
Primary pipework insulated: No primary pipework

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK
Hot water controls: No cylinderstat

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%
Minimum 75% OK

8 Mechanical ventilation

Continuous supply and extract system
Specific fan power: 0.61
Maximum 1.5 OK
MVHR efficiency: 93%
Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): High Fail
Based on:
Overshading: Average
Windows facing North: 1.76 m², No overhang
Windows facing South: 1.76 m², No overhang
Windows facing West: 9.60 m², No overhang
Air change rate: 2.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Roof U-value 0.10 W/m²K
Door U-value 1.00 W/m²K
Window U-value 0.80 W/m²K
Window U-value 0.80 W/m²K
Air permeability 2.5 m³/m²h

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.2400 (1b)	x 2.4000 (2b)	= 120.5760 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.2400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 120.5760 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					2.5000
Infiltration rate					0.1250 (18)
Number of sides sheltered					3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.0969 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1235	0.1211	0.1187	0.1066	0.1041	0.0920	0.0920	0.0896	0.0969	0.1041	0.1090	0.1138 (22b)
Balanced mechanical ventilation with heat recovery												0.5000 (23a)
If mechanical ventilation:												79.0500 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.2283	0.2258	0.2234	0.2113	0.2089	0.1968	0.1968	0.1944	0.2016	0.2089	0.2137	0.2186 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Window (West) (Uw = 0.80)			11.3600	0.7752	8.8062		(27)
Door			2.0900	1.0000	2.0900		(26)
Window (East) (Uw = 0.80)			1.7600	0.7752	1.3643		(27)
External Wall 1	31.4400	13.1200	18.3200	0.1800	3.2976		(29a)
Corridor Wall	23.0400	2.0900	20.9500	0.1786	3.7411		(29a)
External Roof 1	50.2400		50.2400	0.1000	5.0240		(30)
Total net area of external elements Aum(A, m ²)			104.7200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	24.3232		(33)
Party Wall 1			29.7600	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							13.0134 (36)
Total fabric heat loss							(33) + (36) = 37.3366 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	9.0827	8.9863	8.8900	8.4081	8.3118	7.8299	7.8299	7.7336	8.0227	8.3118	8.5045	8.6972 (38)
Heat transfer coeff	46.4193	46.3230	46.2266	45.7448	45.6484	45.1666	45.1666	45.0702	45.3593	45.6484	45.8411	46.0339 (39)
Average = Sum(39)m / 12 =												45.7207 (39)
HLP	0.9240	0.9220	0.9201	0.9105	0.9086	0.8990	0.8990	0.8971	0.9029	0.9086	0.9124	0.9163 (40)
HLP (average)												0.9100 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.6972 (42)
Average daily hot water use (litres/day)												74.5078 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	81.9585	78.9782	75.9979	73.0176	70.0373	67.0570	67.0570	70.0373	73.0176	75.9979	78.9782	81.9585 (44)
Energy content (annual)	121.5421	106.3015	109.6937	95.6336	91.7627	79.1842	73.3758	84.1998	85.2055	99.2987	108.3923	117.7071 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 1172.2972 (45)

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	18.2313	15.9452	16.4540	14.3450	13.7644	11.8776	11.0064	12.6300	12.7808	14.8948	16.2589	17.6561 (46)
Water storage loss:												
Store volume												3.0000 (47)
b) If manufacturer declared loss factor is not known :												
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0212 (51)
Volume factor from Table 2a												3.4200 (52)
Temperature factor from Table 2b												1.0000 (53)
Enter (49) or (54) in (55)												0.2173 (55)
Total storage loss												
6.7353	6.0835	6.7353	6.5180	6.7353	6.5180	6.7353	6.7353	6.5180	6.7353	6.5180	6.7353	(56)
If cylinder contains dedicated solar storage												
6.7353	6.0835	6.7353	6.5180	6.7353	6.5180	6.7353	6.7353	6.5180	6.7353	6.5180	6.7353	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month												
151.5398	133.3962	139.6914	124.6636	121.7604	108.2143	103.3735	114.1975	114.2355	129.2964	137.4224	147.7048	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Output from w/h												
151.5398	133.3962	139.6914	124.6636	121.7604	108.2143	103.3735	114.1975	114.2355	129.2964	137.4224	147.7048	(64)
Heat gains from water heating, kWh/month												
64.4109	57.0210	60.4713	55.0222	54.5093	49.5528	48.3956	51.9946	51.5548	57.0150	59.2645	63.1358	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
(66)m	84.8584	84.8584	84.8584	84.8584	84.8584	84.8584	84.8584	84.8584	84.8584	84.8584	84.8584	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
13.1816	11.7078	9.5214	7.2083	5.3883	4.5490	4.9154	6.3892	8.5756	10.8887	12.7087	13.5479	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
147.8573	149.3916	145.5252	137.2941	126.9039	117.1385	110.6147	109.0804	112.9468	121.1778	131.5681	141.3334	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
31.4858	31.4858	31.4858	31.4858	31.4858	31.4858	31.4858	31.4858	31.4858	31.4858	31.4858	31.4858	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)												
-67.8868	-67.8868	-67.8868	-67.8868	-67.8868	-67.8868	-67.8868	-67.8868	-67.8868	-67.8868	-67.8868	-67.8868	(71)
Water heating gains (Table 5)												
86.5738	84.8527	81.2786	76.4197	73.2651	68.8233	65.0479	69.8852	71.6039	76.6330	82.3118	84.8599	(72)
Total internal gains												
296.0702	294.4095	284.7827	269.3797	254.0148	238.9684	229.0355	233.8123	241.5838	257.1571	275.0460	288.1988	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W	
South					1.7600	46.7521	0.4200	0.8000	0.7700		19.1596 (78)	
West					9.6000	19.6403	0.4200	0.8000	0.7700		43.9027 (80)	
North					1.7600	10.6334	0.5000	0.8000	0.7700		5.1877 (74)	
Solar gains	68.2500	127.1754	198.2539	278.5124	336.3281	343.1130	327.0726	283.5245	226.5059	147.5533	83.8519	56.9838 (83)
Total gains	364.3202	421.5850	483.0367	547.8921	590.3429	582.0814	556.1081	517.3368	468.0897	404.7104	358.8979	345.1826 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
75.1603	75.3166	75.4736	76.2686	76.4296	77.2450	77.2450	77.4101	76.9167	76.4296	76.1083	75.7896	
6.0107	6.0211	6.0316	6.0846	6.0953	6.1497	6.1497	6.1607	6.1278	6.0953	6.0739	6.0526	
util living area												
0.9943	0.9857	0.9570	0.8632	0.6892	0.4932	0.3570	0.3999	0.6487	0.9177	0.9864	0.9958 (86)	
MIT	20.1949	20.3559	20.5941	20.8425	20.9654	20.9961	20.9996	20.9991	20.9817	20.7980	20.4467	20.1611 (87)
Th 2	20.1472	20.1488	20.1504	20.1586	20.1602	20.1683	20.1683	20.1700	20.1651	20.1602	20.1569	20.1537 (88)
util rest of house												
0.9926	0.9815	0.9448	0.8309	0.6363	0.4307	0.2897	0.3282	0.5782	0.8893	0.9816	0.9945 (89)	
MIT 2	19.0792	19.3130	19.6514	19.9875	20.1299	20.1660	20.1682	20.1696	20.1523	19.9411	19.4522	19.0352 (90)
Living area fraction									fLA = Living area / (4) =			0.4697 (91)
MIT	19.6033	19.8029	20.0942	20.3891	20.5224	20.5559	20.5587	20.5593	20.5419	20.3436	19.9194	19.5641 (92)
Temperature adjustment												0.0000
adjusted MIT	19.6033	19.8029	20.0942	20.3891	20.5224	20.5559	20.5587	20.5593	20.5419	20.3436	19.9194	19.5641 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0.9911	0.9794	0.9439	0.8404	0.6596	0.4600	0.3213	0.3619	0.6107	0.8962	0.9799	0.9933 (94)	
Useful gains	361.0837	412.8873	455.9149	460.4330	389.4054	267.7481	178.6882	187.2295	285.8626	362.7066	351.6873	342.8682 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W												
710.3686	690.3473	628.4143	525.5677	402.7277	269.0091	178.8013	187.4595	292.2002	444.7800	587.6544	707.2685 (97)	
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh												
259.8680	186.4531	128.3395	46.8970	9.9118	0.0000	0.0000	0.0000	0.0000	61.0626	169.8963	271.1138 (98)	
Space heating												1133.5422 (98)
Space heating per m2												(98) / (4) = 22.5625 (99)

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8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Boilers	1.0000	(303a)
Fraction of total space heat from community Boilers	1.0000	(304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000	(305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.0500	(306)
Space heating:		
Annual space heating requirement	1133.5422	(98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05	1190.2193	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	(309)
Water heating		
Annual water heating requirement	1525.4958	(64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05	1601.7706	(310a)
Electricity used for heat distribution	27.9199	(313)
Annual totals kWh/year		
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7625)		
mechanical ventilation fans (SFP = 0.7625)	112.1658	(330a)
Total electricity for the above, kWh/year	112.1658	(331)
Electricity for lighting (calculated in Appendix L)	232.7909	(332)
Total delivered energy for all uses	3136.9466	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Boilers			95.0000 (367a)
Space heating from Boilers	2938.9367	0.2160	634.8103 (367)
Electrical energy for heat distribution	27.9199	0.5190	14.4904 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			649.3008 (373)
Space and water heating			649.3008 (376)
Pumps and fans	112.1658	0.5190	58.2141 (378)
Energy for lighting	232.7909	0.5190	120.8185 (379)
Total CO2, kg/year			828.3333 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			16.4900 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		16.4900	ZC1
Total Floor Area	TFA	50.2400	
Assumed number of occupants	N	1.6972	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		17.4397	ZC2
CO2 emissions from cooking, equation (L16)		3.1794	ZC3
Total CO2 emissions		37.1091	ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000	ZC7
Net CO2 emissions		37.1091	ZC8

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.2400 (1b)	x 2.4000 (2b)	= 120.5760 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.2400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 120.5760 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				20.0000 / (5) = 0.1659 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4159 (18)
Number of sides sheltered					3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3223 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4109	0.4029	0.3948	0.3545	0.3465	0.3062	0.3062	0.2981	0.3223	0.3465	0.3626	0.3787 (22b)
Effective ac	0.5844	0.5812	0.5779	0.5628	0.5600	0.5469	0.5469	0.5444	0.5519	0.5600	0.5657	0.5717 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.0900	1.0000	2.0900		(26)
TER Opening Type (Uw = 1.40)			10.4600	1.3258	13.8674		(27)
External Wall 1	31.4400	10.4600	20.9800	0.1800	3.7764		(29a)
Corridor Wall	23.0400	2.0900	20.9500	0.1800	3.7710		(29a)
External Roof 1	50.2400		50.2400	0.1300	6.5312		(30)
Total net area of external elements Aum(A, m ²)			104.7200				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	30.0360	(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							12.7410 (36)
Total fabric heat loss						(33) + (36) =	42.7770 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	23.2546	23.1242	22.9963	22.3957	22.2833	21.7602	21.7602	21.6633	21.9617	22.2833	22.5106	22.7483 (38)
Heat transfer coeff	66.0316	65.9012	65.7733	65.1727	65.0603	64.5372	64.5372	64.4403	64.7387	65.0603	65.2877	65.5253 (39)
Average = Sum(39)m / 12 =												65.1722 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.3143	1.3117	1.3092	1.2972	1.2950	1.2846	1.2846	1.2826	1.2886	1.2950	1.2995	1.3042 (40)
HLP (average)												1.2972 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.6972 (42)
Average daily hot water use (litres/day)												74.5078 (43)
Daily hot water use	81.9585	78.9782	75.9979	73.0176	70.0373	67.0570	67.0570	70.0373	73.0176	75.9979	78.9782	81.9585 (44)
Energy conte	121.5421	106.3015	109.6937	95.6336	91.7627	79.1842	73.3758	84.1998	85.2055	99.2987	108.3923	117.7071 (45)
Energy content (annual)												1172.2972 (45)
Distribution loss (46)m = 0.15 x (45)m	18.2313	15.9452	16.4540	14.3450	13.7644	11.8776	11.0064	12.6300	12.7808	14.8948	16.2589	17.6561 (46)
Water storage loss:												3.0000 (47)
Store volume												0.2602 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.1405 (55)
Enter (49) or (54) in (55)												

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Total storage loss	4.3553	3.9338	4.3553	4.2148	4.3553	4.2148	4.3553	4.3553	4.2148	4.3553	4.2148	4.3553 (56)
If cylinder contains dedicated solar storage	4.3553	3.9338	4.3553	4.2148	4.3553	4.2148	4.3553	4.3553	4.2148	4.3553	4.2148	4.3553 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	149.1598	131.2465	137.3113	122.3604	119.3804	105.9110	100.9935	111.8175	111.9322	126.9164	135.1191	145.3247 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	149.1598	131.2465	137.3113	122.3604	119.3804	105.9110	100.9935	111.8175	111.9322	126.9164	135.1191	145.3247 (64)
Heat gains from water heating, kWh/month	62.5069	55.3013	58.5673	53.1796	52.6052	47.7102	46.4916	50.0906	49.7122	55.1110	57.4219	61.2317 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	84.8584	84.8584	84.8584	84.8584	84.8584	84.8584	84.8584	84.8584	84.8584	84.8584	84.8584	84.8584	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.2261	11.7473	9.5535	7.2326	5.4065	4.5644	4.9320	6.4108	8.6045	10.9254	12.7516	13.5937	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	147.8573	149.3916	145.5252	137.2941	126.9039	117.1385	110.6147	109.0804	112.9468	121.1778	131.5681	141.3334	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.4858	31.4858	31.4858	31.4858	31.4858	31.4858	31.4858	31.4858	31.4858	31.4858	31.4858	31.4858	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-67.8868	-67.8868	-67.8868	-67.8868	-67.8868	-67.8868	-67.8868	-67.8868	-67.8868	-67.8868	-67.8868	-67.8868	(71)
Water heating gains (Table 5)	84.0147	82.2935	78.7195	73.8605	70.7060	66.2641	62.4887	67.3261	69.0448	74.0739	79.7526	82.3007	(72)
Total internal gains	296.5555	294.8899	285.2557	269.8448	254.4739	239.4246	229.4929	234.2748	242.0536	257.6347	275.5298	288.6853	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W	
North					1.4000	10.6334	0.6300	0.7000	0.7700		4.5496 (74)	
South					1.4000	46.7521	0.6300	0.7000	0.7700		20.0033 (78)	
West					7.6600	19.6403	0.6300	0.7000	0.7700		45.9778 (80)	
Solar gains	70.5306	131.3969	204.6268	286.9229	345.8658	352.5394	336.1852	291.8648	233.6279	152.4087	86.6521	58.8873 (83)
Total gains	367.0861	426.2869	489.8825	556.7677	600.3397	591.9640	565.6781	526.1395	475.6816	410.0433	362.1818	347.5726 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	52.8366	52.9412	53.0441	53.5330	53.6254	54.0601	54.0601	54.1414	53.8919	53.6254	53.4387	53.2449	
alpha	4.5224	4.5294	4.5363	4.5689	4.5750	4.6040	4.6040	4.6094	4.5928	4.5750	4.5626	4.5497	
util living area	0.9954	0.9903	0.9757	0.9300	0.8238	0.6513	0.4913	0.5452	0.7945	0.9576	0.9909	0.9964	(86)
MIT	19.6617	19.8399	20.1358	20.5070	20.7988	20.9499	20.9890	20.9825	20.8746	20.4828	20.0016	19.6281	(87)
Th 2	19.8296	19.8317	19.8336	19.8430	19.8448	19.8529	19.8529	19.8544	19.8498	19.8448	19.8412	19.8375	(88)
util rest of house	0.9938	0.9871	0.9672	0.9054	0.7660	0.5530	0.3687	0.4184	0.7086	0.9375	0.9872	0.9952	(89)
MIT 2	18.0734	18.3337	18.7609	19.2855	19.6579	19.8218	19.8492	19.8479	19.7559	19.2657	18.5770	18.0299	(90)
Living area fraction	18.8195	19.0412	19.4067	19.8593	20.1938	20.3517	20.3846	20.3809	20.2814	19.8374	19.2462	18.7806	(92)
Temperature adjustment	18.8195	19.0412	19.4067	19.8593	20.1938	20.3517	20.3846	20.3809	20.2814	19.8374	19.2462	18.7806	(93)
adjusted MIT	18.8195	19.0412	19.4067	19.8593	20.1938	20.3517	20.3846	20.3809	20.2814	19.8374	19.2462	18.7806	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9919	0.9841	0.9633	0.9058	0.7851	0.5976	0.4266	0.4783	0.7438	0.9373	0.9846	0.9936	(94)
Ext temp.	364.1231	419.5041	471.9178	504.3309	471.3001	353.7803	241.3176	251.6470	353.8297	384.3330	356.6012	345.3427	(95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Month fracti	958.7476	931.9235	848.9192	714.2474	552.6094	371.2005	244.2488	256.5289	400.1738	600.9907	792.9974	955.4011	(97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000	(97a)
Space heating per m2	442.4006	344.3458	280.4891	151.1399	60.4941	0.0000	0.0000	0.0000	0.0000	161.1933	314.2053	453.8835	(98)
												2208.1515	(98)
												43.9521	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2361.6594 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	442.4006	344.3458	280.4891	151.1399	60.4941	0.0000	0.0000	0.0000	0.0000	161.1933	314.2053	453.8835	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	473.1557	368.2843	299.9883	161.6469	64.6996	0.0000	0.0000	0.0000	0.0000	172.3992	336.0484	485.4369	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	149.1598	131.2465	137.3113	122.3604	119.3804	105.9110	100.9935	111.8175	111.9322	126.9164	135.1191	145.3247	(64)
Efficiency of water heater (217)m	87.5403	87.2707	86.6802	85.3783	83.1045	79.8000	79.8000	79.8000	79.8000	85.4526	86.9923	87.6497	(216)
Fuel for water heating, kWh/month	170.3898	150.3901	158.4114	143.3155	143.6510	132.7206	126.5583	140.1222	140.2660	148.5226	155.3230	165.8018	(219)
Water heating fuel used												1775.4721	(219)
Annual totals kWh/year													
Space heating fuel - main system												2361.6594	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												233.5768	(232)
Total delivered energy for all uses												4445.7084	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2361.6594	0.2160	510.1184 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1775.4721	0.2160	383.5020 (264)
Space and water heating			893.6204 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	233.5768	0.5190	121.2264 (268)
Total CO2, kg/m2/year			1053.7718 (272)
Emissions per m2 for space and water heating			17.7870 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.4129 (272b)
Emissions per m2 for pumps and fans			0.7748 (272c)
Target Carbon Dioxide Emission Rate (TER) = (17.7870 * 1.00) + 2.4129 + 0.7748, rounded to 2 d.p.			20.9700 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



Property Reference	Type 2 - Option 5 (Gas Boiler)				Issued on Date	18/07/2023
Assessment Reference	St Ann's Type 2	Prop Type Ref	St Ann's Type 2			
Property	Type 2 - 2B - Ground					
SAP Rating	85 B	DER	14.23	TER	17.81	
Environmental	90 B	% DER<TER	20.11			
CO ₂ Emissions (t/year)	0.83	DFEE	40.28	TFEE	51.53	
General Requirements Compliance	Fail	% DFEE<TFEE	21.83			
Assessor Details	Miss Eleanor Ballinger, Eleanor Ballinger, Tel: 02036031625, Eleanor@hodkinsonconsultancy.com				Assessor ID	M976-0001
Client						

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Ground-floor flat, total floor area 71 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Mains gas (c)
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 17.81 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 14.23 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)51.5 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)40.3 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.13 (max. 0.25)	0.13 (max. 0.70)	OK
Roof	(no roof)		
Openings	0.82 (max. 2.00)	1.00 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 2.50 (design value)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system:

None

5 Cylinder insulation

Hot water storage
Permitted by DBSCG 0.35
Primary pipework insulated: Nominal cylinder loss: 0.22 kWh/day
OK
No primary pipework

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls:

No cylinderstat

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%
Minimum 75% OK

8 Mechanical ventilation

Continuous supply and extract system
Specific fan power: 0.61
Maximum 1.5 OK
MVHR efficiency: 93%
Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): High Fail
Based on:
Overshading: Average
Windows facing North: 8.20 m², No overhang
Windows facing East: 8.04 m², No overhang
Air change rate: 2.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Door U-value 1.00 W/m²K
Window U-value 0.80 W/m²K
Window U-value 0.80 W/m²K
Air permeability 2.5 m³/m²h

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	71.4900 (1b)	x 2.4000 (2b)	= 171.5760 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.4900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 171.5760 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					2.5000
Infiltration rate					0.1250 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1063 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1355	0.1328	0.1302	0.1169	0.1142	0.1009	0.1009	0.0983	0.1063	0.1142	0.1195	0.1248 (22b)
Balanced mechanical ventilation with heat recovery												0.5000 (23a)
If mechanical ventilation:												79.0500 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.2402	0.2376	0.2349	0.2216	0.2190	0.2057	0.2057	0.2030	0.2110	0.2190	0.2243	0.2296 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Window (North) (Uw = 0.80)			8.2000	0.7752	6.3566		(27)
Door			2.0900	1.0000	2.0900		(26)
Window (South, etc) (Uw = 0.80)			8.0400	0.7752	6.2326		(27)
Heat Loss Floor 1			71.4900	0.1300	9.2937		(28a)
External Wall 1	42.7200	16.2400	26.4800	0.1800	4.7664		(29a)
Corridor Wall	7.9200	2.0900	5.8300	0.1786	1.0411		(29a)
Total net area of external elements Aum(A, m ²)			122.1300				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =			29.7803	(33)
Party Wall 1			34.3200	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							12.6926 (36)
Total fabric heat loss							(33) + (36) = 42.4729 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	13.6012	13.4508	13.3004	12.5484	12.3980	11.6460	11.6460	11.4956	11.9468	12.3980	12.6988	12.9996 (38)
Average = Sum(39)m / 12 =	56.0741	55.9237	55.7733	55.0213	54.8709	54.1190	54.1190	53.9686	54.4198	54.8709	55.1717	55.4725 (39)
												54.9837 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.7844	0.7823	0.7802	0.7696	0.7675	0.7570	0.7570	0.7549	0.7612	0.7675	0.7717	0.7759 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2817 (42)
Average daily hot water use (litres/day)												88.3915 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	97.2307	93.6950	90.1593	86.6237	83.0880	79.5524	79.5524	83.0880	86.6237	90.1593	93.6950	97.2307 (44)
Energy content (annual)	144.1903	126.1097	130.1340	113.4539	108.8617	93.9394	87.0487	99.8896	101.0826	117.8021	128.5902	139.6406 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 1390.7428 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

21.6285	18.9165	19.5201	17.0181	16.3293	14.0909	13.0573	14.9834	15.1624	17.6703	19.2885	20.9461 (46)
Water storage loss:											
Store volume											3.0000 (47)
b) If manufacturer declared loss factor is not known :											
Hot water storage loss factor from Table 2 (kWh/litre/day)											0.0212 (51)
Volume factor from Table 2a											3.4200 (52)
Temperature factor from Table 2b											1.0000 (53)
Enter (49) or (54) in (55)											0.2173 (55)
Total storage loss											
6.7353	6.0835	6.7353	6.5180	6.7353	6.5180	6.7353	6.7353	6.5180	6.7353	6.5180	6.7353 (56)
If cylinder contains dedicated solar storage											
6.7353	6.0835	6.7353	6.5180	6.7353	6.5180	6.7353	6.7353	6.5180	6.7353	6.5180	6.7353 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month											
174.1880	153.2044	160.1316	142.4840	138.8594	122.9694	117.0464	129.8873	130.1127	147.7997	157.6202	169.6383 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Solar input (sum of months) = Sum(63)m =											0.0000 (63)
Output from w/h											
174.1880	153.2044	160.1316	142.4840	138.8594	122.9694	117.0464	129.8873	130.1127	147.7997	157.6202	169.6383 (64)
Heat gains from water heating, kWh/month											
71.9414	63.6072	67.2677	60.9475	60.1947	54.4589	52.9418	57.2115	56.8340	63.1673	65.9802	70.4286 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	114.0874	114.0874	114.0874	114.0874	114.0874	114.0874	114.0874	114.0874	114.0874	114.0874	114.0874 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5											
17.8969	15.8959	12.9274	9.7869	7.3158	6.1763	6.6737	8.6748	11.6433	14.7838	17.2549	18.3944 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5											
200.7493	202.8325	197.5830	186.4075	172.3004	159.0418	150.1842	148.1011	153.3505	164.5260	178.6331	191.8917 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5											
34.4087	34.4087	34.4087	34.4087	34.4087	34.4087	34.4087	34.4087	34.4087	34.4087	34.4087	34.4087 (69)
Pumps, fans											
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)											
-91.2699	-91.2699	-91.2699	-91.2699	-91.2699	-91.2699	-91.2699	-91.2699	-91.2699	-91.2699	-91.2699	-91.2699 (71)
Water heating gains (Table 5)											
96.6955	94.6536	90.4136	84.6492	80.9068	75.6373	71.1584	76.8971	78.9361	84.9023	91.6392	94.6622 (72)
Total internal gains											
372.5680	370.6082	358.1502	338.0699	317.7493	298.0817	285.2425	290.8992	301.1561	321.4384	344.7534	362.1745 (73)

6. Solar gains

[Jan]			Area	Solar flux	g	FF	Access	Gains				
			m2	Table 6a	Specific data	Specific data	factor	W				
				W/m2	or Table 6b	or Table 6c	Table 6d					
North			8.2000	10.6334	0.5000	0.8000	0.7700	24.1701 (74)				
East			8.0400	19.6403	0.4200	0.8000	0.7700	36.7685 (76)				
Solar gains	60.9386	118.1173	196.9422	298.8303	381.5524	398.5437	376.0822	311.9118	232.1352	140.3310	75.6630	50.3860 (83)
Total gains	433.5066	488.7256	555.0924	636.9002	699.3018	696.6254	661.3248	602.8109	533.2913	461.7694	420.4164	412.5605 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)											
Utilisation factor for gains for living area, nil,m (see Table 9a)											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	88.5361	88.7742	89.0136	90.2301	90.4774	91.7346	91.7346	91.9903	91.2276	90.4774	89.9842
alpha	6.9024	6.9183	6.9342	7.0153	7.0318	7.1156	7.1156	7.1327	7.0818	7.0318	6.9989
util living area	0.9974	0.9933	0.9757	0.8938	0.7064	0.4955	0.3599	0.4114	0.6857	0.9473	0.9932
MIT	20.2905	20.4158	20.6238	20.8638	20.9769	20.9983	20.9998	20.9996	20.9861	20.8119	20.5071
Th 2	20.2669	20.2687	20.2706	20.2797	20.2816	20.2907	20.2907	20.2926	20.2871	20.2816	20.2779
util rest of house	0.9965	0.9912	0.9684	0.8676	0.6591	0.4414	0.3020	0.3484	0.6222	0.9277	0.9908
MIT 2	19.3118	19.4953	19.7951	20.1277	20.2610	20.2897	20.2907	20.2924	20.2769	20.0689	19.6362
Living area fraction	19.6967	19.8572	20.1209	20.4171	20.5425	20.5683	20.5695	20.5705	20.5558	20.3610	19.9787
MIT	19.6967	19.8572	20.1209	20.4171	20.5425	20.5683	20.5695	20.5705	20.5558	20.3610	19.9787
Temperature adjustment											0.0000
adjusted MIT	19.6967	19.8572	20.1209	20.4171	20.5425	20.5683	20.5695	20.5705	20.5558	20.3610	19.9787

8. Space heating requirement

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9957	0.9898	0.9667	0.8730	0.6767	0.4626	0.3248	0.3732	0.6467	0.9302	0.9895
Useful gains	431.6408	483.7198	536.5863	556.0238	473.1930	322.2666	214.7782	224.9507	344.8612	429.5472	415.9891
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000
Heat loss rate W	863.3539	836.4644	759.6842	633.6882	485.1959	322.9982	214.8268	225.0759	351.3212	535.5975	710.5386
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000
Space heating kWh	321.1945	237.0444	165.9848	55.9184	8.9301	0.0000	0.0000	0.0000	0.0000	78.9014	212.0756
Space heating											332.4856 (98)
Space heating per m2											1412.5349 (98)
(98) / (4) =											19.7585 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Boilers	1.0000	(303a)
Fraction of total space heat from community Boilers	1.0000	(304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000	(305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.0500	(306)
Space heating:		
Annual space heating requirement	1412.5349	(98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05	1483.1616	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	(309)
Water heating		
Annual water heating requirement	1743.9414	(64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05	1831.1385	(310a)
Electricity used for heat distribution	33.1430	(313)
Annual totals kWh/year		
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7625)		
mechanical ventilation fans (SFP = 0.7625)	159.6086	(330a)
Total electricity for the above, kWh/year	159.6086	(331)
Electricity for lighting (calculated in Appendix L)	316.0657	(332)
Total delivered energy for all uses	3789.9744	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Boilers			95.0000 (367a)
Space heating from Boilers	3488.7370	0.2160	753.5672 (367)
Electrical energy for heat distribution	33.1430	0.5190	17.2012 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			770.7684 (373)
Space and water heating			770.7684 (376)
Pumps and fans	159.6086	0.5190	82.8368 (378)
Energy for lighting	316.0657	0.5190	164.0381 (379)
Total CO2, kg/year			1017.6434 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			14.2300 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		14.2300	ZC1
Total Floor Area	TFA	71.4900	
Assumed number of occupants	N	2.2817	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		16.6401	ZC2
CO2 emissions from cooking, equation (L16)		2.4306	ZC3
Total CO2 emissions		33.3006	ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000	ZC7
Net CO2 emissions		33.3006	ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	71.4900 (1b)	x 2.4000 (2b)	= 171.5760 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.4900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 171.5760 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour
Pressure test					30.0000 / (5) = 0.1748 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.4248 (18)
					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3611 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4604	0.4514	0.4424	0.3972	0.3882	0.3431	0.3431	0.3340	0.3611	0.3882	0.4063	0.4243 (22b)
Effective ac	0.6060	0.6019	0.5978	0.5789	0.5754	0.5588	0.5588	0.5558	0.5652	0.5754	0.5825	0.5900 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.0900	1.0000	2.0900		(26)
TER Opening Type (Uw = 1.40)			15.7700	1.3258	20.9072		(27)
Heat Loss Floor 1			71.4900	0.1300	9.2937		(28a)
External Wall 1	42.7200	15.7700	26.9500	0.1800	4.8510		(29a)
Corridor Wall	7.9200	2.0900	5.8300	0.1800	1.0494		(29a)
Total net area of external elements Aum(A, m ²)			122.1300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	38.1913		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.8140 (36)
Total fabric heat loss						(33) + (36) =	47.0053 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	34.3117	34.0786	33.8502	32.7772	32.5765	31.6420	31.6420	31.4689	32.0019	32.5765	32.9826	33.4072 (38)
Heat transfer coeff	81.3170	81.0839	80.8555	79.7825	79.5818	78.6473	78.6473	78.4742	79.0072	79.5818	79.9879	80.4125 (39)
Average = Sum(39)m / 12 =												79.7816 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1375	1.1342	1.1310	1.1160	1.1132	1.1001	1.1001	1.0977	1.1052	1.1132	1.1189	1.1248 (40)
HLP (average)												1.1160 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2817 (42)
Average daily hot water use (litres/day)												88.3915 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	97.2307	93.6950	90.1593	86.6237	83.0880	79.5524	79.5524	83.0880	86.6237	90.1593	93.6950	97.2307 (44)
Energy conte	144.1903	126.1097	130.1340	113.4539	108.8617	93.9394	87.0487	99.8896	101.0826	117.8021	128.5902	139.6406 (45)
Energy content (annual)										Total = Sum(45)m =		1390.7428 (45)
Distribution loss (46)m = 0.15 x (45)m	21.6285	18.9165	19.5201	17.0181	16.3293	14.0909	13.0573	14.9834	15.1624	17.6703	19.2885	20.9461 (46)
Water storage loss:												
Store volume												3.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												0.2602 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.1405 (55)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Total storage loss	4.3553	3.9338	4.3553	4.2148	4.3553	4.2148	4.3553	4.3553	4.2148	4.3553	4.2148	4.3553 (56)
If cylinder contains dedicated solar storage	4.3553	3.9338	4.3553	4.2148	4.3553	4.2148	4.3553	4.3553	4.2148	4.3553	4.2148	4.3553 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	171.8079	151.0547	157.7516	140.1807	136.4794	120.6662	114.6663	127.5073	127.8094	145.4197	155.3169	167.2583 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	171.8079	151.0547	157.7516	140.1807	136.4794	120.6662	114.6663	127.5073	127.8094	145.4197	155.3169	167.2583 (64)
Heat gains from water heating, kWh/month	70.0374	61.8875	65.3637	59.1049	58.2907	52.6163	51.0378	55.3074	54.9914	61.2633	64.1377	68.5246 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	114.0874	114.0874	114.0874	114.0874	114.0874	114.0874	114.0874	114.0874	114.0874	114.0874	114.0874	114.0874 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.9016	15.9001	12.9308	9.7895	7.3177	6.1779	6.6755	8.6770	11.6463	14.7877	17.2594	18.3992 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	200.7493	202.8325	197.5830	186.4075	172.3004	159.0418	150.1842	148.1011	153.3505	164.5260	178.6331	191.8917 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4087	34.4087	34.4087	34.4087	34.4087	34.4087	34.4087	34.4087	34.4087	34.4087	34.4087	34.4087 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-91.2699	-91.2699	-91.2699	-91.2699	-91.2699	-91.2699	-91.2699	-91.2699	-91.2699	-91.2699	-91.2699	-91.2699 (71)
Water heating gains (Table 5)	94.1363	92.0945	87.8544	82.0901	78.3477	73.0782	68.5992	74.3380	76.3769	82.3432	89.0801	92.1030 (72)
Total internal gains	373.0135	371.0533	358.5945	338.5133	318.1921	298.5241	285.6851	291.3423	301.6000	321.8831	345.1988	362.6201 (73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W		
North					7.9600	10.6334	0.6300	0.7000	0.7700	25.8676 (74)		
East					7.8100	19.6403	0.6300	0.7000	0.7700	46.8781 (76)		

Solar gains	72.7458	141.1379	235.0238	355.1849	451.6933	470.9042	444.7372	370.1032	276.6421	167.6591	90.3626	60.1148 (83)
Total gains	445.7592	512.1912	593.6182	693.6981	769.8854	769.4283	730.4224	661.4455	578.2421	489.5422	435.5613	422.7350 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	61.0522	61.2277	61.4007	62.2265	62.3834	63.1247	63.1247	63.2639	62.8371	62.3834	62.0667	61.7390
alpha	5.0701	5.0818	5.0934	5.1484	5.1589	5.2083	5.2083	5.2176	5.1891	5.1589	5.1378	5.1159
util living area	0.9976	0.9947	0.9843	0.9409	0.8207	0.6274	0.4686	0.5350	0.8127	0.9717	0.9951	0.9982 (86)
MIT	19.7975	19.9513	20.2248	20.5867	20.8568	20.9727	20.9950	20.9906	20.9004	20.5345	20.1037	19.7740 (87)
Th 2	19.9704	19.9730	19.9756	19.9878	19.9901	20.0007	20.0007	20.0027	19.9966	19.9901	19.9855	19.9806 (88)
util rest of house	0.9968	0.9930	0.9788	0.9204	0.7668	0.5405	0.3649	0.4245	0.7365	0.9580	0.9931	0.9976 (89)
MIT 2	18.3699	18.5960	18.9937	19.5113	19.8557	19.9836	19.9990	19.9990	19.9190	19.4510	18.8280	18.3429 (90)
Living area fraction									fLA = Living area / (4) =			0.3932 (91)
MIT	18.9312	19.1289	19.4778	19.9341	20.2493	20.3725	20.3906	20.3889	20.3049	19.8770	19.3296	18.9056 (92)
Temperature adjustment												0.0000
adjusted MIT	18.9312	19.1289	19.4778	19.9341	20.2493	20.3725	20.3906	20.3889	20.3049	19.8770	19.3296	18.9056 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9957	0.9910	0.9754	0.9191	0.7818	0.5739	0.4059	0.4682	0.7622	0.9560	0.9913	0.9967 (94)
Useful gains	443.8334	507.5627	579.0005	637.6060	601.9171	441.5987	296.4576	309.6649	440.7468	468.0225	431.7522	421.3248 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	1189.7645	1153.7383	1049.3248	880.3317	680.3720	453.9924	298.1222	313.0227	490.2325	738.2816	978.2197	1182.5161 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	554.9727	434.2300	349.9213	174.7625	58.3704	0.0000	0.0000	0.0000	0.0000	201.0728	393.4566	566.3263 (98)
Space heating												2733.1127 (98)
Space heating per m2										(98) / (4) =		38.2307 (99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2923.1152 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	554.9727	434.2300	349.9213	174.7625	58.3704	0.0000	0.0000	0.0000	0.0000	201.0728	393.4566	566.3263	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	593.5537	464.4171	374.2473	186.9118	62.4283	0.0000	0.0000	0.0000	0.0000	215.0511	420.8092	605.6966	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	171.8079	151.0547	157.7516	140.1807	136.4794	120.6662	114.6663	127.5073	127.8094	145.4197	155.3169	167.2583	(64)
Efficiency of water heater (217)m	87.7195	87.4729	86.8801	85.4031	82.7302	79.8000	79.8000	79.8000	79.8000	85.6785	87.1911	79.8000	(216)
Fuel for water heating, kWh/month	195.8605	172.6874	181.5739	164.1402	164.9694	151.2108	143.6922	159.7836	160.1622	169.7272	178.1339	190.4659	(219)
Water heating fuel used												2032.4069	(219)
Annual totals kWh/year												2923.1152	(211)
Space heating fuel - main system												0.0000	(215)
Space heating fuel - secondary													
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												316.1486	(232)
Total delivered energy for all uses												5346.6707	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2923.1152	0.2160	631.3929 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2032.4069	0.2160	438.9999 (264)
Space and water heating			1070.3928 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	316.1486	0.5190	164.0811 (268)
Total CO2, kg/m2/year			1273.3989 (272)
Emissions per m2 for space and water heating			14.9726 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.2952 (272b)
Emissions per m2 for pumps and fans			0.5445 (272c)
Target Carbon Dioxide Emission Rate (TER) = (14.9726 * 1.00) + 2.2952 + 0.5445, rounded to 2 d.p.			17.8100 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



Property Reference	Type 3 - Option 5 (Gas Boiler)				Issued on Date	18/07/2023
Assessment Reference	St Ann's Type 3	Prop Type Ref	St Ann's Type 3			
Property	Type 3 - 2B - Mid					
SAP Rating	86 B	DER	12.41	TER	14.43	
Environmental	91 B	% DER<TER	13.98			
CO ₂ Emissions (t/year)	0.77	DFEE	27.31	TFEE	34.71	
General Requirements Compliance	Fail	% DFEE<TFEE	21.33			
Assessor Details	Miss Eleanor Ballinger, Eleanor Ballinger, Tel: 02036031625, Eleanor@hodkinsonconsultancy.com				Assessor ID	M976-0001
Client						

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Mid-floor flat, total floor area 72 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Mains gas (c)
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 14.43 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 12.41 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)34.7 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)27.3 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	0.82 (max. 2.00)	1.00 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 2.50 (design value)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system:

None

5 Cylinder insulation

Hot water storage Nominal cylinder loss: 0.47 kWh/day
Permitted by DBSCG 0.35 Fail
Primary pipework insulated: No primary pipework

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls:

No cylinderstat

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%
Minimum 75% OK

8 Mechanical ventilation

Continuous supply and extract system
Specific fan power: 0.61
Maximum 1.5 OK
MVHR efficiency: 93%
Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): High Fail
Based on:
Overshading: Average
Windows facing East: 8.58 m², Overhang width less than twice window, ratio 13.71
Windows facing South: 8.44 m², No overhang
Air change rate: 2.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value	0.00 W/m ² K
Door U-value	1.00 W/m ² K
Window U-value	0.80 W/m ² K
Window U-value	0.80 W/m ² K
Air permeability	2.5 m ³ /m ² h

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	72.3500 (1b)	x 2.4000 (2b)	= 173.6400 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.3500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 173.6400 (5)

2. Ventilation rate

					main	secondary	other			total	m3 per hour	
					heating		heating					
Number of chimneys					0	+	0	+	0	=	0 * 40 =	0.0000 (6a)
Number of open flues					0	+	0	+	0	=	0 * 20 =	0.0000 (6b)
Number of intermittent fans											0 * 10 =	0.0000 (7a)
Number of passive vents											0 * 10 =	0.0000 (7b)
Number of flueless gas fires											0 * 40 =	0.0000 (7c)
												Air changes per hour
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =										0.0000 / (5) =	0.0000 (8)	
Pressure test												Yes
Measured/design AP50												2.5000
Infiltration rate												0.1250 (18)
Number of sides sheltered												2 (19)
Shelter factor										(20) = 1 - [0.075 x (19)] =	0.8500 (20)	
Infiltration rate adjusted to include shelter factor										(21) = (18) x (20) =	0.1063 (21)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1355	0.1328	0.1302	0.1169	0.1142	0.1009	0.1009	0.0983	0.1063	0.1142	0.1195	0.1248 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												0.5000 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												65.1000 (23c)
Effective ac	0.3100	0.3073	0.3047	0.2914	0.2887	0.2754	0.2754	0.2728	0.2808	0.2887	0.2940	0.2993 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Window (South) (Uw = 0.80)			17.0200	0.7752	13.1938		(27)					
Door			2.0900	1.0000	2.0900		(26)					
External Wall 1	43.4400	17.0200	26.4200	0.1800	4.7556		(29a)					
Corridor Wall	12.9600	2.0900	10.8700	0.1786	1.9411		(29a)					
Total net area of external elements Aum(A, m2)			56.4000				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	21.9805		(33)					
Party Wall 1			30.7200	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.3668 (36)					
Total fabric heat loss						(33) + (36) =	32.3473 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	17.7616	17.6094	17.4572	16.6961	16.5439	15.7829	15.7829	15.6307	16.0873	16.5439	16.8483	17.1528 (38)
Average = Sum(39)m / 12 =	50.1089	49.9566	49.8044	49.0434	48.8912	48.1302	48.1302	47.9780	48.4346	48.8912	49.1956	49.5000 (39)
												49.0054 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.6926	0.6905	0.6884	0.6779	0.6758	0.6652	0.6652	0.6631	0.6694	0.6758	0.6800	0.6842 (40)
Days in month												0.6773 (40)
	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3018 (42)
Average daily hot water use (litres/day)												88.8677 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	97.7545	94.1998	90.6451	87.0904	83.5357	79.9809	79.9809	83.5357	87.0904	90.6451	94.1998	97.7545 (44)
Energy content (annual)	144.9671	126.7891	130.8350	114.0652	109.4482	94.4455	87.5176	100.4278	101.6272	118.4367	129.2829	140.3929 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		1398.2353 (45)
Water storage loss:	21.7451	19.0184	19.6253	17.1098	16.4172	14.1668	13.1276	15.0642	15.2441	17.7655	19.3924	21.0589 (46)

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Store volume												3.0000 (47)
b) If manufacturer declared loss factor is not known :												
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0461 (51)
Volume factor from Table 2a												3.4200 (52)
Temperature factor from Table 2b												1.0000 (53)
Enter (49) or (54) in (55)												0.4732 (55)
Total storage loss												
14.6692 13.2496 14.6692 14.1960 14.6692 14.1960 14.6692 14.6692 14.1960 14.6692 14.1960 14.6692 (56)												
If cylinder contains dedicated solar storage												
14.6692 13.2496 14.6692 14.1960 14.6692 14.1960 14.6692 14.6692 14.1960 14.6692 14.1960 14.6692 (57)												
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624 (59)
Total heat required for water heating calculated for each month												
182.8987 161.0499 168.7666 150.7732 147.3798 131.1535 125.4492 138.3594 138.3352 156.3683 165.9909 178.3245 (62)												
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Solar input (sum of months) = Sum(63)m =												0.0000 (63)
Output from w/h												
182.8987 161.0499 168.7666 150.7732 147.3798 131.1535 125.4492 138.3594 138.3352 156.3683 165.9909 178.3245 (64)												
Heat gains from water heating, kWh/month												
78.5468 69.5660 73.8479 67.2931 66.7368 60.7695 59.4449 63.7375 63.1574 69.7255 72.3530 77.0259 (65)												

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
(66)m	115.0899	115.0899	115.0899	115.0899	115.0899	115.0899	115.0899	115.0899	115.0899	115.0899	115.0899	115.0899 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
18.0725 16.0518 13.0542 9.8829 7.3876 6.2369 6.7392 8.7599 11.7575 14.9288 17.4241 18.5748 (67)												
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
202.7185 204.8221 199.5211 188.2360 173.9905 160.6018 151.6574 149.5538 154.8547 166.1399 180.3853 193.7740 (68)												
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
34.5090 34.5090 34.5090 34.5090 34.5090 34.5090 34.5090 34.5090 34.5090 34.5090 34.5090 34.5090 (69)												
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)												
-92.0719 -92.0719 -92.0719 -92.0719 -92.0719 -92.0719 -92.0719 -92.0719 -92.0719 -92.0719 -92.0719 -92.0719 (71)												
Water heating gains (Table 5)												
105.5737 103.5209 99.2580 93.4626 89.7000 84.4021 79.8990 85.6687 87.7187 93.7170 100.4902 103.5294 (72)												
Total internal gains												
383.8917 381.9218 369.3603 349.1084 328.6051 308.7678 295.8226 301.5093 311.8579 332.3127 355.8266 373.4052 (73)												

6. Solar gains

[Jan]												
Area	m2											
Solar flux	Table 6a											
Specific data	g											
Specific data	or Table 6b											
FF	Specific data											
Access	factor											
Table 6d												
Gains	W											
East		8.5800		19.6403		0.4200		0.8000		0.7700		39.2380 (76)
South		8.4400		46.7521		0.4200		0.8000		0.7700		91.8789 (78)
Solar gains	131.1169	227.2318	318.0864	400.9972	451.6896	448.5431	432.4670	395.2894	347.2487	253.3800	157.8330	111.6593 (83)
Total gains	515.0086	609.1536	687.4467	750.1057	780.2947	757.3109	728.2896	696.7987	659.1065	585.6927	513.6597	485.0645 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	100.2678	100.5733	100.8807	102.4461	102.7650	104.3899	104.3899	104.7211	103.7338	102.7650	102.1291	101.5011
alpha	7.6845	7.7049	7.7254	7.8297	7.8510	7.9593	7.9593	7.9814	7.9156	7.8510	7.8086	7.7667
util living area												
0.9906 0.9687 0.9060 0.7609 0.5792 0.4066 0.2908 0.3167 0.5059 0.8153 0.9710 0.9936 (86)												
MIT	20.5375	20.6965	20.8592	20.9678	20.9961	20.9998	21.0000	21.0000	20.9989	20.9560	20.7373	20.5041 (87)
Th 2	20.3474	20.3492	20.3511	20.3604	20.3623	20.3716	20.3716	20.3735	20.3679	20.3623	20.3586	20.3548 (88)
util rest of house												
0.9880 0.9610 0.8869 0.7280 0.5407 0.3667 0.2493 0.2736 0.4601 0.7788 0.9625 0.9918 (89)												
MIT 2	19.7350	19.9625	20.1848	20.3272	20.3590	20.3715	20.3716	20.3735	20.3672	20.3182	20.0304	19.6930 (90)
Living area fraction												
fLA = Living area / (4) =												0.4409 (91)
MIT	20.0888	20.2861	20.4821	20.6097	20.6399	20.6485	20.6487	20.6497	20.6457	20.5994	20.3421	20.0506 (92)
Temperature adjustment												0.0000
adjusted MIT	20.0888	20.2861	20.4821	20.6097	20.6399	20.6485	20.6487	20.6497	20.6457	20.5994	20.3421	20.0506 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.9868 0.9602 0.8910 0.7411 0.5575 0.3843 0.2676 0.2926 0.4803 0.7929 0.9623 0.9907 (94)													
Useful gains	508.2089	584.8828	612.5283	555.9172	435.0376	291.0280	194.8598	203.8850	316.5363	464.3676	494.2840	480.5774 (95)	
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)	
Heat loss rate W													
791.1593 768.6400 696.3722 574.2826 437.0811 291.1168 194.8638 203.8930 317.0386 488.8850 651.4513 784.6052 (97)													
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)	
Space heating kWh													
210.5151 123.4848 62.3798 13.2231 1.5204 0.0000 0.0000 0.0000 0.0000 18.2409 113.1604 226.1967 (98)													
Space heating													
Space heating per m2													10.6250 (99)

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8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Boilers	1.0000	(303a)
Fraction of total space heat from community Boilers	1.0000	(304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000	(305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.0500	(306)
Space heating:		
Annual space heating requirement	768.7213	(98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05	807.1574	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	(309)
Water heating		
Annual water heating requirement	1844.8492	(64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05	1937.0917	(310a)
Electricity used for heat distribution	27.4425	(313)
Annual totals kWh/year		
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.8540)		
mechanical ventilation fans (SFP = 0.8540)	180.9120	(330a)
Total electricity for the above, kWh/year	180.9120	(331)
Electricity for lighting (calculated in Appendix L)	319.1660	(332)
Total delivered energy for all uses	3244.3271	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Boilers			95.0000 (367a)
Space heating from Boilers	2888.6832	0.2160	623.9556 (367)
Electrical energy for heat distribution	27.4425	0.5190	14.2427 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			638.1982 (373)
Space and water heating			638.1982 (376)
Pumps and fans	180.9120	0.5190	93.8934 (378)
Energy for lighting	319.1660	0.5190	165.6472 (379)
Total CO2, kg/year			897.7387 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			12.4100 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER	12.4100	ZC1
Total Floor Area	72.3500	TFA
Assumed number of occupants	2.3018	N
CO2 emission factor in Table 12 for electricity displaced from grid	0.5190	EF
CO2 emissions from appliances, equation (L14)	16.6036	ZC2
CO2 emissions from cooking, equation (L16)	2.4083	ZC3
Total CO2 emissions	31.4219	ZC4
Residual CO2 emissions offset from biofuel CHP	0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year	0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation	0.0000	ZC7
Net CO2 emissions	31.4219	ZC8

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1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	72.3500 (1b)	x 2.4000 (2b)	= 173.6400 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.3500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 173.6400 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour
Pressure test					30.0000 / (5) = 0.1728 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.4228 (18)
					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3594 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4582	0.4492	0.4402	0.3953	0.3863	0.3414	0.3414	0.3324	0.3594	0.3863	0.4043	0.4222 (22b)
Effective ac	0.6050	0.6009	0.5969	0.5781	0.5746	0.5583	0.5583	0.5552	0.5646	0.5746	0.5817	0.5891 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Opaque door			2.0900	1.0000	2.0900			(26)				
TER Opening Type (Uw = 1.40)			16.0000	1.3258	21.2121			(27)				
External Wall 1	43.4400	16.0000	27.4400	0.1800	4.9392			(29a)				
Corridor Wall	12.9600	2.0900	10.8700	0.1800	1.9566			(29a)				
Total net area of external elements Aum(A, m2)			56.4000					(31)				
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	30.1979		(33)				
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K									250.0000 (35)			
Thermal bridges (Sum(L x Psi) calculated using Appendix K)									5.7250 (36)			
Total fabric heat loss						(33) + (36) =	35.9229	(37)				
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	34.6651	34.4316	34.2027	33.1274	32.9262	31.9897	31.9897	31.8163	32.3504	32.9262	33.3332	33.7587 (38)
	70.5881	70.3545	70.1256	69.0503	68.8491	67.9126	67.9126	67.7392	68.2734	68.8491	69.2561	69.6816 (39)
Average = Sum(39)m / 12 =												69.0494 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.9756	0.9724	0.9693	0.9544	0.9516	0.9387	0.9387	0.9363	0.9437	0.9516	0.9572	0.9631 (40)
Days in month												0.9544 (40)
	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3018 (42)
Average daily hot water use (litres/day)												88.8677 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	97.7545	94.1998	90.6451	87.0904	83.5357	79.9809	79.9809	83.5357	87.0904	90.6451	94.1998	97.7545 (44)
Energy conte	144.9671	126.7891	130.8350	114.0652	109.4482	94.4455	87.5176	100.4278	101.6272	118.4367	129.2829	140.3929 (45)
Energy content (annual)											Total = Sum(45)m =	1398.2353 (45)
Distribution loss (46)m = 0.15 x (45)m												
	21.7451	19.0184	19.6253	17.1098	16.4172	14.1668	13.1276	15.0642	15.2441	17.7655	19.3924	21.0589 (46)
Water storage loss:												
Store volume												3.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												0.2602 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.1405 (55)
Total storage loss												

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If cylinder contains dedicated solar storage	4.3553	3.9338	4.3553	4.2148	4.3553	4.2148	4.3553	4.3553	4.2148	4.3553	4.2148	4.3553 (56)
Primary loss	4.3553	3.9338	4.3553	4.2148	4.3553	4.2148	4.3553	4.3553	4.2148	4.3553	4.2148	4.3553 (57)
Total heat required for water heating calculated for each month	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Solar input	172.5848	151.7341	158.4527	140.7919	137.0659	121.1723	115.1353	128.0454	128.3540	146.0544	156.0097	168.0106 (62)
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Heat gains from water heating, kWh/month	172.5848	151.7341	158.4527	140.7919	137.0659	121.1723	115.1353	128.0454	128.3540	146.0544	156.0097	168.0106 (64)
	70.2957	62.1134	65.5968	59.3081	58.4857	52.7846	51.1938	55.4864	55.1725	61.4743	64.3680	68.7748 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)
(66)m	115.0899	115.0899	115.0899	115.0899	115.0899	115.0899	115.0899	115.0899	115.0899	115.0899	115.0899	115.0899	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.0760	16.0549	13.0567	9.8848	7.3890	6.2381	6.7405	8.7615	11.7597	14.9317	17.4274	18.5783	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	202.7185	204.8221	199.5211	188.2360	173.9905	160.6018	151.6574	149.5538	154.8547	166.1399	180.3853	193.7740	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5090	34.5090	34.5090	34.5090	34.5090	34.5090	34.5090	34.5090	34.5090	34.5090	34.5090	34.5090	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-92.0719	-92.0719	-92.0719	-92.0719	-92.0719	-92.0719	-92.0719	-92.0719	-92.0719	-92.0719	-92.0719	-92.0719	(71)
Water heating gains (Table 5)	94.4835	92.4306	88.1677	82.3723	78.6098	73.3119	68.8088	74.5785	76.6284	82.6268	89.4000	92.4392	(72)
Total internal gains	375.8049	373.8346	361.2725	341.0201	320.5163	300.6788	287.7336	293.4207	303.7699	324.2253	347.7397	365.3185	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d	Gains W
East					8.0700	19.6403	0.6300	0.7000			0.7700	48.4387
South					7.9300	46.7521	0.6300	0.7000			0.7700	113.3041 (76)

Solar gains	161.7429	280.3194	392.4247	494.7444	557.3115	553.4382	533.5990	487.7118	428.4139	312.5836	194.7014	137.7389 (83)
Total gains	537.5477	654.1540	753.6972	835.7645	877.8278	854.1170	821.3326	781.1325	732.1837	636.8089	542.4412	503.0574 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	71.1778	71.4141	71.6473	72.7630	72.9756	73.9819	73.9819	74.1713	73.5910	72.9756	72.5467	72.1038	
alpha	5.7452	5.7609	5.7765	5.8509	5.8650	5.9321	5.9321	5.9448	5.9061	5.8650	5.8364	5.8069	
util living area	0.9940	0.9817	0.9472	0.8539	0.6944	0.5043	0.3632	0.3979	0.6256	0.8994	0.9843	0.9958	(86)
MIT	20.1359	20.3420	20.5934	20.8360	20.9586	20.9947	20.9994	20.9989	20.9824	20.8070	20.4232	20.1000	(87)
Th 2	20.1037	20.1064	20.1090	20.1215	20.1239	20.1348	20.1348	20.1368	20.1306	20.1239	20.1191	20.1142	(88)
util rest of house	0.9921	0.9763	0.9326	0.8198	0.6398	0.4382	0.2921	0.3238	0.5540	0.8665	0.9788	0.9944	(89)
MIT 2	18.9604	19.2592	19.6147	19.9448	20.0876	20.1315	20.1345	20.1364	20.1184	19.9189	19.3887	18.9162	(90)
Living area fraction	19.4787	19.7366	20.0462	20.3377	20.4716	20.5121	20.5158	20.5167	20.4994	20.3105	19.8448	19.4381	(92)
Temperature adjustment	19.4787	19.7366	20.0462	20.3377	20.4716	20.5121	20.5158	20.5167	20.4994	20.3105	19.8448	19.4381	(93)
adjusted MIT	19.4787	19.7366	20.0462	20.3377	20.4716	20.5121	20.5158	20.5167	20.4994	20.3105	19.8448	19.4381	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9904	0.9736	0.9314	0.8288	0.6620	0.4672	0.3235	0.3565	0.5850	0.8743	0.9767	0.9931	(94)
Ext temp.	532.4062	636.8787	702.0222	692.6829	581.1586	399.0785	265.7115	278.4672	428.3143	556.7471	529.7905	499.5777	(95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Month fracti	1071.4365	1043.8222	949.9367	789.7779	603.9191	401.5082	265.9353	278.8604	436.9070	668.5593	882.6581	1061.8184	(97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating per m2	401.0386	273.4660	184.4484	69.9084	16.9337	0.0000	0.0000	0.0000	0.0000	83.1883	254.0647	418.3070	(98)
												1701.3550	(98)
												23.5156	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1819.6310 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	401.0386	273.4660	184.4484	69.9084	16.9337	0.0000	0.0000	0.0000	0.0000	83.1883	254.0647	418.3070	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	428.9183	292.4770	197.2710	74.7683	18.1110	0.0000	0.0000	0.0000	0.0000	88.9714	271.7269	447.3872	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	172.5848	151.7341	158.4527	140.7919	137.0659	121.1723	115.1353	128.0454	128.3540	146.0544	156.0097	168.0106	(64)
Efficiency of water heater (217)m	86.9906	86.3674	85.2198	83.0582	80.8511	79.8000	79.8000	79.8000	79.8000	83.3773	86.1075	87.1514	(217)
Fuel for water heating, kWh/month	198.3947	175.6844	185.9342	169.5099	169.5288	151.8450	144.2798	160.4580	160.8446	175.1729	181.1801	192.7800	(219)
Water heating fuel used												2065.6124	(219)
Annual totals kWh/year													
Space heating fuel - main system												1819.6310	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												319.2270	(232)
Total delivered energy for all uses												4279.4704	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1819.6310	0.2160	393.0403 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2065.6124	0.2160	446.1723 (264)
Space and water heating			839.2126 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	319.2270	0.5190	165.6788 (268)
Total CO2, kg/m2/year			1043.8164 (272)
Emissions per m2 for space and water heating			11.5993 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.2900 (272b)
Emissions per m2 for pumps and fans			0.5380 (272c)
Target Carbon Dioxide Emission Rate (TER) = (11.5993 * 1.00) + 2.2900 + 0.5380, rounded to 2 d.p.			14.4300 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



Property Reference	Type 4 - Option 5 (Gas Boiler)				Issued on Date	18/07/2023
Assessment Reference	St Ann's Type 4	Prop Type Ref	St Ann's Type 4			
Property	Type 4 - 3B - First (Exposed)					
SAP Rating	86 B	DER	12.65	TER	15.49	
Environmental	90 B	% DER<TER	18.35			
CO ₂ Emissions (t/year)	1.00	DFEE	34.99	TFEE	45.98	
General Requirements Compliance	Fail	% DFEE<TFEE	23.89			
Assessor Details	Miss Eleanor Ballinger, Eleanor Ballinger, Tel: 02036031625, Eleanor@hodkinsonconsultancy.com				Assessor ID	M976-0001
Client						

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Mid-floor flat, total floor area 92 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Mains gas (c)
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 15.49 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 12.65 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)46.0 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)35.0 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.13 (max. 0.25)	0.13 (max. 0.70)	OK
Roof	(no roof)		
Openings	0.82 (max. 2.00)	1.00 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 2.50 (design value)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Community heating scheme -
Secondary heating system: None

5 Cylinder insulation

Hot water storage Nominal cylinder loss: 0.22 kWh/day
Permitted by DBSCG 0.35 OK
Primary pipework insulated: No primary pipework

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK
Hot water controls: No cylinderstat

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%
Minimum 75% OK

8 Mechanical ventilation

Continuous supply and extract system
Specific fan power: 0.66
Maximum 1.5 OK
MVHR efficiency: 93%
Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): High Fail
Based on:
Overshading: Average
Windows facing South: 8.65 m², No overhang
Windows facing West: 13.28 m², No overhang
Air change rate: 2.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Door U-value 1.00 W/m²K
Window U-value 0.80 W/m²K
Air permeability 2.5 m³/m²h

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	91.5100 (1b)	x 2.4000 (2b)	= 219.6240 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	91.5100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 219.6240 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					2.5000
Infiltration rate					0.1250 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1063 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1355	0.1328	0.1302	0.1169	0.1142	0.1009	0.1009	0.0983	0.1063	0.1142	0.1195	0.1248 (22b)
Balanced mechanical ventilation with heat recovery												0.5000 (23a)
If mechanical ventilation:												79.0500 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.2402	0.2376	0.2349	0.2216	0.2190	0.2057	0.2057	0.2030	0.2110	0.2190	0.2243	0.2296 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Window (south) (Uw = 0.80)			21.9300	0.7752	17.0000		(27)
Door			2.0900	1.0000	2.0900		(26)
Heat Loss Floor 1			91.5100	0.1300	11.8963		(28b)
External Wall 1	47.2800	21.9300	25.3500	0.1800	4.5630		(29a)
Corridor Wall	14.6400	2.0900	12.5500	0.1786	2.2411		(29a)
Total net area of external elements Aum(A, m ²)			153.4300				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	37.7904			(33)
Party Wall 1			33.6000	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							100.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							14.7664 (36)
Total fabric heat loss							(33) + (36) = 52.5568 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	17.4101	17.2176	17.0250	16.0625	15.8700	14.9074	14.9074	14.7149	15.2924	15.8700	16.2550	16.6400 (38)
Average = Sum(39)m / 12 =	69.9668	69.7743	69.5818	68.6192	68.4267	67.4642	67.4642	67.2716	67.8492	68.4267	68.8118	69.1968 (39)
												68.5711 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.7646	0.7625	0.7604	0.7499	0.7478	0.7372	0.7372	0.7351	0.7414	0.7478	0.7520	0.7562 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.6458 (42)
Average daily hot water use (litres/day)												97.0385 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	106.7423	102.8608	98.9792	95.0977	91.2161	87.3346	87.3346	91.2161	95.0977	98.9792	102.8608	106.7423 (44)
Energy content (annual)	158.2957	138.4465	142.8644	124.5526	119.5112	103.1291	95.5642	109.6614	110.9711	129.3261	141.1695	153.3010 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 1526.7927 (45)
	23.7444	20.7670	21.4297	18.6829	17.9267	15.4694	14.3346	16.4492	16.6457	19.3989	21.1754	22.9951 (46)

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Water storage loss:												
Store volume											3.0000 (47)	
b) If manufacturer declared loss factor is not known :												
Hot water storage loss factor from Table 2 (kWh/litre/day)											0.0212 (51)	
Volume factor from Table 2a											3.4200 (52)	
Temperature factor from Table 2b											1.0000 (53)	
Enter (49) or (54) in (55)											0.2173 (55)	
Total storage loss	6.7353	6.0835	6.7353	6.5180	6.7353	6.5180	6.7353	6.7353	6.5180	6.7353	6.5180	6.7353 (56)
If cylinder contains dedicated solar storage	6.7353	6.0835	6.7353	6.5180	6.7353	6.5180	6.7353	6.7353	6.5180	6.7353	6.5180	6.7353 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	188.2934	165.5412	172.8620	153.5826	149.5089	132.1591	125.5619	139.6591	140.0011	159.3238	170.1996	183.2987 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
	Solar input (sum of months) = Sum(63)m =										0.0000 (63)	
Output from w/h	188.2934	165.5412	172.8620	153.5826	149.5089	132.1591	125.5619	139.6591	140.0011	159.3238	170.1996	183.2987 (64)
	Total per year (kWh/year) = Sum(64)m =										1879.9913 (64)	
Heat gains from water heating, kWh/month	76.6315	67.7092	71.5006	64.6378	63.7356	57.5144	55.7733	60.4606	60.1219	66.9991	70.1629	74.9707 (66)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	132.2915	132.2915	132.2915	132.2915	132.2915	132.2915	132.2915	132.2915	132.2915	132.2915	132.2915	132.2915 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	21.5592	19.1487	15.5727	11.7896	8.8128	7.4402	8.0394	10.4499	14.0258	17.8090	20.7857	22.1584 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	241.8285	244.3379	238.0142	224.5519	207.5581	191.5864	180.9162	178.4068	184.7305	198.1928	215.1866	231.1583 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.2291	36.2291	36.2291	36.2291	36.2291	36.2291	36.2291	36.2291	36.2291	36.2291	36.2291	36.2291 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-105.8332	-105.8332	-105.8332	-105.8332	-105.8332	-105.8332	-105.8332	-105.8332	-105.8332	-105.8332	-105.8332	-105.8332 (71)
Water heating gains (Table 5)	102.9993	100.7577	96.1029	89.7747	85.6662	79.8812	74.9641	81.2642	83.5026	90.0525	97.4485	100.7671 (72)
Total internal gains	429.0744	426.9317	412.3773	388.8036	364.7246	341.5951	326.6071	332.8083	344.9464	368.7418	396.1082	416.7713 (73)

[Jan]					Area	Solar flux	g	FF			Access	Gains	
					m2	Table 6a	or Table 6b	Specific data	Specific data			factor	W
						W/m2		or Table 6c	or Table 6c			Table 6d	
South					8.6500	46.7521	0.4200		0.8000			0.7700	94.1650 (78)
West					13.2800	19.6403	0.4200		0.8000			0.7700	60.7320 (80)
Solar gains	154.8970	273.0227	392.1009	507.3775	581.0736	580.6462	588.3698	504.0304	432.7657	307.3104	187.3433	131.3103 (83)	
Total gains	583.9714	699.9545	804.4782	896.1810	945.7981	922.2414	884.9769	836.8388	777.7121	676.0522	583.4515	548.0816 (84)	

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	36.3307	36.4309	36.5317	37.0442	37.1484	37.6784	37.6784	37.7863	37.4646	37.1484	36.9406	36.7350
alpha	3.4220	3.4287	3.4354	3.4696	3.4766	3.5119	3.5119	3.5191	3.4976	3.4766	3.4627	3.4490
util living area	0.9511	0.9151	0.8531	0.7457	0.6060	0.4503	0.3306	0.3627	0.5568	0.7961	0.9209	0.9590 (86)
MIT	19.6187	19.9112	20.2718	20.6329	20.8566	20.9624	20.9902	20.9864	20.9200	20.6066	20.0506	19.5601 (87)
Th 2	20.2841	20.2860	20.2878	20.2970	20.2998	20.3081	20.3081	20.3099	20.3044	20.2988	20.2952	20.2915 (88)
util rest of house	0.9452	0.9055	0.8373	0.7207	0.5708	0.4060	0.2803	0.3106	0.5103	0.7694	0.9102	0.9540 (89)
MIT 2	18.4149	18.8335	19.3432	19.8451	20.1377	20.2725	20.3010	20.2996	20.2241	19.8220	19.0450	18.3358 (90)
Living area fraction									fLA = Living area / (4) =			0.1929 (91)
MIT	18.6471	19.0414	19.5223	19.9970	20.2764	20.4056	20.4339	20.4321	20.3584	19.9733	19.2390	18.5719 (92)
Temperature adjustment												0.0000
adjusted MIT	18.6471	19.0414	19.5223	19.9970	20.2764	20.4056	20.4339	20.4321	20.3584	19.9733	19.2390	18.5719 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9279	0.8854	0.8182	0.7093	0.5697	0.4124	0.2895	0.3199	0.5140	0.7557	0.8910	0.9381 (94)
Useful gains	541.8757	619.7467	658.2427	635.6961	538.7979	380.2958	256.2064	267.7438	399.7714	510.9241	519.8498	514.1716 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	1003.8219	986.7038	906.1144	761.4683	586.8534	391.6686	258.6507	271.2439	424.6246	641.3851	835.3044	994.4899 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	343.6880	246.5952	184.4166	90.5560	35.7533	0.0000	0.0000	0.0000	0.0000	97.0630	227.1274	357.3568 (98)
Space heating												1582.5562 (98)
Space heating per m2												17.2938 (99)
										(98) / (4) =		

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Boilers	1.0000	(303a)
Fraction of total space heat from community Boilers	1.0000	(304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000	(305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.0500	(306)
Space heating:		
Annual space heating requirement	1582.5562	(98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05	1661.6840	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	(309)
Water heating		
Annual water heating requirement	1879.9913	(64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05	1973.9909	(310a)
Electricity used for heat distribution	36.3567	(313)
Annual totals kWh/year		
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.8250)		
mechanical ventilation fans (SFP = 0.8250)	221.0516	(330a)
Total electricity for the above, kWh/year	221.0516	(331)
Electricity for lighting (calculated in Appendix L)	380.7419	(332)
Total delivered energy for all uses	4237.4684	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Boilers			95.0000 (367a)
Space heating from Boilers	3827.0263	0.2160	826.6377 (367)
Electrical energy for heat distribution	36.3567	0.5190	18.8692 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			845.5068 (373)
Space and water heating			845.5068 (376)
Pumps and fans	221.0516	0.5190	114.7258 (378)
Energy for lighting	380.7419	0.5190	197.6051 (379)
Total CO2, kg/year			1157.8376 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			12.6500 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		12.6500	ZC1
Total Floor Area	TFA	91.5100	
Assumed number of occupants	N	2.6458	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		15.6598	ZC2
CO2 emissions from cooking, equation (L16)		1.9943	ZC3
Total CO2 emissions		30.3041	ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000	ZC7
Net CO2 emissions		30.3041	ZC8

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	91.5100 (1b)	x 2.4000 (2b)	= 219.6240 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	91.5100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 219.6240 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour 30.0000 / (5) = 0.1366 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3866 (18)
Number of sides sheltered					2 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.8500 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3286 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4190	0.4108	0.4025	0.3615	0.3533	0.3122	0.3122	0.3040	0.3286	0.3533	0.3697	0.3861 (22b)
	0.5878	0.5844	0.5810	0.5653	0.5624	0.5487	0.5487	0.5462	0.5540	0.5624	0.5683	0.5745 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.0900	1.0000	2.0900		(26)
TER Opening Type (Uw = 1.40)			20.8000	1.3258	27.5758		(27)
Heat Loss Floor 1			91.5100	0.1300	11.8963		(28b)
External Wall 1	47.2800	20.8000	26.4800	0.1800	4.7664		(29a)
Corridor Wall	14.6400	2.0900	12.5500	0.1800	2.2590		(29a)
Total net area of external elements Aum(A, m ²)			153.4300				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		48.5875		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							13.7040 (36)
Total fabric heat loss						(33) + (36) =	62.2915 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	42.5992	42.3521	42.1100	40.9728	40.7600	39.7695	39.7695	39.5861	40.1510	40.7600	41.1905	41.6405 (38)
Heat transfer coeff	104.8906	104.6436	104.4015	103.2642	103.0515	102.0610	102.0610	101.8775	102.4425	103.0515	103.4819	103.9319 (39)
Average = Sum(39)m / 12 =												103.2632 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1462	1.1435	1.1409	1.1284	1.1261	1.1153	1.1153	1.1133	1.1195	1.1261	1.1308	1.1357 (40)
HLP (average)												1.1284 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.6458 (42)
Average daily hot water use (litres/day)												97.0385 (43)
Daily hot water use	106.7423	102.8608	98.9792	95.0977	91.2161	87.3346	87.3346	91.2161	95.0977	98.9792	102.8608	106.7423 (44)
Energy conte	158.2957	138.4465	142.8644	124.5526	119.5112	103.1291	95.5642	109.6614	110.9711	129.3261	141.1695	153.3010 (45)
Energy content (annual)										Total = Sum(45)m =		1526.7927 (45)
Distribution loss (46)m = 0.15 x (45)m	23.7444	20.7670	21.4297	18.6829	17.9267	15.4694	14.3346	16.4492	16.6457	19.3989	21.1754	22.9951 (46)
Water storage loss:												3.0000 (47)
Store volume												0.2602 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.1405 (55)
Enter (49) or (54) in (55)												

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Total storage loss	4.3553	3.9338	4.3553	4.2148	4.3553	4.2148	4.3553	4.3553	4.2148	4.3553	4.2148	4.3553 (56)
If cylinder contains dedicated solar storage	4.3553	3.9338	4.3553	4.2148	4.3553	4.2148	4.3553	4.3553	4.2148	4.3553	4.2148	4.3553 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	185.9134	163.3915	170.4820	151.2794	147.1289	129.8559	123.1819	137.2790	137.6979	156.9438	167.8963	180.9186 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	185.9134	163.3915	170.4820	151.2794	147.1289	129.8559	123.1819	137.2790	137.6979	156.9438	167.8963	180.9186 (64)
Heat gains from water heating, kWh/month	74.7275	65.9894	69.5965	62.7952	61.8316	55.6718	53.8692	58.5565	58.2793	65.0951	68.3203	73.0667 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	132.2915	132.2915	132.2915	132.2915	132.2915	132.2915	132.2915	132.2915	132.2915	132.2915	132.2915	132.2915 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	21.5592	19.1487	15.5727	11.7896	8.8128	7.4402	8.0394	10.4499	14.0258	17.8090	20.7857	22.1584 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	241.8285	244.3379	238.0142	224.5519	207.5581	191.5864	180.9162	178.4068	184.7305	198.1928	215.1866	231.1583 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.2291	36.2291	36.2291	36.2291	36.2291	36.2291	36.2291	36.2291	36.2291	36.2291	36.2291	36.2291 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-105.8332	-105.8332	-105.8332	-105.8332	-105.8332	-105.8332	-105.8332	-105.8332	-105.8332	-105.8332	-105.8332	-105.8332 (71)
Water heating gains (Table 5)	100.4402	98.1986	93.5437	87.2155	83.1070	77.3220	72.4049	78.7050	80.9435	87.4934	94.8893	98.2079 (72)
Total internal gains	429.5152	427.3726	412.8181	389.2444	365.1654	342.0360	327.0480	333.2492	345.3872	369.1826	396.5490	417.2121 (73)

6. Solar gains

[Jan]						Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W
South						8.2000	46.7521	0.6300	0.7000	0.7700		117.1619 (78)
West						12.6000	19.6403	0.6300	0.7000	0.7700		75.6292 (80)
Solar gains	192.7911	339.8279	488.0697	631.5955	723.3588	722.8359	695.1007	627.4390	538.7000	382.5131	233.1776	163.4325 (83)
Total gains	622.3064	767.2004	900.8879	1020.8399	1088.5242	1064.8719	1022.1487	960.6882	884.0872	751.6957	629.7266	580.6446 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	60.5856	60.7286	60.8695	61.5398	61.6669	62.2653	62.2653	62.3774	62.0334	61.6669	61.4104	61.1445
alpha	5.0390	5.0486	5.0580	5.1027	5.1111	5.1510	5.1510	5.1585	5.1356	5.1111	5.0940	5.0763
util living area	0.9965	0.9896	0.9694	0.9079	0.7789	0.5933	0.4358	0.4816	0.7315	0.9450	0.9916	0.9975 (86)
MIT	19.8379	20.0490	20.3415	20.6676	20.8861	20.9779	20.9962	20.9938	20.9379	20.6275	20.1617	19.7993 (87)
Th 2	19.9633	19.9654	19.9676	19.9777	19.9796	19.9884	19.9884	19.9900	19.9850	19.9796	19.9757	19.9717 (88)
util rest of house	0.9953	0.9863	0.9595	0.8798	0.7208	0.5080	0.3375	0.3791	0.6483	0.9216	0.9883	0.9967 (89)
MIT 2	18.4237	18.7317	19.1520	19.6068	19.8760	19.9748	19.9871	19.9876	19.9401	19.5662	18.9047	18.3735 (90)
Living area fraction									fLA = Living area / (4) =			0.1929 (91)
MIT	18.6964	18.9858	19.3814	19.8114	20.0708	20.1682	20.1817	20.1817	20.1326	19.7709	19.1471	18.6485 (92)
Temperature adjustment												0.0000
adjusted MIT	18.6964	18.9858	19.3814	19.8114	20.0708	20.1682	20.1817	20.1817	20.1326	19.7709	19.1471	18.6485 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9932	0.9819	0.9523	0.8745	0.7264	0.5237	0.3565	0.3989	0.6614	0.9157	0.9845	0.9951 (94)
Useful gains	618.0856	753.3184	857.8954	892.6987	790.7522	557.6402	364.3732	383.1918	584.7212	688.3198	619.9634	577.7728 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	1510.0518	1473.9853	1344.8418	1126.7538	862.6242	568.2987	365.5515	385.2703	617.9902	945.0763	1246.6593	1501.6641 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	663.6229	484.2882	362.2881	168.5197	53.4728	0.0000	0.0000	0.0000	0.0000	191.0268	451.2211	687.3751 (98)
Space heating												3061.8148 (98)
Space heating per m2										(98) / (4) =		33.4588 (99)

8c. Space cooling requirement

Not applicable

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3274.6682 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	663.6229	484.2882	362.2881	168.5197	53.4728	0.0000	0.0000	0.0000	0.0000	191.0268	451.2211	687.3751	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	709.7571	517.9553	387.4740	180.2350	57.1902	0.0000	0.0000	0.0000	0.0000	204.3068	482.5894	735.1606	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	185.9134	163.3915	170.4820	151.2794	147.1289	129.8559	123.1819	137.2790	137.6979	156.9438	167.8963	180.9186	(64)
Efficiency of water heater (217)m	87.9201	87.5389	86.7767	85.1021	82.3968	79.8000	79.8000	79.8000	79.8000	85.3390	87.3247	88.0403	(216)
Fuel for water heating, kWh/month	211.4572	186.6501	196.4605	177.7622	178.5613	162.7266	154.3633	172.0289	172.5537	183.9062	192.2667	205.4952	(219)
Water heating fuel used												2194.2319	(219)
Annual totals kWh/year													
Space heating fuel - main system												3274.6682	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												380.7419	(232)
Total delivered energy for all uses												5924.6420	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3274.6682	0.2160	707.3283 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2194.2319	0.2160	473.9541 (264)
Space and water heating			1181.2824 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	380.7419	0.5190	197.6051 (268)
Total CO2, kg/m2/year			1417.8125 (272)
Emissions per m2 for space and water heating			12.9088 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.1594 (272b)
Emissions per m2 for pumps and fans			0.4254 (272c)
Target Carbon Dioxide Emission Rate (TER) = (12.9088 * 1.00) + 2.1594 + 0.4254, rounded to 2 d.p.			15.4900 (273)

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Property Reference	Type 5 - Option 5 (Gas Boiler)				Issued on Date	18/07/2023
Assessment Reference	St Ann's Type 5	Prop Type Ref	St Ann's Type 5			
Property	Type 5 - 1B - Mid					
SAP Rating	85 B	DER	13.46	TER	16.36	
Environmental	91 B	% DER<TER	17.72			
CO ₂ Emissions (t/year)	0.61	DFEE	29.77	TFEE	36.61	
General Requirements Compliance	Fail	% DFEE<TFEE	18.69			
Assessor Details	Miss Eleanor Ballinger, Eleanor Ballinger, Tel: 02036031625, Eleanor@hodkinsonconsultancy.com				Assessor ID	M976-0001
Client						

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Mid-floor flat, total floor area 52 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating: Mains gas (c)
Fuel factor: 1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 16.36 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 13.46 kgCO₂/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 36.6 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 29.8 kWh/m²/yr OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	0.83 (max. 2.00)	1.00 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 2.50 (design value)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system:

None

5 Cylinder insulation

Hot water storage
Permitted by DBSCG 0.35
Primary pipework insulated: Nominal cylinder loss: 0.22 kWh/day
OK
No primary pipework

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room stats OK

Hot water controls:

No cylinder stat

7 Low energy lights

Percentage of fixed lights with low-energy fittings: 100%
Minimum 75% OK

8 Mechanical ventilation

Continuous supply and extract system
Specific fan power: 0.68
Maximum 1.5 OK
MVHR efficiency: 87%
Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): High Fail
Based on:
Overshading: Average
Windows facing East: 9.97 m², No overhang
Air change rate: 2.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Door U-value 1.00 W/m²K
Window U-value 0.80 W/m²K
Air permeability 2.5 m³/m²h

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	52.1600 (1b)	x 2.4000 (2b)	= 125.1840 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.1600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 125.1840 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					2.5000
Infiltration rate					0.1250 (18)
Number of sides sheltered					3 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.0969 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1235	0.1211	0.1187	0.1066	0.1041	0.0920	0.0920	0.0896	0.0969	0.1041	0.1090	0.1138 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												0.5000 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												73.9500 (23c)
Effective ac	0.2538	0.2513	0.2489	0.2368	0.2344	0.2223	0.2223	0.2199	0.2271	0.2344	0.2392	0.2441 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Window (Uw = 0.80)			9.9700	0.7752	7.7287		(27)
Door			2.0900	1.0000	2.0900		(26)
External Wall 1	23.0400	9.9700	13.0700	0.1800	2.3526		(29a)
Corridor Wall	19.4400	2.0900	17.3500	0.1786	3.0982		(29a)
Total net area of external elements Aum(A, m ²)			42.4800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	15.2695		(33)
Party Wall 1			32.6400	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.8716 (36)
Total fabric heat loss						(33) + (36) =	23.1411 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	10.4832	10.3832	10.2831	9.7829	9.6828	9.1826	9.1826	9.0825	9.3827	9.6828	9.8829	10.0830 (38)
Heat transfer coeff	33.6243	33.5243	33.4242	32.9240	32.8239	32.3237	32.3237	32.2236	32.5238	32.8239	33.0240	33.2241 (39)
Average = Sum(39)m / 12 =												32.8990 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.6446	0.6427	0.6408	0.6312	0.6293	0.6197	0.6197	0.6178	0.6235	0.6293	0.6331	0.6370 (40)
HLP (average)												0.6307 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	1.7538 (42)
Average daily hot water use (litres/day)	75.8525 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	83.4378	80.4037	77.3696	74.3355	71.3014	68.2673	68.2673	71.3014	74.3355	77.3696	80.4037	83.4378 (44)
Energy conte	123.7358	108.2201	111.6735	97.3597	93.4189	80.6134	74.7002	85.7196	86.7433	101.0910	110.3487	119.8315 (45)
Energy content (annual)										Total = Sum(45)m =		1193.4558 (45)
Distribution loss (46)m = 0.15 x (45)m	18.5604	16.2330	16.7510	14.6039	14.0128	12.0920	11.2050	12.8579	13.0115	15.1636	16.5523	17.9747 (46)
Water storage loss:												

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Store volume												3.0000 (47)
b) If manufacturer declared loss factor is not known :												
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0212 (51)
Volume factor from Table 2a												3.4200 (52)
Temperature factor from Table 2b												1.0000 (53)
Enter (49) or (54) in (55)												0.2173 (55)
Total storage loss												
6.7353 6.0835 6.7353 6.5180 6.7353 6.5180 6.7353 6.7353 6.5180 6.7353 6.5180 6.7353 (56)												
If cylinder contains dedicated solar storage												
6.7353 6.0835 6.7353 6.5180 6.7353 6.5180 6.7353 6.7353 6.5180 6.7353 6.5180 6.7353 (57)												
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month												
153.7335 135.3148 141.6712 126.3897 123.4166 109.6434 104.6979 115.7172 115.7733 131.0887 139.3787 149.8292 (62)												
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Solar input (sum of months) = Sum(63)m =												0.0000 (63)
Output from w/h												
153.7335 135.3148 141.6712 126.3897 123.4166 109.6434 104.6979 115.7172 115.7733 131.0887 139.3787 149.8292 (64)												
Heat gains from water heating, kWh/month												
65.1403 57.6590 61.1296 55.5961 55.0599 50.0280 48.8360 52.4999 52.0662 57.6109 59.9150 63.8421 (65)												

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
(66)m	87.6896	87.6896	87.6896	87.6896	87.6896	87.6896	87.6896	87.6896	87.6896	87.6896	87.6896	87.6896 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
13.7954 12.2530 9.9648 7.5440 5.6392 4.7609 5.1443 6.6867 8.9749 11.3957 13.3005 14.1788 (67)												
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
152.8409 154.4269 150.4302 141.9217 131.1813 121.0868 114.3430 112.7570 116.7537 125.2622 136.0026 146.0971 (68)												
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
31.7690 31.7690 31.7690 31.7690 31.7690 31.7690 31.7690 31.7690 31.7690 31.7690 31.7690 31.7690 (69)												
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)												
-70.1516 -70.1516 -70.1516 -70.1516 -70.1516 -70.1516 -70.1516 -70.1516 -70.1516 -70.1516 -70.1516 -70.1516 (71)												
Water heating gains (Table 5)												
87.5542 85.8020 82.1634 77.2168 74.0053 69.4833 65.6397 70.5644 72.3141 77.4340 83.2152 85.8093 (72)												
Total internal gains												
303.4974 301.7888 291.8653 275.9894 260.1327 244.6378 234.4339 239.3150 247.3496 263.3988 281.8252 295.3922 (73)												

6. Solar gains

[Jan]												
Area												
m2												
Solar flux												
Table 6a												
W/m2												
Specific data												
or Table 6b												
Specific data												
or Table 6c												
Access												
factor												
Table 6d												
Gains												
W												
East												
9.9700 19.6403 0.4200 0.8000 0.7700 45.5948 (76)												
Solar gains	45.5948	89.1930	146.8882	214.2277	262.5441	268.7606	255.8711	219.7895	170.8371	105.8350	56.8513	37.4949 (83)
Total gains	349.0921	390.9818	438.7535	490.2171	522.6768	513.3984	490.3050	459.1045	418.1867	369.2339	338.6765	332.8871 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
Jan												
Feb												
Mar												
Apr												
May												
Jun												
Jul												
Aug												
Sep												
Oct												
Nov												
Dec												
tau	107.7262	108.0477	108.3711	110.0177	110.3531	112.0609	112.0609	112.4088	111.3715	110.3531	109.6844	109.0238
alpha	8.1817	8.2032	8.2247	8.3345	8.3569	8.4707	8.4707	8.4939	8.4248	8.3569	8.3123	8.2683
util living area												
0.9922 0.9794 0.9304 0.7811 0.5813 0.4028 0.2901 0.3229 0.5353 0.8549 0.9778 0.9943 (86)												
MIT	20.5733	20.6889	20.8483	20.9692	20.9972	20.9999	21.0000	21.0000	20.9989	20.9489	20.7458	20.5488 (87)
Th 2	20.3900	20.3917	20.3934	20.4020	20.4037	20.4123	20.4123	20.4140	20.4089	20.4037	20.4003	20.3968 (88)
util rest of house												
0.9900 0.9740 0.9151 0.7500 0.5450 0.3659 0.2513 0.2817 0.4900 0.8225 0.9711 0.9927 (89)												
MIT 2	19.8224	19.9892	20.2107	20.3699	20.4013	20.4122	20.4123	20.4140	20.4081	20.3510	20.0790	19.7928 (90)
Living area fraction												
MIT	20.1876	20.3295	20.5208	20.6614	20.6911	20.6981	20.6981	20.6990	20.6955	20.6418	20.4033	20.1605 (92)
Temperature adjustment												
adjusted MIT	20.1876	20.3295	20.5208	20.6614	20.6911	20.6981	20.6981	20.6990	20.6955	20.6418	20.4033	20.1605 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0.9891 0.9734 0.9186 0.7638 0.5626 0.3839 0.2702 0.3017 0.5120 0.8360 0.9711 0.9920 (94)												
Useful gains	345.2925	380.5823	403.0257	374.4184	294.0359	197.0753	132.4657	138.5266	214.1316	308.6754	328.8861	330.2135 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W												
534.2107 517.2637 468.6357 387.2327 295.1235 197.1118 132.4672 138.5302 214.5094 329.6107 439.3295 530.2739 (97)												
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh												
140.5551 91.8499 48.8138 9.2263 0.8092 0.0000 0.0000 0.0000 0.0000 15.5758 79.5192 148.8449 (98)												
Space heating												
535.1944 (98)												
Space heating per m2												
(98) / (4) = 10.2606 (99)												

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Calculation Type: New Build (As Designed)



CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Boilers	1.0000	(303a)
Fraction of total space heat from community Boilers	1.0000	(304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000	(305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.0500	(306)
Space heating:		
Annual space heating requirement	535.1944	(98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05	561.9541	(307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	(309)
Water heating		
Annual water heating requirement	1546.6544	(64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05	1623.9871	(310a)
Electricity used for heat distribution	21.8594	(313)
Annual totals kWh/year		
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.8500)		
mechanical ventilation fans (SFP = 0.8500)	129.8158	(330a)
Total electricity for the above, kWh/year	129.8158	(331)
Electricity for lighting (calculated in Appendix L)	243.6316	(332)
Total delivered energy for all uses	2559.3886	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Boilers			95.0000 (367a)
Space heating from Boilers	2300.9908	0.2160	497.0140 (367)
Electrical energy for heat distribution	21.8594	0.5190	11.3450 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			508.3590 (373)
Space and water heating			508.3590 (376)
Pumps and fans	129.8158	0.5190	67.3744 (378)
Energy for lighting	243.6316	0.5190	126.4448 (379)
Total CO2, kg/year			702.1782 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			13.4600 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		13.4600	ZC1
Total Floor Area	TFA	52.1600	
Assumed number of occupants	N	1.7538	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		17.3639	ZC2
CO2 emissions from cooking, equation (L16)		3.0884	ZC3
Total CO2 emissions		33.9123	ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000	ZC7
Net CO2 emissions		33.9123	ZC8

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	52.1600 (1b)	x 2.4000 (2b)	= 125.1840 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.1600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 125.1840 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour 20.0000 / (5) = 0.1598 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4098 (18)
Number of sides sheltered					3 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.7750 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3176 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4049	0.3970	0.3890	0.3493	0.3414	0.3017	0.3017	0.2938	0.3176	0.3414	0.3573	0.3731 (22b)
	0.5820	0.5788	0.5757	0.5610	0.5583	0.5455	0.5455	0.5431	0.5504	0.5583	0.5638	0.5696 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K						
TER Opaque door			2.0900	1.0000	2.0900			(26)					
TER Opening Type (Uw = 1.40)			9.9700	1.3258	13.2178			(27)					
External Wall 1	23.0400	9.9700	13.0700	0.1800	2.3526			(29a)					
Corridor Wall	19.4400	2.0900	17.3500	0.1800	3.1230			(29a)					
Total net area of external elements Aum(A, m2)			42.4800					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	20.7834			(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								4.0960 (36)					
Total fabric heat loss						(33) + (36) =		24.8794 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 24.0417	Feb 23.9102	Mar 23.7813	Apr 23.1759	May 23.0626	Jun 22.5353	Jul 22.5353	Aug 22.4377	Sep 22.7384	Oct 23.0626	Nov 23.2918	Dec 23.5313	(38)
Heat transfer coeff	48.9211	48.7896	48.6607	48.0553	47.9420	47.4147	47.4147	47.3171	47.6178	47.9420	48.1712	48.4107	(39)
Average = Sum(39)m / 12 =												48.0547	(39)
HLP	Jan 0.9379	Feb 0.9354	Mar 0.9329	Apr 0.9213	May 0.9191	Jun 0.9090	Jul 0.9090	Aug 0.9072	Sep 0.9129	Oct 0.9191	Nov 0.9235	Dec 0.9281	(40)
HLP (average)												0.9213	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7538 (42)
Average daily hot water use (litres/day)												75.8525 (43)
Daily hot water use	83.4378	80.4037	77.3696	74.3355	71.3014	68.2673	68.2673	71.3014	74.3355	77.3696	80.4037	83.4378 (44)
Energy conte	123.7358	108.2201	111.6735	97.3597	93.4189	80.6134	74.7002	85.7196	86.7433	101.0910	110.3487	119.8315 (45)
Energy content (annual)										Total = Sum(45)m =		1193.4558 (45)
Distribution loss (46)m = 0.15 x (45)m	18.5604	16.2330	16.7510	14.6039	14.0128	12.0920	11.2050	12.8579	13.0115	15.1636	16.5523	17.9747 (46)
Water storage loss:												
Store volume												3.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												0.2602 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.1405 (55)
Total storage loss												

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If cylinder contains dedicated solar storage	4.3553	3.9338	4.3553	4.2148	4.3553	4.2148	4.3553	4.3553	4.2148	4.3553	4.2148	4.3553 (56)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (57)
Total heat required for water heating calculated for each month	151.3535	133.1651	139.2912	124.0864	121.0366	107.3402	102.3179	113.3372	113.4701	128.7086	137.0755	147.4492 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	151.3535	133.1651	139.2912	124.0864	121.0366	107.3402	102.3179	113.3372	113.4701	128.7086	137.0755	147.4492 (64)
Heat gains from water heating, kWh/month	63.2363	55.9392	59.2256	53.7535	53.1559	48.1854	46.9320	50.5959	50.2236	55.7069	58.0724	61.9381 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)
(66)m	87.6896	87.6896	87.6896	87.6896	87.6896	87.6896	87.6896	87.6896	87.6896	87.6896	87.6896	87.6896	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.7954	12.2530	9.9648	7.5440	5.6392	4.7609	5.1443	6.6867	8.9749	11.3957	13.3005	14.1788	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	152.8409	154.4269	150.4302	141.9217	131.1813	121.0868	114.3430	112.7570	116.7537	125.2622	136.0026	146.0971	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.7690	31.7690	31.7690	31.7690	31.7690	31.7690	31.7690	31.7690	31.7690	31.7690	31.7690	31.7690	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-70.1516	-70.1516	-70.1516	-70.1516	-70.1516	-70.1516	-70.1516	-70.1516	-70.1516	-70.1516	-70.1516	-70.1516	(71)
Water heating gains (Table 5)	84.9950	83.2429	79.6043	74.6577	71.4461	66.9241	63.0806	68.0052	69.7550	74.8748	80.6561	83.2502	(72)
Total internal gains	303.9382	302.2296	292.3061	276.4302	260.5735	245.0787	234.8748	239.7559	247.7905	263.8396	282.2661	295.8330	(73)

6. Solar gains

[Jan]					Area	Solar flux		g	FF			Access	Gains		
					m2	Table 6a	Specific data		Specific data			factor	W		
						W/m2	or Table 6b		or Table 6c			Table 6d			
East					9.9700	19.6403		0.6300		0.7000		0.7700		59.8431 (76)	
Solar gains	59.8431	117.0659	192.7908	281.1739	344.5891	352.7483	335.8308	288.4737	224.2237	138.9085	74.6173	49.2121	(83)		
Total gains	363.7813	419.2954	485.0969	557.6041	605.1626	597.8270	570.7055	528.2295	472.0141	402.7481	356.8834	345.0451	(84)		

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	74.0422	74.2417	74.4384	75.3761	75.5542	76.3944	76.3944	76.5521	76.0686	75.5542	75.1948	74.8227	
alpha	5.9361	5.9494	5.9626	6.0251	6.0369	6.0930	6.0930	6.1035	6.0712	6.0369	6.0130	5.9882	
util living area	0.9954	0.9887	0.9639	0.8750	0.7020	0.5035	0.3651	0.4110	0.6707	0.9318	0.9892	0.9966	(86)
MIT	20.1481	20.3049	20.5538	20.8242	20.9605	20.9954	20.9995	20.9989	20.9774	20.7683	20.4056	20.1192	(87)
Th 2	20.1354	20.1375	20.1396	20.1494	20.1513	20.1598	20.1598	20.1614	20.1565	20.1513	20.1475	20.1437	(88)
util rest of house	0.9940	0.9853	0.9532	0.8440	0.6486	0.4393	0.2956	0.3366	0.5987	0.9067	0.9853	0.9955	(89)
MIT 2	19.0023	19.2310	19.5869	19.9569	20.1165	20.1571	20.1596	20.1610	20.1405	19.8959	19.3860	18.9665	(90)
Living area fraction	19.5596	19.7534	20.0572	20.3787	20.5270	20.5648	20.5681	20.5686	20.5476	20.3202	19.8819	19.5271	(92)
MIT	19.5596	19.7534	20.0572	20.3787	20.5270	20.5648	20.5681	20.5686	20.5476	20.3202	19.8819	19.5271	(93)
Temperature adjustment												0.0000	
adjusted MIT	19.5596	19.7534	20.0572	20.3787	20.5270	20.5648	20.5681	20.5686	20.5476	20.3202	19.8819	19.5271	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	361.1485	412.3251	461.8294	475.6251	407.2102	281.2552	188.0011	196.9410	298.7421	367.4397	351.1086	343.1526	(94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	746.5148	724.6889	659.7018	551.6144	423.1847	282.8213	188.1472	197.2439	307.0196	466.0074	615.7190	741.9980	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	286.7125	209.9084	147.2171	54.7123	11.8850	0.0000	0.0000	0.0000	0.0000	73.3344	190.5195	296.7410	(98)
Space heating												1271.0302	(98)
Space heating per m2												24.3679	(99)

8c. Space cooling requirement

Not applicable

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1359.3905 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	286.7125	209.9084	147.2171	54.7123	11.8850	0.0000	0.0000	0.0000	0.0000	73.3344	190.5195	296.7410	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	306.6444	224.5010	157.4514	58.5159	12.7112	0.0000	0.0000	0.0000	0.0000	78.4325	203.7641	317.3700	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	151.3535	133.1651	139.2912	124.0864	121.0366	107.3402	102.3179	113.3372	113.4701	128.7086	137.0755	147.4492	(64)
Efficiency of water heater (217)m	86.4930	86.0229	84.9615	82.7955	80.6526	79.8000	79.8000	79.8000	79.8000	83.3781	85.6922	79.8000	(216)
Fuel for water heating, kWh/month	174.9892	154.8020	163.9462	149.8711	150.0715	134.5115	128.2179	142.0266	142.1931	154.3675	159.9626	170.1792	(219)
Water heating fuel used												1825.1383	(219)
Annual totals kWh/year													
Space heating fuel - main system												1359.3905	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												243.6316	(232)
Total delivered energy for all uses												3503.1604	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1359.3905	0.2160	293.6284 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1825.1383	0.2160	394.2299 (264)
Space and water heating			687.8582 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	243.6316	0.5190	126.4448 (268)
Total CO2, kg/m2/year			853.2280 (272)
Emissions per m2 for space and water heating			13.1875 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.4242 (272b)
Emissions per m2 for pumps and fans			0.7463 (272c)
Target Carbon Dioxide Emission Rate (TER) = (13.1875 * 1.00) + 2.4242 + 0.7463, rounded to 2 d.p.			16.3600 (273)

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Property Reference	Type 6 - Option 5 (Gas Boiler)				Issued on Date	18/07/2023
Assessment Reference	St Ann's Type 6	Prop Type Ref	St Ann's Type 6			
Property	Type 6 - 4B - Mid Terrace					
SAP Rating	86 B	DER	11.94	TER	15.54	
Environmental	90 B	% DER<TER	23.16			
CO ₂ Emissions (t/year)	1.13	DFEE	35.84	TFEE	52.02	
General Requirements Compliance	Pass	% DFEE<TFEE	31.10			
Assessor Details	Miss Eleanor Ballinger, Eleanor Ballinger, Tel: 02036031625, Eleanor@hodkinsonconsultancy.com				Assessor ID	M976-0001
Client						

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Mid-Terrace House, total floor area 116 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Mains gas (c)
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 15.54 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 11.94 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 52.0 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 35.8 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.13 (max. 0.25)	0.13 (max. 0.70)	OK
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	OK
Openings	0.85 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 3.00 (design value)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system: None

5 Cylinder insulation

Hot water storage Nominal cylinder loss: 0.22 kWh/day
Permitted by DBSCG 0.35 OK
Primary pipework insulated: No primary pipework

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls: No cylinderstat

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%
Minimum 75% OK

8 Mechanical ventilation

Continuous supply and extract system
Specific fan power: 0.83
Maximum 1.5 OK
MVHR efficiency: 92%
Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): Medium OK
Based on:
Overshading: Average
Windows facing East: 8.61 m², No overhang
Windows facing West: 14.61 m², No overhang
Air change rate: 2.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Roof U-value 0.10 W/m²K
Roof U-value 0.10 W/m²K
Window U-value 0.80 W/m²K
Window U-value 0.80 W/m²K
Air permeability 3.0 m³/m²h

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	44.9000 (1b)	x 2.4900 (2b)	= 111.8010 (1b) - (3b)
First floor	35.5300 (1c)	x 3.0700 (2c)	= 109.0771 (1c) - (3c)
Second floor	35.5300 (1d)	x 2.9200 (2d)	= 103.7476 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	115.9600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 324.6257 (5)

2. Ventilation rate

	main		secondary		other		total	m3 per hour				
	heating		heating									
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)			
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)			
Number of intermittent fans							0 * 10 =	0.0000	(7a)			
Number of passive vents							0 * 10 =	0.0000	(7b)			
Number of flueless gas fires							0 * 40 =	0.0000	(7c)			
							Air changes per hour					
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =						0.0000 / (5) =	0.0000	(8)			
Pressure test							Yes					
Measured/design AP50							3.0000					
Infiltration rate							0.1500		(18)			
Number of sides sheltered							2		(19)			
Shelter factor							(20) = 1 - [0.075 x (19)] =	0.8500	(20)			
Infiltration rate adjusted to include shelter factor							(21) = (18) x (20) =	0.1275	(21)			
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750
	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												0.5000
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												78.2000
Effective ac	0.2716	0.2684	0.2652	0.2493	0.2461	0.2301	0.2301	0.2269	0.2365	0.2461	0.2524	0.2588

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Window (East) (Uw = 0.80)			23.2200	0.7752	18.0000		(27)					
Door			2.2600	1.2000	2.7120		(26)					
Roof Window (Uw = 1.20)			1.4400	1.1450	1.6489		(27a)					
Heat Loss Floor 1			44.9000	0.1300	5.8370		(28a)					
External Wall 1	25.4000	10.8300	14.5700	0.1800	2.6226		(29a)					
External Wall 2 (FF)	31.3100	6.9700	24.3400	0.1800	4.3812		(29a)					
External Wall 3 (SF)	29.7800	7.6800	22.1000	0.1800	3.9780		(29a)					
External Roof 1	37.2000	1.4400	35.7600	0.1000	3.5760		(30)					
External Roof 2 (1st Floor)	11.0500		11.0500	0.1000	1.1050		(30)					
Total net area of external elements Aum(A, m2)			179.6400				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	43.8607		(33)					
Party Wall 1			129.3800	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								9.7206 (36)				
Total fabric heat loss								(33) + (36) = 53.5813 (37)				
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 29.0915	Feb 28.7501	Mar 28.4086	Apr 26.7013	May 26.3598	Jun 24.6525	Jul 24.6525	Aug 24.3110	Sep 25.3354	Oct 26.3598	Nov 27.0427	Dec 27.7257 (38)
Heat transfer coeff	82.6728	82.3313	81.9899	80.2825	79.9411	78.2337	78.2337	77.8923	78.9167	79.9411	80.6240	81.3069 (39)
Average = Sum(39)m / 12 =												80.1972 (39)
HLP	Jan 0.7129	Feb 0.7100	Mar 0.7071	Apr 0.6923	May 0.6894	Jun 0.6747	Jul 0.6747	Aug 0.6717	Sep 0.6806	Oct 0.6894	Nov 0.6953	Dec 0.7012 (40)
HLP (average)												0.6916 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy											
											2.8463 (42)
Average daily hot water use (litres/day)											
											101.7986 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Daily hot water use												
	111.9784	107.9065	103.8345	99.7626	95.6906	91.6187	91.6187	95.6906	99.7626	103.8345	107.9065	111.9784 (44)
Energy conte	166.0607	145.2378	149.8724	130.6624	125.3737	108.1879	100.2520	115.0407	116.4146	135.6700	148.0944	160.8210 (45)
Energy content (annual)	Total = Sum (45)m = 1601.6876 (45)											
Distribution loss (46)m = 0.15 x (45)m	24.9091	21.7857	22.4809	19.5994	18.8060	16.2282	15.0378	17.2561	17.4622	20.3505	22.2142	24.1231 (46)
Water storage loss:												
Store volume	3.0000 (47)											
b) If manufacturer declared loss factor is not known :												
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.0212 (51)											
Volume factor from Table 2a	3.4200 (52)											
Temperature factor from Table 2b	1.0000 (53)											
Enter (49) or (54) in (55)	0.2173 (55)											
Total storage loss	6.7353	6.0835	6.7353	6.5180	6.7353	6.5180	6.7353	6.7353	6.5180	6.7353	6.5180	6.7353 (56)
If cylinder contains dedicated solar storage	6.7353	6.0835	6.7353	6.5180	6.7353	6.5180	6.7353	6.7353	6.5180	6.7353	6.5180	6.7353 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month												
196.0584	172.3325	179.8701	159.6924	155.3714	137.2180	130.2497	145.0384	145.4446	165.6677	177.1245	190.8187	190.8187 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Solar input (sum of months) = Sum (63)m = 0.0000 (63)												
Output from w/h	196.0584	172.3325	179.8701	159.6924	155.3714	137.2180	130.2497	145.0384	145.4446	165.6677	177.1245	190.8187 (64)
Total per year (kWh/year) = Sum (64)m = 1954.8862 (64)												
Heat gains from water heating, kWh/month	79.2134	69.9673	73.8307	66.6693	65.6849	59.1965	57.3320	62.2492	61.9319	69.1084	72.4654	77.4711 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	142.3127	142.3127	142.3127	142.3127	142.3127	142.3127	142.3127	142.3127	142.3127	142.3127	142.3127	142.3127 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	24.9808	22.1877	18.0442	13.6607	10.2115	8.6210	9.3153	12.1083	16.2518	20.6354	24.0845	25.6751 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	279.8563	282.7603	275.4422	259.8629	240.1969	221.7135	209.3655	206.4615	213.7796	229.3589	249.0249	267.5083 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.2313	37.2313	37.2313	37.2313	37.2313	37.2313	37.2313	37.2313	37.2313	37.2313	37.2313	37.2313 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-113.8502	-113.8502	-113.8502	-113.8502	-113.8502	-113.8502	-113.8502	-113.8502	-113.8502	-113.8502	-113.8502	-113.8502 (71)
Water heating gains (Table 5)	106.4696	104.1180	99.2348	92.5962	88.2862	82.2174	77.0591	83.6682	86.0165	92.8877	100.6464	104.1279 (72)
Total internal gains	477.0004	474.7598	458.4151	431.8136	404.3883	378.2457	361.4337	367.9319	381.7417	408.5757	439.4497	463.0050 (73)

6. Solar gains

[Jan]												
	Area m2			Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
East	8.6100			19.6403		0.5000		0.8000		0.7700		46.8753 (76)
West	14.6100			19.6403		0.5000		0.8000		0.7700		79.5409 (80)
Horizontal	1.4400			26.0000		0.5000		0.8000		1.0000		13.4784 (82)
Solar gains	139.8946	275.2905	457.0292	671.7285	827.4635	848.8466	807.4066	690.7778	533.2795	327.6530	174.7333	114.8449 (83)
Total gains	616.8950	750.0503	915.4443	1103.5421	1231.8518	1227.0923	1168.8403	1058.7097	915.0212	736.2288	614.1830	577.8499 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	97.4054	97.8094	98.2168	100.3055	100.7339	102.9323	102.9323	103.3835	102.0415	100.7339	99.8807	99.0417
alpha	7.4937	7.5206	7.5478	7.6870	7.7156	7.8622	7.8622	7.8922	7.8028	7.7156	7.6587	7.6028
util living area	0.9987	0.9940	0.9642	0.8212	0.5986	0.4078	0.2945	0.3384	0.5909	0.9314	0.9955	0.9992 (86)
MIT	20.3272	20.4893	20.7302	20.9424	20.9946	20.9998	21.0000	21.0000	20.9966	20.8712	20.5503	20.3045 (87)
Th 2	20.3294	20.3320	20.3346	20.3476	20.3502	20.3633	20.3633	20.3659	20.3580	20.3502	20.3450	20.3398 (88)
util rest of house	0.9983	0.9921	0.9544	0.7899	0.5585	0.3674	0.2519	0.2918	0.5377	0.9089	0.9938	0.9989 (89)
MIT 2	19.4152	19.6532	19.9984	20.2864	20.3456	20.3631	20.3633	20.3659	20.3556	20.2074	19.7533	19.3902 (90)
Living area fraction	fLA = Living area / (4) = 0.1369 (91)											
MIT	19.5400	19.7676	20.0986	20.3762	20.4344	20.4503	20.4504	20.4526	20.4434	20.2982	19.8624	19.5154 (92)
Temperature adjustment	0.0000											
adjusted MIT	19.5400	19.7676	20.0986	20.3762	20.4344	20.4503	20.4504	20.4526	20.4434	20.2982	19.8624	19.5154 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9976	0.9901	0.9504	0.7914	0.5637	0.3729	0.2577	0.2981	0.5448	0.9068	0.9922	0.9984 (94)
Useful gains	615.3986	742.6362	870.0365	873.3273	694.4263	457.5643	301.2262	315.6541	498.5367	667.6023	609.3701	576.9453 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	1259.9322	1224.0714	1114.9445	921.3367	698.2411	457.6875	301.2315	315.6699	500.5962	775.2867	1028.9552	1245.2443 (97)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	479.5330	323.5245	182.2116	34.5667	2.8381	0.0000	0.0000	0.0000	0.0000	80.1172	302.1013	497.2144 (98)
Space heating												1902.1068 (98)
Space heating per m2										(98) / (4) =		16.4031 (99)

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Boilers	1.0000 (303a)
Fraction of total space heat from community Boilers	1.0000 (304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.0500 (306)
Space heating:	
Annual space heating requirement	1902.1068 (98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05	1997.2122 (307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	1954.8862 (64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05	2052.6306 (310a)
Electricity used for heat distribution	40.4984 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 1.0375)	
mechanical ventilation fans (SFP = 1.0375)	410.8950 (330a)
Total electricity for the above, kWh/year	410.8950 (331)
Electricity for lighting (calculated in Appendix L)	441.1680 (332)
Total delivered energy for all uses	4901.9057 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Boilers			95.0000 (367a)
Space heating from Boilers	4262.9923	0.2160	920.8063 (367)
Electrical energy for heat distribution	40.4984	0.5190	21.0187 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			941.8250 (373)
Space and water heating			941.8250 (376)
Pumps and fans	410.8950	0.5190	213.2545 (378)
Energy for lighting	441.1680	0.5190	228.9662 (379)
Total CO2, kg/year			1384.0457 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			11.9400 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		11.9400 ZC1
Total Floor Area	TFA	115.9600
Assumed number of occupants	N	2.8463
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		14.3012 ZC2
CO2 emissions from cooking, equation (L16)		1.6153 ZC3
Total CO2 emissions		27.8565 ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000 ZC7
Net CO2 emissions		27.8565 ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	44.9000 (1b)	x 2.4900 (2b)	= 111.8010 (1b) - (3b)
First floor	35.5300 (1c)	x 3.0700 (2c)	= 109.0771 (1c) - (3c)
Second floor	35.5300 (1d)	x 2.9200 (2d)	= 103.7476 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	115.9600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 324.6257 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					4 * 10 = 40.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				40.0000 / (5) = 0.1232 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3732 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3172 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4045	0.3965	0.3886	0.3490	0.3410	0.3014	0.3014	0.2934	0.3172	0.3410	0.3569	0.3728 (22b)
Effective ac	0.5818	0.5786	0.5755	0.5609	0.5582	0.5454	0.5454	0.5431	0.5503	0.5582	0.5637	0.5695 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.2600	1.0000	2.2600		(26)
TER Opening Type (Uw = 1.40)			23.2200	1.3258	30.7841		(27)
TER Room Window (Uw = 1.70)			1.4400	1.5918	2.2921		(27a)
Heat Loss Floor 1			44.9000	0.1300	5.8370		(28a)
External Wall 1	25.4000	10.8300	14.5700	0.1800	2.6226		(29a)
External Wall 2 (FF)	31.3100	6.9700	24.3400	0.1800	4.3812		(29a)
External Wall 3 (SF)	29.7800	7.6800	22.1000	0.1800	3.9780		(29a)
External Roof 1	37.2000	1.4400	35.7600	0.1300	4.6488		(30)
External Roof 2 (1st Floor)	11.0500		11.0500	0.1300	1.4365		(30)
Total net area of external elements Aum(A, m ²)			179.6400				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	58.2403		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							13.7312 (36)
Total fabric heat loss						(33) + (36) =	71.9715 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	62.3262	61.9860	61.6524	60.0858	59.7927	58.4282	58.4282	58.1755	58.9538	59.7927	60.3856	61.0055 (38)
Heat transfer coeff	134.2978	133.9575	133.6239	132.0573	131.7642	130.3997	130.3997	130.1470	130.9253	131.7642	132.3572	132.9771 (39)
Average = Sum(39)m / 12 =												132.0559 (39)
HLP	1.1581	1.1552	1.1523	1.1388	1.1363	1.1245	1.1245	1.1223	1.1291	1.1363	1.1414	1.1467 (40)
HLP (average)												1.1388 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.8463 (42)
Average daily hot water use (litres/day)												101.7986 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	111.9784	107.9065	103.8345	99.7626	95.6906	91.6187	91.6187	95.6906	99.7626	103.8345	107.9065	111.9784 (44)
Energy conte	166.0607	145.2378	149.8724	130.6624	125.3737	108.1879	100.2520	115.0407	116.4146	135.6700	148.0944	160.8210 (45)
Energy content (annual)										Total = Sum(45)m =		1601.6876 (45)
Distribution loss (46)m = 0.15 x (45)m												

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

24.9091	21.7857	22.4809	19.5994	18.8060	16.2282	15.0378	17.2561	17.4622	20.3505	22.2142	24.1231 (46)
Water storage loss:											
Store volume											3.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):											0.2602 (48)
Temperature factor from Table 2b											0.5400 (49)
Enter (49) or (54) in (55)											0.1405 (55)
Total storage loss											
4.3553	3.9338	4.3553	4.2148	4.3553	4.2148	4.3553	4.3553	4.2148	4.3553	4.2148	4.3553 (56)
If cylinder contains dedicated solar storage											
4.3553	3.9338	4.3553	4.2148	4.3553	4.2148	4.3553	4.3553	4.2148	4.3553	4.2148	4.3553 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month											
193.6784	170.1828	177.4901	157.3892	152.9913	134.9147	127.8697	142.6583	143.1414	163.2877	174.8212	188.4386 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Solar input (sum of months) = Sum(63)m =											0.0000 (63)
Output from w/h											
193.6784	170.1828	177.4901	157.3892	152.9913	134.9147	127.8697	142.6583	143.1414	163.2877	174.8212	188.4386 (64)
Heat gains from water heating, kWh/month											
77.3093	68.2476	71.9267	64.8267	63.7809	57.3539	55.4279	60.3452	60.0893	67.2044	70.6228	75.5671 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	142.3127	142.3127	142.3127	142.3127	142.3127	142.3127	142.3127	142.3127	142.3127	142.3127	142.3127	142.3127 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	24.9808	22.1877	18.0442	13.6607	10.2115	8.6210	9.3153	12.1083	16.2518	20.6354	24.0845	25.6751 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	279.8563	282.7603	275.4422	259.8629	240.1969	221.7135	209.3655	206.4615	213.7796	229.3589	249.0249	267.5083 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.2313	37.2313	37.2313	37.2313	37.2313	37.2313	37.2313	37.2313	37.2313	37.2313	37.2313	37.2313 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-113.8502	-113.8502	-113.8502	-113.8502	-113.8502	-113.8502	-113.8502	-113.8502	-113.8502	-113.8502	-113.8502	-113.8502 (71)
Water heating gains (Table 5)	103.9104	101.5589	96.6757	90.0370	85.7270	79.6582	74.4999	81.1091	83.4573	90.3285	98.0873	101.5687 (72)
Total internal gains	477.4412	475.2007	458.8560	432.2544	404.8292	378.6865	361.8745	368.3727	382.1825	409.0166	439.8905	463.4458 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
East				8.6100	19.6403	0.6300	0.7000	0.7700	51.6800 (76)			
West				14.6100	19.6403	0.6300	0.7000	0.7700	87.6939 (80)			
Horizontal				1.4400	26.0000	0.6300	0.7000	1.0000	14.8599 (82)			
Solar gains	154.2338	303.5078	503.8747	740.5807	912.2785	935.8534	890.1658	761.5826	587.9406	361.2375	192.6435	126.6165 (83)
Total gains	631.6750	778.7085	962.7307	1172.8351	1317.1077	1314.5399	1252.0403	1129.9553	970.1231	770.2540	632.5340	590.0624 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	59.9621	60.1144	60.2645	60.9794	61.1151	61.7546	61.7546	61.8745	61.5067	61.1151	60.8413	60.5576
alpha	4.9975	5.0076	5.0176	5.0653	5.0743	5.1170	5.1170	5.1250	5.1004	5.0743	5.0561	5.0372
util living area												
	0.9987	0.9961	0.9847	0.9344	0.8038	0.6107	0.4536	0.5200	0.8049	0.9757	0.9970	0.9991 (86)
MIT	19.6965	19.8826	20.1989	20.5926	20.8647	20.9741	20.9953	20.9910	20.9004	20.4976	20.0192	19.6673 (87)
Th 2	19.9536	19.9560	19.9583	19.9693	19.9713	19.9809	19.9809	19.9826	19.9772	19.9713	19.9672	19.9628 (88)
util rest of house												
	0.9983	0.9948	0.9793	0.9121	0.7476	0.5235	0.3510	0.4100	0.7267	0.9636	0.9958	0.9988 (89)
MIT 2	18.2105	18.4838	18.9439	19.5033	19.8462	19.9648	19.9792	19.9791	19.9004	19.3856	18.6921	18.1744 (90)
Living area fraction												
MIT	18.4139	18.6753	19.1157	19.6524	19.9856	20.1029	20.1183	20.1176	20.0372	19.5377	18.8737	18.3788 (92)
Temperature adjustment												
adjusted MIT	18.4139	18.6753	19.1157	19.6524	19.9856	20.1029	20.1183	20.1176	20.0372	19.5377	18.8737	18.3788 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9972	0.9923	0.9733	0.9037	0.7484	0.5344	0.3651	0.4250	0.7319	0.9566	0.9938	0.9980 (94)
Useful gains	629.9366	772.6907	937.0085	1059.9341	985.7636	702.4955	457.0716	480.2324	710.0068	736.8157	628.5809	588.8957 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W												
	1895.4615	1845.2986	1685.7540	1419.9278	1091.7395	717.5831	458.7827	483.8341	777.3331	1177.6744	1558.3399	1885.4501 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh												
	941.5505	720.7925	557.0667	259.1955	78.8460	0.0000	0.0000	0.0000	0.0000	327.9989	669.4265	964.6364 (98)
Space heating												
												4519.5129 (98)
Space heating per m2												
												(98) / (4) = 38.9748 (99)

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8c. Space cooling requirement

Not applicable

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000	(201)
Fraction of space heat from main system(s)													1.0000	(202)
Efficiency of main space heating system 1 (in %)													93.5000	(206)
Efficiency of secondary/supplementary heating system, %													0.0000	(208)
Space heating requirement													4833.7036	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	941.5505	720.7925	557.0667	259.1955	78.8460	0.0000	0.0000	0.0000	0.0000	327.9989	669.4265	964.6364	(98)	
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)	
Space heating fuel (main heating system)	1007.0059	770.9011	595.7932	277.2144	84.3273	0.0000	0.0000	0.0000	0.0000	350.8010	715.9641	1031.6967	(211)	
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)	
Water heating														
Water heating requirement	193.6784	170.1828	177.4901	157.3892	152.9913	134.9147	127.8697	142.6583	143.1414	163.2877	174.8212	188.4386	(64)	
Efficiency of water heater	88.4760	88.2401	87.6599	86.1365	83.1432	79.8000	79.8000	79.8000	79.8000	86.6389	88.0551	88.5594	(216)	
(217)m	218.9050	192.8634	202.4757	182.7207	184.0095	169.0661	160.2377	178.7698	179.3752	188.4693	198.5361	212.7821	(219)	
Fuel for water heating, kWh/month												2268.2106	(219)	
Water heating fuel used														
Annual totals kWh/year														
Space heating fuel - main system													4833.7036	(211)
Space heating fuel - secondary													0.0000	(215)
Electricity for pumps and fans:														
central heating pump													30.0000	(230c)
main heating flue fan													45.0000	(230e)
Total electricity for the above, kWh/year													75.0000	(231)
Electricity for lighting (calculated in Appendix L)													441.1680	(232)
Total delivered energy for all uses													7618.0823	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	4833.7036	0.2160	1044.0800 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2268.2106	0.2160	489.9335 (264)
Space and water heating			1534.0135 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	441.1680	0.5190	228.9662 (268)
Total CO2, kg/m2/year			1801.9047 (272)
Emissions per m2 for space and water heating			13.2288 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			1.9745 (272b)
Emissions per m2 for pumps and fans			0.3357 (272c)
Target Carbon Dioxide Emission Rate (TER) = (13.2288 * 1.00) + 1.9745 + 0.3357, rounded to 2 d.p.			15.5400 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



Property Reference	Type 7 - Option 5 (Gas Boiler)				Issued on Date	18/07/2023
Assessment Reference	St Ann's Type 7	Prop Type Ref	St Ann's Type 7			
Property	Type 7 - 4B - End Terrace					
SAP Rating	85 B	DER	13.83	TER	17.27	
Environmental	88 B	% DER<TER	19.90			
CO ₂ Emissions (t/year)	1.31	DFEE	43.56	TFEE	61.27	
General Requirements Compliance	Pass	% DFEE<TFEE	28.91			
Assessor Details	Miss Eleanor Ballinger, Eleanor Ballinger, Tel: 02036031625, Eleanor@hodkinsonconsultancy.com				Assessor ID	M976-0001
Client						

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

End-Terrace House, total floor area 116 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Mains gas (c)
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 17.27 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 13.83 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)61.3 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)43.6 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.13 (max. 0.25)	0.13 (max. 0.70)	OK
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	OK
Openings	0.85 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 3.00 (design value)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Community heating scheme -
Secondary heating system: None

5 Cylinder insulation

Hot water storage Nominal cylinder loss: 0.22 kWh/day
Permitted by DBSCG 0.35 OK
Primary pipework insulated: No primary pipework

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK
Hot water controls: No cylinderstat

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%
Minimum 75% OK

8 Mechanical ventilation

Continuous supply and extract system
Specific fan power: 0.83
Maximum 1.5 OK
MVHR efficiency: 92%
Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): Medium OK
Based on:
Overshading: Average
Windows facing East: 8.61 m², No overhang
Windows facing South: 5.68 m², No overhang
Windows facing West: 14.61 m², No overhang
Air change rate: 2.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Roof U-value 0.10 W/m²K
Roof U-value 0.10 W/m²K
Window U-value 0.80 W/m²K
Window U-value 0.80 W/m²K
Air permeability 3.0 m³/m²h

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	45.0400 (1b)	x 2.4900 (2b)	= 112.1496 (1b) - (3b)
First floor	35.5000 (1c)	x 3.0700 (2c)	= 108.9850 (1c) - (3c)
Second floor	35.5000 (1d)	x 2.9200 (2d)	= 103.6600 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	116.0400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 324.7946 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour							
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)							
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)							
Number of intermittent fans					0 * 10 = 0.0000 (7a)							
Number of passive vents					0 * 10 = 0.0000 (7b)							
Number of flueless gas fires					0 * 40 = 0.0000 (7c)							
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					0.0000 / (5) = 0.0000 (8)							
Pressure test					Yes							
Measured/design AP50					3.0000							
Infiltration rate					0.1500 (18)							
Number of sides sheltered					1 (19)							
Shelter factor					(20) = 1 - [0.075 x (19)] = 0.9250 (20)							
Infiltration rate adjusted to include shelter factor					(21) = (18) x (20) = 0.1388 (21)							
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
	0.1769	0.1734	0.1700	0.1526	0.1492	0.1318	0.1318	0.1283	0.1388	0.1492	0.1561	0.1630 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
												0.5000 (23a)
												78.2000 (23c)
Effective ac	0.2859	0.2824	0.2790	0.2616	0.2582	0.2408	0.2408	0.2373	0.2478	0.2582	0.2651	0.2720 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Window (west) (Uw = 0.80)			5.6800	0.7752	4.4031		(27)					
Door			2.2600	1.2000	2.7120		(26)					
Window (east) (Uw = 0.80)			23.2200	0.7752	18.0000		(27)					
Roof Window (Uw = 1.20)			1.4400	1.1450	1.6489		(27a)					
Heat Loss Floor 1			45.0400	0.1300	5.8552		(28a)					
External Wall 1 GF	47.5600	13.9900	33.5700	0.1800	6.0426		(29a)					
External Wall 2 (FF)	53.4200	8.2300	45.1900	0.1800	8.1342		(29a)					
External Wall 3 (SF)	50.8100	8.9400	41.8700	0.1800	7.5366		(29a)					
External Roof 1	37.2000	1.4400	35.7600	0.1000	3.5760		(30)					
External Roof 2 (1st Floor)	11.0500		11.0500	0.1000	1.1050		(30)					
Total net area of external elements Aum(A, m2)			245.0800				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		59.0136		(33)					
Party Wall 1			65.2900	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							16.5714 (36)					
Total fabric heat loss							(33) + (36) = 75.5850 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 30.6441	Feb 30.2723	Mar 29.9005	Apr 28.0415	May 27.6698	Jun 25.8108	Jul 25.8108	Aug 25.4390	Sep 26.5544	Oct 27.6698	Nov 28.4133	Dec 29.1569 (38)
Heat transfer coeff	106.2290	105.8572	105.4854	103.6265	103.2547	101.3958	101.3958	101.0240	102.1394	103.2547	103.9983	104.7419 (39)
Average = Sum(39)m / 12 =												103.5336 (39)
HLP	Jan 0.9155	Feb 0.9122	Mar 0.9090	Apr 0.8930	May 0.8898	Jun 0.8738	Jul 0.8738	Aug 0.8706	Sep 0.8802	Oct 0.8898	Nov 0.8962	Dec 0.9026 (40)
HLP (average)												0.8922 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.8466 (42)
Average daily hot water use (litres/day)	101.8073 (43)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	111.9880	107.9157	103.8434	99.7711	95.6989	91.6266	91.6266	95.6989	99.7711	103.8434	107.9157	111.9880 (44)
Energy conte	166.0750	145.2503	149.8852	130.6736	125.3844	108.1972	100.2606	115.0505	116.4246	135.6817	148.1071	160.8348 (45)
Energy content (annual)										Total = Sum (45)m =		1601.8251 (45)
Distribution loss (46)m = 0.15 x (45)m	24.9112	21.7875	22.4828	19.6010	18.8077	16.2296	15.0391	17.2576	17.4637	20.3522	22.2161	24.1252 (46)
Water storage loss:												
Store volume												3.0000 (47)
b) If manufacturer declared loss factor is not known :												
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0212 (51)
Volume factor from Table 2a												3.4200 (52)
Temperature factor from Table 2b												1.0000 (53)
Enter (49) or (54) in (55)												0.2173 (55)
Total storage loss	6.7353	6.0835	6.7353	6.5180	6.7353	6.5180	6.7353	6.7353	6.5180	6.7353	6.5180	6.7353 (56)
If cylinder contains dedicated solar storage	6.7353	6.0835	6.7353	6.5180	6.7353	6.5180	6.7353	6.7353	6.5180	6.7353	6.5180	6.7353 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	196.0727	172.3449	179.8829	159.7036	155.3821	137.2272	130.2583	145.0482	145.4546	165.6794	177.1372	190.8325 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Solar input (sum of months) = Sum (63)m =												0.0000 (63)
Output from w/h	196.0727	172.3449	179.8829	159.7036	155.3821	137.2272	130.2583	145.0482	145.4546	165.6794	177.1372	190.8325 (64)
Heat gains from water heating, kWh/month	79.2181	69.9715	73.8350	66.6730	65.6885	59.1996	57.3348	62.2525	61.9352	69.1123	72.4696	77.4757 (65)
Total per year (kWh/year) = Sum (64)m =												1955.0237 (64)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	142.3311	142.3311	142.3311	142.3311	142.3311	142.3311	142.3311	142.3311	142.3311	142.3311	142.3311	142.3311 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	24.9590	22.1684	18.0285	13.6488	10.2026	8.6135	9.3072	12.0978	16.2376	20.6174	24.0636	25.6527 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	279.9643	282.8695	275.5486	259.9633	240.2896	221.7991	209.4464	206.5412	213.8621	229.4474	249.1211	267.6115 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.2331	37.2331	37.2331	37.2331	37.2331	37.2331	37.2331	37.2331	37.2331	37.2331	37.2331	37.2331 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-113.8649	-113.8649	-113.8649	-113.8649	-113.8649	-113.8649	-113.8649	-113.8649	-113.8649	-113.8649	-113.8649	-113.8649 (71)
Water heating gains (Table 5)	106.4759	104.1242	99.2406	92.6014	88.2910	82.2217	77.0629	83.6727	86.0211	92.8929	100.6523	104.1340 (72)
Total internal gains	477.0986	474.8614	458.5170	431.9127	404.4825	378.3336	361.5158	368.0110	381.8202	408.6571	439.5363	463.0976 (73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W		
South					5.6800	46.7521	0.4200	0.8000	0.7700	61.8332 (78)		
Horizontal					1.4400	26.0000	0.5000	0.8000	1.0000	13.4784 (82)		
East					8.6100	19.6403	0.5000	0.8000	0.7700	46.8753 (76)		
West					14.6100	19.6403	0.5000	0.8000	0.7700	79.5409 (80)		

Solar gains	201.7278	376.5573	586.0252	817.5220	979.3893	995.0545	950.2606	829.5089	668.0310	436.8788	248.0268	168.2745 (83)
Total gains	678.8264	851.4187	1044.5422	1249.4347	1383.8718	1373.3881	1311.7764	1197.5199	1049.8512	845.5359	687.5630	631.3721 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation factor for gains for living area, nil,m (see Table 9a)												21.0000 (85)
tau	75.8581	76.1245	76.3928	77.7632	78.0432	79.4741	79.4741	79.7665	78.8955	78.0432	77.4852	76.9352
alpha	6.0572	6.0750	6.0929	6.1842	6.2029	6.2983	6.2983	6.3178	6.2597	6.2029	6.1657	6.1290
util living area	0.9982	0.9926	0.9667	0.8623	0.6702	0.4703	0.3399	0.3875	0.6520	0.9412	0.9946	0.9988 (86)
MIT	20.0730	20.2731	20.5600	20.8502	20.9721	20.9974	20.9997	20.9994	20.9828	20.7638	20.3536	20.0431 (87)
Th 2	20.1544	20.1571	20.1598	20.1734	20.1762	20.1898	20.1898	20.1926	20.1844	20.1762	20.1707	20.1653 (88)
util rest of house	0.9976	0.9902	0.9568	0.8303	0.6184	0.4118	0.2774	0.3198	0.5827	0.9188	0.9926	0.9984 (89)
MIT 2	18.9074	19.2006	19.6125	20.0107	20.1519	20.1882	20.1897	20.1923	20.1722	19.9125	19.3294	18.8720 (90)
Living area fraction									fLA = Living area / (4) =			0.1368 (91)
MIT	19.0668	19.3473	19.7421	20.1255	20.2641	20.2989	20.3005	20.3027	20.2831	20.0289	19.4695	19.0321 (92)
Temperature adjustment												0.0000
adjusted MIT	19.0668	19.3473	19.7421	20.1255	20.2641	20.2989	20.3005	20.3027	20.2831	20.0289	19.4695	19.0321 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9964	0.9872	0.9508	0.8282	0.6241	0.4197	0.2860	0.3290	0.5913	0.9140	0.9901	0.9976 (94)
Useful gains	676.4094	840.4913	993.1669	1034.8321	863.6191	576.4084	375.1143	394.0295	620.8184	772.8346	680.7604	629.8662 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Heat loss rate W	1568.6630	1529.3469	1396.8487	1163.2610	884.2835	577.8453	375.2153	394.2662	631.5349	973.5819	1286.4079	1553.5454 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	663.8367	462.9110	300.3393	92.4688	15.3743	0.0000	0.0000	0.0000	0.0000	149.3560	436.0662	687.2173 (98)
Space heating												2807.5696 (98)
Space heating per m2										(98) / (4) =		24.1948 (99)

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Boilers	1.0000 (303a)
Fraction of total space heat from community Boilers	1.0000 (304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.0500 (306)
Space heating:	
Annual space heating requirement	2807.5696 (98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05	2947.9481 (307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	1955.0237 (64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05	2052.7749 (310a)
Electricity used for heat distribution	50.0072 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 1.0375)	
mechanical ventilation fans (SFP = 1.0375)	411.1088 (330a)
Total electricity for the above, kWh/year	411.1088 (331)
Electricity for lighting (calculated in Appendix L)	440.7841 (332)
Total delivered energy for all uses	5852.6159 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Boilers			95.0000 (367a)
Space heating from Boilers	5263.9190	0.2160	1137.0065 (367)
Electrical energy for heat distribution	50.0072	0.5190	25.9538 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			1162.9602 (373)
Space and water heating			1162.9602 (376)
Pumps and fans	411.1088	0.5190	213.3654 (378)
Energy for lighting	440.7841	0.5190	228.7670 (379)
Total CO2, kg/year			1605.0927 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			13.8300 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		13.8300 ZC1
Total Floor Area	TFA	116.0400
Assumed number of occupants	N	2.8466
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		14.2969 ZC2
CO2 emissions from cooking, equation (L16)		1.6143 ZC3
Total CO2 emissions		29.7411 ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000 ZC7
Net CO2 emissions		29.7411 ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	45.0400 (1b)	x 2.4900 (2b)	= 112.1496 (1b) - (3b)
First floor	35.5000 (1c)	x 3.0700 (2c)	= 108.9850 (1c) - (3c)
Second floor	35.5000 (1d)	x 2.9200 (2d)	= 103.6600 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	116.0400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 324.7946 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					4 * 10 = 40.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour 40.0000 / (5) = 0.1232 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3732 (18)
Number of sides sheltered					1 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.9250 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3452 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4401	0.4315	0.4228	0.3797	0.3711	0.3279	0.3279	0.3193	0.3452	0.3711	0.3883	0.4056 (22b)
Effective ac	0.5968	0.5931	0.5894	0.5721	0.5688	0.5538	0.5538	0.5510	0.5596	0.5688	0.5754	0.5822 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.2600	1.0000	2.2600		(26)
TER Opening Type (Uw = 1.40)			25.4700	1.3258	33.7670		(27)
TER Room Window (Uw = 1.70)			1.2700	1.5918	2.0215		(27a)
Heat Loss Floor 1			45.0400	0.1300	5.8552		(28a)
External Wall 1 GF	47.5600	12.5900	34.9700	0.1800	6.2946		(29a)
External Wall 2 (FF)	53.4200	7.2600	46.1600	0.1800	8.3088		(29a)
External Wall 3 (SF)	50.8100	7.8800	42.9300	0.1800	7.7274		(29a)
External Roof 1	37.2000	1.2700	35.9300	0.1300	4.6709		(30)
External Roof 2 (1st Floor)	11.0500		11.0500	0.1300	1.4365		(30)
Total net area of external elements Aum(A, m ²)			245.0800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	72.3420		(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K		250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)		21.0000 (36)
Total fabric heat loss	(33) + (36) =	93.3420 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)		
(38)m	Jan 63.9706	Feb 63.5675
Heat transfer coeff	Mar 63.1725	Apr 61.3168
Average = Sum(39)m / 12 =	May 60.9697	Jun 59.3535
	Jul 59.3535	Aug 59.0542
	Sep 59.9760	Oct 60.9697
	Nov 61.6720	Dec 62.4063 (38)
		155.7482 (39)
		154.6572 (39)
HLP	Jan 1.3557	Feb 1.3522
HLP (average)	Mar 1.3488	Apr 1.3328
Days in month	May 1.3298	Jun 1.3159
	Jul 1.3159	Aug 1.3133
	Sep 1.3213	Oct 1.3298
	Nov 1.3359	Dec 1.3422 (40)
		1.3328 (40)
		31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.8466 (42)
Average daily hot water use (litres/day)		101.8073 (43)
Daily hot water use	Jan 111.9880	Feb 107.9157
Energy conte	Mar 103.8434	Apr 99.7711
Energy content (annual)	May 95.6989	Jun 91.6266
Distribution loss (46)m = 0.15 x (45)m	Jul 91.6266	Aug 95.6989
	Sep 99.7711	Oct 103.8434
	Nov 107.9157	Dec 111.9880 (44)
		135.6817
		148.1071
		160.8348 (45)
		1601.8251 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Water storage loss:	24.9112	21.7875	22.4828	19.6010	18.8077	16.2296	15.0391	17.2576	17.4637	20.3522	22.2161	24.1252 (46)
Store volume												3.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												0.2602 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.1405 (55)
Total storage loss												
	4.3553	3.9338	4.3553	4.2148	4.3553	4.2148	4.3553	4.3553	4.2148	4.3553	4.2148	4.3553 (56)
If cylinder contains dedicated solar storage												
	4.3553	3.9338	4.3553	4.2148	4.3553	4.2148	4.3553	4.3553	4.2148	4.3553	4.2148	4.3553 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month												
	193.6927	170.1952	177.5029	157.4004	153.0021	134.9240	127.8783	142.6682	143.1514	163.2993	174.8339	188.4524 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
								Solar input (sum of months) = Sum(63)m =				0.0000 (63)
Output from w/h												
	193.6927	170.1952	177.5029	157.4004	153.0021	134.9240	127.8783	142.6682	143.1514	163.2993	174.8339	188.4524 (64)
								Total per year (kWh/year) = Sum(64)m =				1927.0009 (64)
Heat gains from water heating, kWh/month												
	77.3141	68.2517	71.9310	64.8304	63.7845	57.3570	55.4308	60.3484	60.0926	67.2083	70.6270	75.5717 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	142.3311	142.3311	142.3311	142.3311	142.3311	142.3311	142.3311	142.3311	142.3311	142.3311	142.3311	142.3311 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	24.9590	22.1684	18.0285	13.6488	10.2026	8.6135	9.3072	12.0978	16.2376	20.6174	24.0636	25.6527 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	279.9643	282.8695	275.5486	259.9633	240.2896	221.7991	209.4464	206.5412	213.8621	229.4474	249.1211	267.6115 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.2331	37.2331	37.2331	37.2331	37.2331	37.2331	37.2331	37.2331	37.2331	37.2331	37.2331	37.2331 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-113.8649	-113.8649	-113.8649	-113.8649	-113.8649	-113.8649	-113.8649	-113.8649	-113.8649	-113.8649	-113.8649	-113.8649 (71)
Water heating gains (Table 5)	103.9168	101.5650	96.6814	90.0422	85.7318	79.6625	74.5038	81.1135	83.4620	90.3337	98.0931	101.5749 (72)
Total internal gains	477.5394	475.3022	458.9579	432.3536	404.9233	378.7744	361.9566	368.4518	382.2610	409.0979	439.9771	463.5385 (73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W		
East					7.5800	19.6403	0.6300	0.7000	0.7700	45.4976 (76)		
South					5.0000	46.7521	0.6300	0.7000	0.7700	71.4402 (78)		
West					12.8900	19.6403	0.6300	0.7000	0.7700	77.3699 (80)		
Horizontal					1.2700	26.0000	0.6300	0.7000	1.0000	13.1056 (82)		

Solar gains	207.4133	384.5749	593.2583	821.3496	979.8070	993.9853	949.8312	831.7060	674.0220	444.6656	254.5164	173.3565 (83)
Total gains	684.9528	859.8771	1052.2162	1253.7032	1384.7304	1372.7598	1311.7879	1200.1578	1056.2831	853.7635	694.4935	636.8949 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	51.2250	51.3566	51.4862	52.1039	52.2212	52.7739	52.7739	52.8775	52.5596	52.2212	51.9846	51.7395
alpha	4.4150	4.4238	4.4324	4.4736	4.4814	4.5183	4.5183	4.5252	4.5040	4.4814	4.4656	4.4493
util living area	0.9980	0.9944	0.9819	0.9381	0.8319	0.6597	0.4997	0.5616	0.8189	0.9714	0.9957	0.9986 (86)
MIT	19.4838	19.6955	20.0344	20.4554	20.7781	20.9437	20.9872	20.9788	20.8486	20.3923	19.8545	19.4513 (87)
Th 2	19.7975	19.8002	19.8028	19.8152	19.8176	19.8284	19.8284	19.8304	19.8242	19.8176	19.8128	19.8079 (88)
util rest of house	0.9974	0.9924	0.9754	0.9154	0.7744	0.5594	0.3730	0.4298	0.7355	0.9568	0.9938	0.9981 (89)
MIT 2	17.7924	18.1028	18.5950	19.1952	19.6106	19.7935	19.8241	19.8224	19.7084	19.1225	18.3447	17.7518 (90)
Living area fraction										fLA = Living area / (4) =		0.1368 (91)
MIT	18.0238	18.3206	18.7919	19.3675	19.7702	19.9508	19.9832	19.9806	19.8643	19.2962	18.5512	17.9843 (92)
Temperature adjustment												0.0000
adjusted MIT	18.0238	18.3206	18.7919	19.3675	19.7702	19.9508	19.9832	19.9806	19.8643	19.2962	18.5512	17.9843 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9957	0.9887	0.9675	0.9046	0.7717	0.5707	0.3902	0.4476	0.7388	0.9477	0.9907	0.9968 (94)
Useful gains	682.0045	850.1246	1018.0681	1134.0581	1068.6292	783.4003	511.9244	537.1525	780.3651	809.0849	688.0561	634.8824 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W												
	2158.9200	2105.8213	1923.8570	1618.8960	1245.3300	817.0381	516.5987	545.6678	883.7736	1341.9244	1775.0938	2146.8745 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh												
	1098.8251	843.8282	673.9069	349.0833	131.4654	0.0000	0.0000	0.0000	0.0000	396.4326	782.6671	1124.9221 (98)
Space heating												5401.1307 (99)
Space heating per m2											(98) / (4) =	46.5454 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF TARGET EMISSIONS 09 Jan 2014

8c. Space cooling requirement

Not applicable

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													5776.6104 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	1098.8251	843.8282	673.9069	349.0833	131.4654	0.0000	0.0000	0.0000	0.0000	396.4326	782.6671	1124.9221	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	1175.2140	902.4900	720.7561	373.3511	140.6047	0.0000	0.0000	0.0000	0.0000	423.9921	837.0771	1203.1253	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	193.6927	170.1952	177.5029	157.4004	153.0021	134.9240	127.8783	142.6682	143.1514	163.2993	174.8339	188.4524	(64)
Efficiency of water heater (217)m	88.7173	88.5081	88.0389	86.8797	84.4123	79.8000	79.8000	79.8000	79.8000	87.0930	88.3372	79.8000	(216)
Fuel for water heating, kWh/month	218.3256	192.2934	201.6187	181.1704	181.2556	169.0777	160.2485	178.7822	179.3877	187.4999	197.9165	212.2411	(219)
Water heating fuel used												2259.8172	(219)
Annual totals kWh/year													
Space heating fuel - main system												5776.6104	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												440.7841	(232)
Total delivered energy for all uses												8552.2118	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	5776.6104	0.2160	1247.7479	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2259.8172	0.2160	488.1205	(264)
Space and water heating			1735.8684	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	440.7841	0.5190	228.7670	(268)
Total CO2, kg/m2/year			2003.5603	(272)
Emissions per m2 for space and water heating			14.9592	(272a)
Fuel factor (mains gas)			1.0000	
Emissions per m2 for lighting			1.9714	(272b)
Emissions per m2 for pumps and fans			0.3354	(272c)
Target Carbon Dioxide Emission Rate (TER) = (14.9592 * 1.00) + 1.9714 + 0.3354, rounded to 2 d.p.			17.2700	(273)

Project name

Shell and Core

Retail

As designed

Date: Tue Jul 18 14:10:31 2023

Administrative information

Building Details

Address: Retail, London, N15,

Certifier details

Name: Nimco Ali

Telephone number: 02036031613

Address: Trinity Court Batchworth Island Church Street,
Rickmansworth, WD3 1RT

Certification tool

Calculation engine: SBEM

Calculation engine version: v6.1.d.0

Interface to calculation engine: DesignBuilder SBEM

Interface to calculation engine version: v7.1.3

BRUKL compliance module version: v6.1.d.0

Foundation area [m²]: 127.63The CO₂ emission and primary energy rates of the building must not exceed the targets

Target CO ₂ emission rate (TER), kgCO ₂ /m ² .annum	4.57
Building CO ₂ emission rate (BER), kgCO ₂ /m ² .annum	3.71
Target primary energy rate (TPER), kWh/m ² .annum	49.52
Building primary energy rate (BPER), kWh/m ² .annum	40.09
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	0.19	0.25	00 Ground Floor - Retail_W_7
Floors	0.18	0.09	0.09	00 Ground Floor - Retail_S_2
Pitched roofs	0.16	-	-	No heat loss pitched roofs
Flat roofs	0.18	0.14	0.14	00 Ground Floor - Retail_R_3
Windows** and roof windows	1.6	1	1	00 Ground Floor - Retail_G_6
Rooflights***	2.2	-	-	No external rooflights
Personnel doors [^]	1.6	-	-	No external personnel doors
Vehicle access & similar large doors	1.3	-	-	No external vehicle access doors
High usage entrance doors	3	-	-	No external high usage entrance doors

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

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

** Display windows and similar glazing are excluded from the U-value check.

*** Values for rooflights refer to the horizontal position.

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

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

Air permeability	Limiting standard	This building
m ³ /(h.m ²) at 50 Pa	8	3

Building services

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

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

1- VRF

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	2.86	6.7	-	-	-
Standard value	2.5*	5	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					

1- Project DHW

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	2.64	-
Standard value	1	N/A

1- CHP 1

	CHPQA quality index	CHP electrical efficiency
This building	110	0.36
Standard value	N/A	N/A

Zone-level mechanical ventilation, exhaust, and terminal units

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

Zone name	SFP [W/(l/s)]										HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		Zone	Standard
Standard value	0.3	1.1	0.5	2.3	2	0.5	0.5	0.4	1			
00 Ground Floor - Retail	-	-	-	-	1.2	-	-	-	-		0.85	N/A

Shell and core configuration

Zone	Assumed shell?
00 Ground Floor - Retail	NO

General lighting and display lighting	General luminaire	Display light source	
Zone name	Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m²]
Standard value	95	80	0.3
00 Ground Floor - Retail	110	110	1.364

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

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
00 Ground Floor - Retail	NO (-29.2%)	NO

Regulation 25A: Consideration of high efficiency alternative energy systems

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

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m ²]	127.6	127.6
External area [m ²]	396	396
Weather	LON	LON
Infiltration [m ³ /hm ² @ 50Pa]	3	3
Average conductance [W/K]	87.28	102.96
Average U-value [W/m ² K]	0.22	0.26
Alpha value* [%]	21.39	15.93

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

Building Use

% Area Building Type

100	Retail/Financial and Professional Services
	Restaurants and Cafes/Drinking Establishments/Takeaways
	Offices and Workshop Businesses
	General Industrial and Special Industrial Groups
	Storage or Distribution
	Hotels
	Residential Institutions: Hospitals and Care Homes
	Residential Institutions: Residential Schools
	Residential Institutions: Universities and Colleges
	Secure Residential Institutions
	Residential Spaces
	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	5.44	6.84
Cooling	4.94	6.06
Auxiliary	4.59	3.44
Lighting	11.44	15.41
Hot water	0.64	1.7
Equipment*	20.26	20.26
TOTAL **	27.04	33.46

* 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
<i>Displaced electricity</i>	<i>0</i>	<i>0</i>

Energy & CO₂ Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m ²]	143.89	161.09
Primary energy [kWh/m ²]	40.09	49.52
Total emissions [kg/m ²]	3.71	4.57

HVAC Systems Performance										
System Type	Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEFF	Cool SSEER	Heat gen SEFF	Cool gen SEER	
[ST] Split or multi-split system, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	54.9	89	5.4	4.9	4.6	2.81	5.01	2.86	6.7
	Notional	65	96.1	6.8	6.1	3.4	2.64	4.4	----	----

Key to terms

Heat dem [MJ/m2]	= Heating energy demand
Cool dem [MJ/m2]	= Cooling energy demand
Heat con [kWh/m2]	= Heating energy consumption
Cool con [kWh/m2]	= Cooling energy consumption
Aux con [kWh/m2]	= Auxiliary energy consumption
Heat SSEFF	= Heating system seasonal efficiency (for notional building, value depends on activity glazing class)
Cool SSEER	= Cooling system seasonal energy efficiency ratio
Heat gen SSEFF	= Heating generator seasonal efficiency
Cool gen SSEER	= Cooling generator seasonal energy efficiency ratio
ST	= System type
HS	= Heat source
HFT	= Heating fuel type
CFT	= Cooling fuel type

Appendix D

**DER Worksheets (Part L 2013) –
Be Clean**

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



Property Reference	Type 1 - Option 5 (Be Clean)				Issued on Date	18/07/2023
Assessment Reference	St Ann's Type 1	Prop Type Ref	St Ann's Type 1			
Property	Type 1 - 1B - Top					
SAP Rating	84 B	DER	13.85	TER	30.76	
Environmental	91 B	% DER<TER	54.97			
CO ₂ Emissions (t/year)	0.59	DFEE	44.14	TFEE	59.39	
General Requirements Compliance	Fail	% DFEE<TFEE	25.68			
Assessor Details	Miss Eleanor Ballinger, Eleanor Ballinger, Tel: 02036031625, Eleanor@hodkinsonconsultancy.com				Assessor ID	M976-0001
Client						

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Top-floor flat, total floor area 50 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating: Electricity (c)
Fuel factor: 1.55 (electricity)
Target Carbon Dioxide Emission Rate (TER) 30.76 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 13.85 kgCO₂/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 59.4 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 44.1 kWh/m²/yr OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	OK
Openings	0.83 (max. 2.00)	1.00 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 2.50 (design value)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Community heating scheme -
Secondary heating system: None

5 Cylinder insulation

Hot water storage Nominal cylinder loss: 0.22 kWh/day
Permitted by DBSCG 0.35 OK
Primary pipework insulated: No primary pipework

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room stats OK
Hot water controls: No cylinder stat

7 Low energy lights

Percentage of fixed lights with low-energy fittings: 100%
Minimum 75% OK

8 Mechanical ventilation

Continuous supply and extract system
Specific fan power: 0.61
Maximum 1.5 OK
MVHR efficiency: 93%
Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): High Fail
Based on:
Overshading: Average
Windows facing North: 1.76 m², No overhang
Windows facing South: 1.76 m², No overhang
Windows facing West: 9.60 m², No overhang
Air change rate: 2.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Roof U-value 0.10 W/m²K
Door U-value 1.00 W/m²K
Window U-value 0.80 W/m²K
Window U-value 0.80 W/m²K
Air permeability 2.5 m³/m²h

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.2400 (1b)	x 2.4000 (2b)	= 120.5760 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.2400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 120.5760 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					2.5000
Infiltration rate					0.1250 (18)
Number of sides sheltered					3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.0969 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1235	0.1211	0.1187	0.1066	0.1041	0.0920	0.0920	0.0896	0.0969	0.1041	0.1090	0.1138 (22b)
Balanced mechanical ventilation with heat recovery												0.5000 (23a)
If mechanical ventilation:												79.0500 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.2283	0.2258	0.2234	0.2113	0.2089	0.1968	0.1968	0.1944	0.2016	0.2089	0.2137	0.2186 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Window (West) (Uw = 0.80)			11.3600	0.7752	8.8062		(27)
Door			2.0900	1.0000	2.0900		(26)
Window (East) (Uw = 0.80)			1.7600	0.7752	1.3643		(27)
External Wall 1	31.4400	13.1200	18.3200	0.1800	3.2976		(29a)
Corridor Wall	23.0400	2.0900	20.9500	0.1786	3.7411		(29a)
External Roof 1	50.2400		50.2400	0.1000	5.0240		(30)
Total net area of external elements Aum(A, m ²)			104.7200				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		24.3232		(33)
Party Wall 1			29.7600	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							13.0134 (36)
Total fabric heat loss							(33) + (36) = 37.3366 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	9.0827	8.9863	8.8900	8.4081	8.3118	7.8299	7.8299	7.7336	8.0227	8.3118	8.5045	8.6972 (38)
Heat transfer coeff	46.4193	46.3230	46.2266	45.7448	45.6484	45.1666	45.1666	45.0702	45.3593	45.6484	45.8411	46.0339 (39)
Average = Sum(39)m / 12 =												45.7207 (39)
HLP	0.9240	0.9220	0.9201	0.9105	0.9086	0.8990	0.8990	0.8971	0.9029	0.9086	0.9124	0.9163 (40)
HLP (average)												0.9100 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.6972 (42)
Average daily hot water use (litres/day)												74.5078 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	81.9585	78.9782	75.9979	73.0176	70.0373	67.0570	67.0570	70.0373	73.0176	75.9979	78.9782	81.9585 (44)
Energy content (annual)	121.5421	106.3015	109.6937	95.6336	91.7627	79.1842	73.3758	84.1998	85.2055	99.2987	108.3923	117.7071 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 1172.2972 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

	18.2313	15.9452	16.4540	14.3450	13.7644	11.8776	11.0064	12.6300	12.7808	14.8948	16.2589	17.6561 (46)
Water storage loss:												
Store volume												3.0000 (47)
b) If manufacturer declared loss factor is not known :												
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0212 (51)
Volume factor from Table 2a												3.4200 (52)
Temperature factor from Table 2b												1.0000 (53)
Enter (49) or (54) in (55)												0.2173 (55)
Total storage loss												
6.7353	6.0835	6.7353	6.5180	6.7353	6.5180	6.7353	6.7353	6.5180	6.7353	6.5180	6.7353	(56)
If cylinder contains dedicated solar storage												
6.7353	6.0835	6.7353	6.5180	6.7353	6.5180	6.7353	6.7353	6.5180	6.7353	6.5180	6.7353	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month												
151.5398	133.3962	139.6914	124.6636	121.7604	108.2143	103.3735	114.1975	114.2355	129.2964	137.4224	147.7048	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Output from w/h												
151.5398	133.3962	139.6914	124.6636	121.7604	108.2143	103.3735	114.1975	114.2355	129.2964	137.4224	147.7048	(64)
Heat gains from water heating, kWh/month												
64.4109	57.0210	60.4713	55.0222	54.5093	49.5528	48.3956	51.9946	51.5548	57.0150	59.2645	63.1358	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
(66)m	84.8584	84.8584	84.8584	84.8584	84.8584	84.8584	84.8584	84.8584	84.8584	84.8584	84.8584	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
13.1816	11.7078	9.5214	7.2083	5.3883	4.5490	4.9154	6.3892	8.5756	10.8887	12.7087	13.5479	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
147.8573	149.3916	145.5252	137.2941	126.9039	117.1385	110.6147	109.0804	112.9468	121.1778	131.5681	141.3334	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
31.4858	31.4858	31.4858	31.4858	31.4858	31.4858	31.4858	31.4858	31.4858	31.4858	31.4858	31.4858	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)												
-67.8868	-67.8868	-67.8868	-67.8868	-67.8868	-67.8868	-67.8868	-67.8868	-67.8868	-67.8868	-67.8868	-67.8868	(71)
Water heating gains (Table 5)												
86.5738	84.8527	81.2786	76.4197	73.2651	68.8233	65.0479	69.8852	71.6039	76.6330	82.3118	84.8599	(72)
Total internal gains												
296.0702	294.4095	284.7827	269.3797	254.0148	238.9684	229.0355	233.8123	241.5838	257.1571	275.0460	288.1988	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
South				1.7600	46.7521	0.4200	0.8000	0.7700	19.1596 (78)			
West				9.6000	19.6403	0.4200	0.8000	0.7700	43.9027 (80)			
North				1.7600	10.6334	0.5000	0.8000	0.7700	5.1877 (74)			
Solar gains	68.2500	127.1754	198.2539	278.5124	336.3281	343.1130	327.0726	283.5245	226.5059	147.5533	83.8519	56.9838 (83)
Total gains	364.3202	421.5850	483.0367	547.8921	590.3429	582.0814	556.1081	517.3368	468.0897	404.7104	358.8979	345.1826 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
75.1603	75.3166	75.4736	76.2686	76.4296	77.2450	77.2450	77.4101	76.9167	76.4296	76.1083	75.7896	
6.0107	6.0211	6.0316	6.0846	6.0953	6.1497	6.1497	6.1607	6.1278	6.0953	6.0739	6.0526	
util living area												
0.9943	0.9857	0.9570	0.8632	0.6892	0.4932	0.3570	0.3999	0.6487	0.9177	0.9864	0.9958 (86)	
MIT	20.1949	20.3559	20.5941	20.8425	20.9654	20.9961	20.9996	20.9991	20.9817	20.7980	20.4467	20.1611 (87)
Th 2	20.1472	20.1488	20.1504	20.1586	20.1602	20.1683	20.1683	20.1700	20.1651	20.1602	20.1569	20.1537 (88)
util rest of house												
0.9926	0.9815	0.9448	0.8309	0.6363	0.4307	0.2897	0.3282	0.5782	0.8893	0.9816	0.9945 (89)	
MIT 2	19.0792	19.3130	19.6514	19.9875	20.1299	20.1660	20.1682	20.1696	20.1523	19.9411	19.4522	19.0352 (90)
Living area fraction									fLA = Living area / (4) =			0.4697 (91)
MIT	19.6033	19.8029	20.0942	20.3891	20.5224	20.5559	20.5587	20.5593	20.5419	20.3436	19.9194	19.5641 (92)
Temperature adjustment												0.0000
adjusted MIT	19.6033	19.8029	20.0942	20.3891	20.5224	20.5559	20.5587	20.5593	20.5419	20.3436	19.9194	19.5641 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0.9911	0.9794	0.9439	0.8404	0.6596	0.4600	0.3213	0.3619	0.6107	0.8962	0.9799	0.9933 (94)	
Useful gains	361.0837	412.8873	455.9149	460.4330	389.4054	267.7481	178.6882	187.2295	285.8626	362.7066	351.6873	342.8682 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W												
710.3686	690.3473	628.4143	525.5677	402.7277	269.0091	178.8013	187.4595	292.2002	444.7800	587.6544	707.2685 (97)	
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh												
259.8680	186.4531	128.3395	46.8970	9.9118	0.0000	0.0000	0.0000	0.0000	61.0626	169.8963	271.1138 (98)	
Space heating												1133.5422 (98)
Space heating per m2												(98) / (4) = 22.5625 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump	0.9500	(303a)
Fraction of heat from community Boilers	0.0500	(303b)
Fraction of total space heat from community Heat pump	0.9500	(304a)
Fraction of total space heat from community Boilers	0.0500	(304b)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000	(305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.0500	(306)
Space heating:		
Annual space heating requirement	1133.5422	(98)
Space heat from Heat pump = (98) x 0.95 x 1.00 x 1.05	1130.7083	(307a)
Space heat from Boilers = (98) x 0.05 x 1.00 x 1.05	59.5110	(307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	(309)
Water heating		
Annual water heating requirement	1525.4958	(64)
Water heat from Heat pump = (64) x 0.95 x 1.00 x 1.05	1521.6821	(310a)
Water heat from Boilers = (64) x 0.05 x 1.00 x 1.05	80.0885	(310b)
Electricity used for heat distribution	27.9199	(313)
Annual totals kWh/year		
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7625)		
mechanical ventilation fans (SFP = 0.7625)	112.1658	(330a)
Total electricity for the above, kWh/year	112.1658	(331)
Electricity for lighting (calculated in Appendix L)	232.7909	(332)
Total delivered energy for all uses	3136.9466	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			323.0000	(367a)
Space heating from Heat pump	821.1735	0.5190	426.1890	(367)
Efficiency of heat source Boilers			95.0000	(367b)
Space heating from Boilers	146.9468	0.5190	76.2654	(368)
Electrical energy for heat distribution	27.9199	0.5190	14.4904	(372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			516.9449	(373)
Space and water heating			516.9449	(376)
Pumps and fans	112.1658	0.5190	58.2141	(378)
Energy for lighting	232.7909	0.5190	120.8185	(379)
Total CO2, kg/year			695.9774	(383)
Dwelling Carbon Dioxide Emission Rate (DER)			13.8500	(384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		13.8500	ZC1
Total Floor Area	TFA	50.2400	
Assumed number of occupants	N	1.6972	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		17.4397	ZC2
CO2 emissions from cooking, equation (L16)		3.1794	ZC3
Total CO2 emissions		34.4691	ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000	ZC7
Net CO2 emissions		34.4691	ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.2400 (1b)	x 2.4000 (2b)	= 120.5760 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.2400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 120.5760 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				20.0000 / (5) =	0.1659 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4159 (18)
Number of sides sheltered					3 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.7750 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3223 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4109	0.4029	0.3948	0.3545	0.3465	0.3062	0.3062	0.2981	0.3223	0.3465	0.3626	0.3787 (22b)
Effective ac	0.5844	0.5812	0.5779	0.5628	0.5600	0.5469	0.5469	0.5444	0.5519	0.5600	0.5657	0.5717 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.0900	1.0000	2.0900		(26)
TER Opening Type (Uw = 1.40)			10.4600	1.3258	13.8674		(27)
External Wall 1	31.4400	10.4600	20.9800	0.1800	3.7764		(29a)
Corridor Wall	23.0400	2.0900	20.9500	0.1800	3.7710		(29a)
External Roof 1	50.2400		50.2400	0.1300	6.5312		(30)
Total net area of external elements Aum(A, m ²)			104.7200				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	30.0360	(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							12.7410 (36)
Total fabric heat loss						(33) + (36) =	42.7770 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	23.2546	23.1242	22.9963	22.3957	22.2833	21.7602	21.7602	21.6633	21.9617	22.2833	22.5106	22.7483 (38)
Heat transfer coeff	66.0316	65.9012	65.7733	65.1727	65.0603	64.5372	64.5372	64.4403	64.7387	65.0603	65.2877	65.5253 (39)
Average = Sum(39)m / 12 =												65.1722 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.3143	1.3117	1.3092	1.2972	1.2950	1.2846	1.2846	1.2826	1.2886	1.2950	1.2995	1.3042 (40)
HLP (average)												1.2972 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.6972 (42)
Average daily hot water use (litres/day)												74.5078 (43)
Daily hot water use	81.9585	78.9782	75.9979	73.0176	70.0373	67.0570	67.0570	70.0373	73.0176	75.9979	78.9782	81.9585 (44)
Energy conte	121.5421	106.3015	109.6937	95.6336	91.7627	79.1842	73.3758	84.1998	85.2055	99.2987	108.3923	117.7071 (45)
Energy content (annual)												1172.2972 (45)
Distribution loss (46)m = 0.15 x (45)m	18.2313	15.9452	16.4540	14.3450	13.7644	11.8776	11.0064	12.6300	12.7808	14.8948	16.2589	17.6561 (46)
Water storage loss:												3.0000 (47)
Store volume												0.2602 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.1405 (55)
Enter (49) or (54) in (55)												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Total storage loss	4.3553	3.9338	4.3553	4.2148	4.3553	4.2148	4.3553	4.3553	4.2148	4.3553	4.2148	4.3553 (56)
If cylinder contains dedicated solar storage	4.3553	3.9338	4.3553	4.2148	4.3553	4.2148	4.3553	4.3553	4.2148	4.3553	4.2148	4.3553 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	149.1598	131.2465	137.3113	122.3604	119.3804	105.9110	100.9935	111.8175	111.9322	126.9164	135.1191	145.3247 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	149.1598	131.2465	137.3113	122.3604	119.3804	105.9110	100.9935	111.8175	111.9322	126.9164	135.1191	145.3247 (64)
Heat gains from water heating, kWh/month	62.5069	55.3013	58.5673	53.1796	52.6052	47.7102	46.4916	50.0906	49.7122	55.1110	57.4219	61.2317 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	84.8584	84.8584	84.8584	84.8584	84.8584	84.8584	84.8584	84.8584	84.8584	84.8584	84.8584	84.8584	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.2261	11.7473	9.5535	7.2326	5.4065	4.5644	4.9320	6.4108	8.6045	10.9254	12.7516	13.5937	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	147.8573	149.3916	145.5252	137.2941	126.9039	117.1385	110.6147	109.0804	112.9468	121.1778	131.5681	141.3334	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.4858	31.4858	31.4858	31.4858	31.4858	31.4858	31.4858	31.4858	31.4858	31.4858	31.4858	31.4858	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-67.8868	-67.8868	-67.8868	-67.8868	-67.8868	-67.8868	-67.8868	-67.8868	-67.8868	-67.8868	-67.8868	-67.8868	(71)
Water heating gains (Table 5)	84.0147	82.2935	78.7195	73.8605	70.7060	66.2641	62.4887	67.3261	69.0448	74.0739	79.7526	82.3007	(72)
Total internal gains	296.5555	294.8899	285.2557	269.8448	254.4739	239.4246	229.4929	234.2748	242.0536	257.6347	275.5298	288.6853	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W		
North				1.4000	10.6334	0.6300	0.7000	0.7700		4.5496 (74)		
South				1.4000	46.7521	0.6300	0.7000	0.7700		20.0033 (78)		
West				7.6600	19.6403	0.6300	0.7000	0.7700		45.9778 (80)		
Solar gains	70.5306	131.3969	204.6268	286.9229	345.8658	352.5394	336.1852	291.8648	233.6279	152.4087	86.6521	58.8873 (83)
Total gains	367.0861	426.2869	489.8825	556.7677	600.3397	591.9640	565.6781	526.1395	475.6816	410.0433	362.1818	347.5726 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	52.8366	52.9412	53.0441	53.5330	53.6254	54.0601	54.0601	54.1414	53.8919	53.6254	53.4387	53.2449	
alpha	4.5224	4.5294	4.5363	4.5689	4.5750	4.6040	4.6040	4.6094	4.5928	4.5750	4.5626	4.5497	
util living area	0.9954	0.9903	0.9757	0.9300	0.8238	0.6513	0.4913	0.5452	0.7945	0.9576	0.9909	0.9964	(86)
MIT	19.6617	19.8399	20.1358	20.5070	20.7988	20.9499	20.9890	20.9825	20.8746	20.4828	20.0016	19.6281	(87)
Th 2	19.8296	19.8317	19.8336	19.8430	19.8448	19.8529	19.8529	19.8544	19.8498	19.8448	19.8412	19.8375	(88)
util rest of house	0.9938	0.9871	0.9672	0.9054	0.7660	0.5530	0.3687	0.4184	0.7086	0.9375	0.9872	0.9952	(89)
MIT 2	18.0734	18.3337	18.7609	19.2855	19.6579	19.8218	19.8492	19.8479	19.7559	19.2657	18.5770	18.0299	(90)
Living area fraction	18.8195	19.0412	19.4067	19.8593	20.1938	20.3517	20.3846	20.3809	20.2814	19.8374	19.2462	18.7806	(92)
Temperature adjustment	18.8195	19.0412	19.4067	19.8593	20.1938	20.3517	20.3846	20.3809	20.2814	19.8374	19.2462	18.7806	(93)
adjusted MIT	18.8195	19.0412	19.4067	19.8593	20.1938	20.3517	20.3846	20.3809	20.2814	19.8374	19.2462	18.7806	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9919	0.9841	0.9633	0.9058	0.7851	0.5976	0.4266	0.4783	0.7438	0.9373	0.9846	0.9936	(94)
Ext temp.	364.1231	419.5041	471.9178	504.3309	471.3001	353.7803	241.3176	251.6470	353.8297	384.3330	356.6012	345.3427	(95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Month fracti	958.7476	931.9235	848.9192	714.2474	552.6094	371.2005	244.2488	256.5289	400.1738	600.9907	792.9974	955.4011	(97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000	(97a)
Space heating per m2	442.4006	344.3458	280.4891	151.1399	60.4941	0.0000	0.0000	0.0000	0.0000	161.1933	314.2053	453.8835	(98)
												2208.1515	(98)
												43.9521	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2361.6594 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	442.4006	344.3458	280.4891	151.1399	60.4941	0.0000	0.0000	0.0000	0.0000	161.1933	314.2053	453.8835	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	473.1557	368.2843	299.9883	161.6469	64.6996	0.0000	0.0000	0.0000	0.0000	172.3992	336.0484	485.4369	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	149.1598	131.2465	137.3113	122.3604	119.3804	105.9110	100.9935	111.8175	111.9322	126.9164	135.1191	145.3247	(64)
Efficiency of water heater (217)m	87.5403	87.2707	86.6802	85.3783	83.1045	79.8000	79.8000	79.8000	79.8000	85.4526	86.9923	87.6497	(216)
Fuel for water heating, kWh/month	170.3898	150.3901	158.4114	143.3155	143.6510	132.7206	126.5583	140.1222	140.2660	148.5226	155.3230	165.8018	(219)
Water heating fuel used												1775.4721	(219)
Annual totals kWh/year													
Space heating fuel - main system												2361.6594	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												233.5768	(232)
Total delivered energy for all uses												4445.7084	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2361.6594	0.2160	510.1184 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1775.4721	0.2160	383.5020 (264)
Space and water heating			893.6204 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	233.5768	0.5190	121.2264 (268)
Total CO2, kg/m2/year			1053.7718 (272)
Emissions per m2 for space and water heating			17.7870 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.4129 (272b)
Emissions per m2 for pumps and fans			0.7748 (272c)
Target Carbon Dioxide Emission Rate (TER) = (17.7870 * 1.55) + 2.4129 + 0.7748, rounded to 2 d.p.			30.7600 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



Property Reference	Type 2 - Option 5 (Be Clean)			Issued on Date	18/07/2023
Assessment Reference	St Ann's Type 2	Prop Type Ref	St Ann's Type 2		
Property	Type 2 - 2B - Ground				
SAP Rating	85 B	DER	11.97	TER	26.05
Environmental	91 B	% DER<TER	54.04		
CO ₂ Emissions (t/year)	0.71	DFEE	39.93	TFEE	51.53
General Requirements Compliance	Fail	% DFEE<TFEE	22.51		
Assessor Details	Miss Eleanor Ballinger, Eleanor Ballinger, Tel: 02036031625, Eleanor@hodkinsonconsultancy.com			Assessor ID	M976-0001
Client					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Ground-floor flat, total floor area 71 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating: Electricity (c)
Fuel factor: 1.55 (electricity)
Target Carbon Dioxide Emission Rate (TER) 26.05 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 11.97 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 51.5 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 39.9 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.13 (max. 0.25)	0.13 (max. 0.70)	OK
Roof	(no roof)		
Openings	0.82 (max. 2.00)	1.00 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 2.50 (design value)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Community heating scheme -
Secondary heating system: None

5 Cylinder insulation

Hot water storage: Nominal cylinder loss: 0.22 kWh/day
Permitted by DBSCG 0.35 OK
Primary pipework insulated: No primary pipework

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK
Hot water controls: No cylinder stat

7 Low energy lights

Percentage of fixed lights with low-energy fittings: 100%
Minimum 75% OK

8 Mechanical ventilation

Continuous supply and extract system
Specific fan power: 0.61
Maximum 1.5 OK
MVHR efficiency: 93%
Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): High Fail
Based on:
Overshading: Average
Windows facing North: 8.20 m², No overhang
Windows facing East: 8.04 m², No overhang
Air change rate: 2.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Door U-value 1.00 W/m²K
Window U-value 0.80 W/m²K
Window U-value 0.80 W/m²K
Air permeability 2.5 m³/m²h

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	71.4900 (1b)	x 2.4000 (2b)	= 171.5760 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.4900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 171.5760 (5)

2. Ventilation rate

	main		secondary		other		total	m3 per hour				
	heating		heating									
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000 (6a)				
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000 (6b)				
Number of intermittent fans							0 * 10 =	0.0000 (7a)				
Number of passive vents							0 * 10 =	0.0000 (7b)				
Number of flueless gas fires							0 * 40 =	0.0000 (7c)				
Air changes per hour												
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =						0.0000 / (5) =	0.0000 (8)				
Pressure test							Yes					
Measured/design AP50							2.5000					
Infiltration rate							0.1250	(18)				
Number of sides sheltered							2	(19)				
Shelter factor							(20) = 1 - [0.075 x (19)] =	0.8500 (20)				
Infiltration rate adjusted to include shelter factor							(21) = (18) x (20) =	0.1063 (21)				
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
	0.1355	0.1328	0.1302	0.1169	0.1142	0.1009	0.1009	0.0983	0.1063	0.1142	0.1195	0.1248 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												0.5000 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												79.0500 (23c)
Effective ac	0.2402	0.2376	0.2349	0.2216	0.2190	0.2057	0.2057	0.2030	0.2110	0.2190	0.2243	0.2296 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Window (Uw = 0.80)			8.2000	0.7752	6.3566		(27)					
Door			2.0900	1.0000	2.0900		(26)					
Window (east, west, south (Uw = 0.80)			8.0400	0.7752	6.2326		(27)					
Heat Loss Floor 1			71.4900	0.1300	9.2937		(28a)					
External Wall 1	42.7200	16.2400	26.4800	0.1800	4.7664		(29a)					
Corridor Wall	7.9200	2.0900	5.8300	0.1786	1.0411		(29a)					
Total net area of external elements Aum(A, m2)			122.1300				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		29.7803		(33)					
Party Wall 1			34.3200	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												
Thermal bridges (Sum(L x Psi) calculated using Appendix K)												
Total fabric heat loss						(33) + (36) =	42.0409 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 13.6012	Feb 13.4508	Mar 13.3004	Apr 12.5484	May 12.3980	Jun 11.6460	Jul 11.6460	Aug 11.4956	Sep 11.9468	Oct 12.3980	Nov 12.6988	Dec 12.9996 (38)
Heat transfer coeff	55.6421	55.4917	55.3413	54.5893	54.4389	53.6870	53.6870	53.5366	53.9878	54.4389	54.7397	55.0405 (39)
Average = Sum(39)m / 12 =	54.5517 (39)											
HLP	Jan 0.7783	Feb 0.7762	Mar 0.7741	Apr 0.7636	May 0.7615	Jun 0.7510	Jul 0.7510	Aug 0.7489	Sep 0.7552	Oct 0.7615	Nov 0.7657	Dec 0.7699 (40)
HLP (average)	0.7631 (40)											
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2817 (42)
Average daily hot water use (litres/day)												88.3915 (43)
Daily hot water use	Jan 97.2307	Feb 93.6950	Mar 90.1593	Apr 86.6237	May 83.0880	Jun 79.5524	Jul 79.5524	Aug 83.0880	Sep 86.6237	Oct 90.1593	Nov 93.6950	Dec 97.2307 (44)
Energy conte	144.1903	126.1097	130.1340	113.4539	108.8617	93.9394	87.0487	99.8896	101.0826	117.8021	128.5902	139.6406 (45)
Energy content (annual)												Total = Sum(45)m = 1390.7428 (45)
Distribution loss (46)m = 0.15 x (45)m												

Water storage loss:	21.6285	18.9165	19.5201	17.0181	16.3293	14.0909	13.0573	14.9834	15.1624	17.6703	19.2885	20.9461 (46)
Store volume												3.0000 (47)
b) If manufacturer declared loss factor is not known :												
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0212 (51)
Volume factor from Table 2a												3.4200 (52)
Temperature factor from Table 2b												1.0000 (53)
Enter (49) or (54) in (55)												0.2173 (55)
Total storage loss												
	6.7353	6.0835	6.7353	6.5180	6.7353	6.5180	6.7353	6.7353	6.5180	6.7353	6.5180	6.7353 (56)
If cylinder contains dedicated solar storage												
	6.7353	6.0835	6.7353	6.5180	6.7353	6.5180	6.7353	6.7353	6.5180	6.7353	6.5180	6.7353 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month												
	174.1880	153.2044	160.1316	142.4840	138.8594	122.9694	117.0464	129.8873	130.1127	147.7997	157.6202	169.6383 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
								Solar input (sum of months) =	Sum(63)m =			0.0000 (63)
Output from w/h												
	174.1880	153.2044	160.1316	142.4840	138.8594	122.9694	117.0464	129.8873	130.1127	147.7997	157.6202	169.6383 (64)
								Total per year (kWh/year) =	Sum(64)m =			1743.9414 (64)
Heat gains from water heating, kWh/month												
	71.9414	63.6072	67.2677	60.9475	60.1947	54.4589	52.9418	57.2115	56.8340	63.1673	65.9802	70.4286 (65)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9957	0.9896	0.9661	0.8706	0.6726	0.4593	0.3224	0.3705	0.6426	0.9288	0.9893	0.9968 (94)
Useful gains	431.6242	483.6518	536.2470	554.4707	470.3737	319.9312	213.2411	223.3343	342.7160	428.9035	415.9262	411.2434 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	857.5047	830.7828	754.4981	629.1913	481.6232	320.5982	213.2846	223.4472	348.7465	531.8769	705.6601	852.2578 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	316.8551	233.2720	162.3788	53.7988	8.3696	0.0000	0.0000	0.0000	0.0000	76.6122	208.6084	328.1147 (98)
Space heating												1388.0096 (98)
Space heating per m2												19.4154 (99)
										(98) / (4) =		

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump	0.9500	(303a)
Fraction of heat from community Boilers	0.0500	(303b)
Fraction of total space heat from community Heat pump	0.9500	(304a)
Fraction of total space heat from community Boilers	0.0500	(304b)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000	(305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.0500	(306)
Space heating:		
Annual space heating requirement	1388.0096	(98)
Space heat from Heat pump = (98) x 0.95 x 1.00 x 1.05	1384.5396	(307a)
Space heat from Boilers = (98) x 0.05 x 1.00 x 1.05	72.8705	(307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	(309)
Water heating		
Annual water heating requirement	1743.9414	(64)
Water heat from Heat pump = (64) x 0.95 x 1.00 x 1.05	1739.5816	(310a)
Water heat from Boilers = (64) x 0.05 x 1.00 x 1.05	91.5569	(310b)
Electricity used for heat distribution	32.8855	(313)
Annual totals kWh/year		
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7625)		
mechanical ventilation fans (SFP = 0.7625)	159.6086	(330a)
Total electricity for the above, kWh/year	159.6086	(331)
Electricity for lighting (calculated in Appendix L)	316.0657	(332)
Total delivered energy for all uses	3764.2228	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			323.0000 (367a)
Space heating from Heat pump	967.2202	0.5190	501.9873 (367)
Efficiency of heat source Boilers			95.0000 (367b)
Space heating from Boilers	173.0815	0.5190	89.8293 (368)
Electrical energy for heat distribution	32.8855	0.5190	17.0676 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			608.8841 (373)
Space and water heating			608.8841 (376)
Pumps and fans	159.6086	0.5190	82.8368 (378)
Energy for lighting	316.0657	0.5190	164.0381 (379)
Total CO2, kg/year			855.7591 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			11.9700 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		11.9700	ZC1
Total Floor Area	TFA	71.4900	
Assumed number of occupants	N	2.2817	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		16.6401	ZC2
CO2 emissions from cooking, equation (L16)		2.4306	ZC3
Total CO2 emissions		31.0406	ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000	ZC7
Net CO2 emissions		31.0406	ZC8

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	71.4900 (1b)	x 2.4000 (2b)	= 171.5760 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.4900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 171.5760 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				30.0000 / (5) = 0.1748 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4248 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3611 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4604	0.4514	0.4424	0.3972	0.3882	0.3431	0.3431	0.3340	0.3611	0.3882	0.4063	0.4243 (22b)
Effective ac	0.6060	0.6019	0.5978	0.5789	0.5754	0.5588	0.5588	0.5558	0.5652	0.5754	0.5825	0.5900 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.0900	1.0000	2.0900		(26)
TER Opening Type (Uw = 1.40)			15.7700	1.3258	20.9072		(27)
Heat Loss Floor 1			71.4900	0.1300	9.2937		(28a)
External Wall 1	42.7200	15.7700	26.9500	0.1800	4.8510		(29a)
Corridor Wall	7.9200	2.0900	5.8300	0.1800	1.0494		(29a)
Total net area of external elements Aum(A, m ²)			122.1300				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		38.1913		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.8140 (36)
Total fabric heat loss						(33) + (36) =	47.0053 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	34.3117	34.0786	33.8502	32.7772	32.5765	31.6420	31.6420	31.4689	32.0019	32.5765	32.9826	33.4072 (38)
Heat transfer coeff	81.3170	81.0839	80.8555	79.7825	79.5818	78.6473	78.6473	78.4742	79.0072	79.5818	79.9879	80.4125 (39)
Average = Sum(39)m / 12 =												79.7816 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1375	1.1342	1.1310	1.1160	1.1132	1.1001	1.1001	1.0977	1.1052	1.1132	1.1189	1.1248 (40)
HLP (average)												1.1160 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2817 (42)
Average daily hot water use (litres/day)												88.3915 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	97.2307	93.6950	90.1593	86.6237	83.0880	79.5524	79.5524	83.0880	86.6237	90.1593	93.6950	97.2307 (44)
Energy conte	144.1903	126.1097	130.1340	113.4539	108.8617	93.9394	87.0487	99.8896	101.0826	117.8021	128.5902	139.6406 (45)
Energy content (annual)										Total = Sum(45)m =		1390.7428 (45)
Distribution loss (46)m = 0.15 x (45)m	21.6285	18.9165	19.5201	17.0181	16.3293	14.0909	13.0573	14.9834	15.1624	17.6703	19.2885	20.9461 (46)
Water storage loss:												
Store volume												3.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												0.2602 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.1405 (55)

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Total storage loss	4.3553	3.9338	4.3553	4.2148	4.3553	4.2148	4.3553	4.3553	4.2148	4.3553	4.2148	4.3553 (56)
If cylinder contains dedicated solar storage	4.3553	3.9338	4.3553	4.2148	4.3553	4.2148	4.3553	4.3553	4.2148	4.3553	4.2148	4.3553 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	171.8079	151.0547	157.7516	140.1807	136.4794	120.6662	114.6663	127.5073	127.8094	145.4197	155.3169	167.2583 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	171.8079	151.0547	157.7516	140.1807	136.4794	120.6662	114.6663	127.5073	127.8094	145.4197	155.3169	167.2583 (64)
Heat gains from water heating, kWh/month	70.0374	61.8875	65.3637	59.1049	58.2907	52.6163	51.0378	55.3074	54.9914	61.2633	64.1377	68.5246 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	114.0874	114.0874	114.0874	114.0874	114.0874	114.0874	114.0874	114.0874	114.0874	114.0874	114.0874	114.0874 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.9016	15.9001	12.9308	9.7895	7.3177	6.1779	6.6755	8.6770	11.6463	14.7877	17.2594	18.3992 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	200.7493	202.8325	197.5830	186.4075	172.3004	159.0418	150.1842	148.1011	153.3505	164.5260	178.6331	191.8917 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4087	34.4087	34.4087	34.4087	34.4087	34.4087	34.4087	34.4087	34.4087	34.4087	34.4087	34.4087 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-91.2699	-91.2699	-91.2699	-91.2699	-91.2699	-91.2699	-91.2699	-91.2699	-91.2699	-91.2699	-91.2699	-91.2699 (71)
Water heating gains (Table 5)	94.1363	92.0945	87.8544	82.0901	78.3477	73.0782	68.5992	74.3380	76.3769	82.3432	89.0801	92.1030 (72)
Total internal gains	373.0135	371.0533	358.5945	338.5133	318.1921	298.5241	285.6851	291.3423	301.6000	321.8831	345.1988	362.6201 (73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d	Gains W
North					7.9600	10.6334	0.6300	0.7000			0.7700	25.8676 (74)
East					7.8100	19.6403	0.6300	0.7000			0.7700	46.8781 (76)

Solar gains	72.7458	141.1379	235.0238	355.1849	451.6933	470.9042	444.7372	370.1032	276.6421	167.6591	90.3626	60.1148 (83)
Total gains	445.7592	512.1912	593.6182	693.6981	769.8854	769.4283	730.4224	661.4455	578.2421	489.5422	435.5613	422.7350 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	61.0522	61.2277	61.4007	62.2265	62.3834	63.1247	63.1247	63.2639	62.8371	62.3834	62.0667	61.7390
alpha	5.0701	5.0818	5.0934	5.1484	5.1589	5.2083	5.2083	5.2176	5.1891	5.1589	5.1378	5.1159
util living area	0.9976	0.9947	0.9843	0.9409	0.8207	0.6274	0.4686	0.5350	0.8127	0.9717	0.9951	0.9982 (86)
MIT	19.7975	19.9513	20.2248	20.5867	20.8568	20.9727	20.9950	20.9906	20.9004	20.5345	20.1037	19.7740 (87)
Th 2	19.9704	19.9730	19.9756	19.9878	19.9901	20.0007	20.0007	20.0027	19.9966	19.9901	19.9855	19.9806 (88)
util rest of house	0.9968	0.9930	0.9788	0.9204	0.7668	0.5405	0.3649	0.4245	0.7365	0.9580	0.9931	0.9976 (89)
MIT 2	18.3699	18.5960	18.9937	19.5113	19.8557	19.9836	19.9990	19.9990	19.9190	19.4510	18.8280	18.3429 (90)
Living area fraction									fLA = Living area / (4) =			0.3932 (91)
MIT	18.9312	19.1289	19.4778	19.9341	20.2493	20.3725	20.3906	20.3889	20.3049	19.8770	19.3296	18.9056 (92)
Temperature adjustment												0.0000
adjusted MIT	18.9312	19.1289	19.4778	19.9341	20.2493	20.3725	20.3906	20.3889	20.3049	19.8770	19.3296	18.9056 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9957	0.9910	0.9754	0.9191	0.7818	0.5739	0.4059	0.4682	0.7622	0.9560	0.9913	0.9967 (94)
Useful gains	443.8334	507.5627	579.0005	637.6060	601.9171	441.5987	296.4576	309.6649	440.7468	468.0225	431.7522	421.3248 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	1189.7645	1153.7383	1049.3248	880.3317	680.3720	453.9924	298.1222	313.0227	490.2325	738.2816	978.2197	1182.5161 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	554.9727	434.2300	349.9213	174.7625	58.3704	0.0000	0.0000	0.0000	0.0000	201.0728	393.4566	566.3263 (98)
Space heating												2733.1127 (98)
Space heating per m2										(98) / (4) =		38.2307 (99)

8c. Space cooling requirement

Not applicable

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9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2923.1152 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	554.9727	434.2300	349.9213	174.7625	58.3704	0.0000	0.0000	0.0000	0.0000	201.0728	393.4566	566.3263	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	593.5537	464.4171	374.2473	186.9118	62.4283	0.0000	0.0000	0.0000	0.0000	215.0511	420.8092	605.6966	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	171.8079	151.0547	157.7516	140.1807	136.4794	120.6662	114.6663	127.5073	127.8094	145.4197	155.3169	167.2583	(64)
Efficiency of water heater (217)m	87.7195	87.4729	86.8801	85.4031	82.7302	79.8000	79.8000	79.8000	79.8000	85.6785	87.1911	79.8000	(216)
Fuel for water heating, kWh/month	195.8605	172.6874	181.5739	164.1402	164.9694	151.2108	143.6922	159.7836	160.1622	169.7272	178.1339	190.4659	(219)
Water heating fuel used												2032.4069	(219)
Annual totals kWh/year												2923.1152	(211)
Space heating fuel - main system												0.0000	(215)
Space heating fuel - secondary													
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												316.1486	(232)
Total delivered energy for all uses												5346.6707	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2923.1152	0.2160	631.3929 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2032.4069	0.2160	438.9999 (264)
Space and water heating			1070.3928 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	316.1486	0.5190	164.0811 (268)
Total CO2, kg/m2/year			1273.3989 (272)
Emissions per m2 for space and water heating			14.9726 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.2952 (272b)
Emissions per m2 for pumps and fans			0.5445 (272c)
Target Carbon Dioxide Emission Rate (TER) = (14.9726 * 1.55) + 2.2952 + 0.5445, rounded to 2 d.p.			26.0500 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



Property Reference	Type 3 - Option 5 (Be Clean)				Issued on Date	18/07/2023
Assessment Reference	St Ann's Type 3	Prop Type Ref	St Ann's Type 3			
Property	Type 3 - 2B - Mid					
SAP Rating	86 B	DER	10.61	TER	20.81	
Environmental	92 A	% DER<TER	49.01			
CO ₂ Emissions (t/year)	0.67	DFEE	27.31	TFEE	34.71	
General Requirements Compliance	Fail	% DFEE<TFEE	21.33			
Assessor Details	Miss Eleanor Ballinger, Eleanor Ballinger, Tel: 02036031625, Eleanor@hodkinsonconsultancy.com				Assessor ID	M976-0001
Client						

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Mid-floor flat, total floor area 72 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating: Electricity (c)
Fuel factor: 1.55 (electricity)
Target Carbon Dioxide Emission Rate (TER) 20.81 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 10.61 kgCO₂/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 34.7 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 27.3 kWh/m²/yr OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	0.82 (max. 2.00)	1.00 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 2.50 (design value)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system: None

5 Cylinder insulation

Hot water storage: Nominal cylinder loss: 0.47 kWh/day
Permitted by DBSCG 0.35 Fail
Primary pipework insulated: No primary pipework

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room stats OK

Hot water controls: No cylinder stat

7 Low energy lights

Percentage of fixed lights with low-energy fittings: 100%
Minimum 75% OK

8 Mechanical ventilation

Continuous supply and extract system
Specific fan power: 0.61
Maximum 1.5 OK
MVHR efficiency: 93%
Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): High Fail
Based on:
Overshading: Average
Windows facing East: 8.58 m², Overhang width less than twice window, ratio 13.71
Windows facing South: 8.44 m², No overhang
Air change rate: 2.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Door U-value 1.00 W/m²K
Window U-value 0.80 W/m²K
Window U-value 0.80 W/m²K
Air permeability 2.5 m³/m²h

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	72.3500 (1b)	x 2.4000 (2b)	= 173.6400 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.3500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 173.6400 (5)

2. Ventilation rate

					main	secondary	other			total	m3 per hour	
					heating		heating					
Number of chimneys					0	+	0	+	0	=	0 * 40 =	0.0000 (6a)
Number of open flues					0	+	0	+	0	=	0 * 20 =	0.0000 (6b)
Number of intermittent fans											0 * 10 =	0.0000 (7a)
Number of passive vents											0 * 10 =	0.0000 (7b)
Number of flueless gas fires											0 * 40 =	0.0000 (7c)
Air changes per hour												
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =										0.0000 / (5) =	0.0000 (8)	
Pressure test										Yes		
Measured/design AP50										2.5000		
Infiltration rate										0.1250 (18)		
Number of sides sheltered										2 (19)		
Shelter factor										(20) = 1 - [0.075 x (19)] =	0.8500 (20)	
Infiltration rate adjusted to include shelter factor										(21) = (18) x (20) =	0.1063 (21)	
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
	0.1355	0.1328	0.1302	0.1169	0.1142	0.1009	0.1009	0.0983	0.1063	0.1142	0.1195	0.1248 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.3100	0.3073	0.3047	0.2914	0.2887	0.2754	0.2754	0.2728	0.2808	0.2887	0.2940	0.2993 (25)
												0.5000 (23a)
												65.1000 (23c)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Window (South) (Uw = 0.80)			17.0200	0.7752	13.1938		(27)					
Door			2.0900	1.0000	2.0900		(26)					
External Wall 1	43.4400	17.0200	26.4200	0.1800	4.7556		(29a)					
Corridor Wall	12.9600	2.0900	10.8700	0.1786	1.9411		(29a)					
Total net area of external elements Aum(A, m2)			56.4000				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	21.9805		(33)					
Party Wall 1			30.7200	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.3668 (36)					
Total fabric heat loss						(33) + (36) =	32.3473 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 17.7616	Feb 17.6094	Mar 17.4572	Apr 16.6961	May 16.5439	Jun 15.7829	Jul 15.7829	Aug 15.6307	Sep 16.0873	Oct 16.5439	Nov 16.8483	Dec 17.1528 (38)
Heat transfer coeff	50.1089	49.9566	49.8044	49.0434	48.8912	48.1302	48.1302	47.9780	48.4346	48.8912	49.1956	49.5000 (39)
Average = Sum(39)m / 12 =												49.0054 (39)
HLP	Jan 0.6926	Feb 0.6905	Mar 0.6884	Apr 0.6779	May 0.6758	Jun 0.6652	Jul 0.6652	Aug 0.6631	Sep 0.6694	Oct 0.6758	Nov 0.6800	Dec 0.6842 (40)
HLP (average)												0.6773 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3018 (42)
Average daily hot water use (litres/day)												88.8677 (43)
Daily hot water use	Jan 97.7545	Feb 94.1998	Mar 90.6451	Apr 87.0904	May 83.5357	Jun 79.9809	Jul 79.9809	Aug 83.5357	Sep 87.0904	Oct 90.6451	Nov 94.1998	Dec 97.7545 (44)
Energy conte	144.9671	126.7891	130.8350	114.0652	109.4482	94.4455	87.5176	100.4278	101.6272	118.4367	129.2829	140.3929 (45)
Energy content (annual)										Total = Sum(45)m =		1398.2353 (45)
Distribution loss (46)m = 0.15 x (45)m												
	21.7451	19.0184	19.6253	17.1098	16.4172	14.1668	13.1276	15.0642	15.2441	17.7655	19.3924	21.0589 (46)
Water storage loss:												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Store volume												3.0000 (47)
b) If manufacturer declared loss factor is not known :												
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0461 (51)
Volume factor from Table 2a												3.4200 (52)
Temperature factor from Table 2b												1.0000 (53)
Enter (49) or (54) in (55)												0.4732 (55)
Total storage loss												
14.6692 13.2496 14.6692 14.1960 14.6692 14.1960 14.6692 14.6692 14.1960 14.6692 14.1960 14.6692 (56)												
If cylinder contains dedicated solar storage												
14.6692 13.2496 14.6692 14.1960 14.6692 14.1960 14.6692 14.6692 14.1960 14.6692 14.1960 14.6692 (57)												
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624 (59)
Total heat required for water heating calculated for each month												
182.8987 161.0499 168.7666 150.7732 147.3798 131.1535 125.4492 138.3594 138.3352 156.3683 165.9909 178.3245 (62)												
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Solar input (sum of months) = Sum(63)m =												0.0000 (63)
Output from w/h												
182.8987 161.0499 168.7666 150.7732 147.3798 131.1535 125.4492 138.3594 138.3352 156.3683 165.9909 178.3245 (64)												
Heat gains from water heating, kWh/month												
78.5468 69.5660 73.8479 67.2931 66.7368 60.7695 59.4449 63.7375 63.1574 69.7255 72.3530 77.0259 (65)												

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
(66)m	115.0899	115.0899	115.0899	115.0899	115.0899	115.0899	115.0899	115.0899	115.0899	115.0899	115.0899	115.0899 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
18.0725 16.0518 13.0542 9.8829 7.3876 6.2369 6.7392 8.7599 11.7575 14.9288 17.4241 18.5748 (67)												
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
202.7185 204.8221 199.5211 188.2360 173.9905 160.6018 151.6574 149.5538 154.8547 166.1399 180.3853 193.7740 (68)												
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
34.5090 34.5090 34.5090 34.5090 34.5090 34.5090 34.5090 34.5090 34.5090 34.5090 34.5090 34.5090 (69)												
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)												
-92.0719 -92.0719 -92.0719 -92.0719 -92.0719 -92.0719 -92.0719 -92.0719 -92.0719 -92.0719 -92.0719 -92.0719 (71)												
Water heating gains (Table 5)												
105.5737 103.5209 99.2580 93.4626 89.7000 84.4021 79.8990 85.6687 87.7187 93.7170 100.4902 103.5294 (72)												
Total internal gains												
383.8917 381.9218 369.3603 349.1084 328.6051 308.7678 295.8226 301.5093 311.8579 332.3127 355.8266 373.4052 (73)												

6. Solar gains

[Jan]												
Area	m2											
Solar flux	Table 6a											
Specific data	g											
Specific data	or Table 6b											
FF	Specific data											
Access	factor											
Table 6d												
Gains	W											
East		8.5800		19.6403		0.4200		0.8000		0.7700		39.2380 (76)
South		8.4400		46.7521		0.4200		0.8000		0.7700		91.8789 (78)
Solar gains	131.1169	227.2318	318.0864	400.9972	451.6896	448.5431	432.4670	395.2894	347.2487	253.3800	157.8330	111.6593 (83)
Total gains	515.0086	609.1536	687.4467	750.1057	780.2947	757.3109	728.2896	696.7987	659.1065	585.6927	513.6597	485.0645 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	100.2678	100.5733	100.8807	102.4461	102.7650	104.3899	104.3899	104.7211	103.7338	102.7650	102.1291	101.5011
alpha	7.6845	7.7049	7.7254	7.8297	7.8510	7.9593	7.9593	7.9814	7.9156	7.8510	7.8086	7.7667
util living area	0.9906	0.9687	0.9060	0.7609	0.5792	0.4066	0.2908	0.3167	0.5059	0.8153	0.9710	0.9936 (86)
MIT	20.5375	20.6965	20.8592	20.9678	20.9961	20.9998	21.0000	21.0000	20.9989	20.9560	20.7373	20.5041 (87)
Th 2	20.3474	20.3492	20.3511	20.3604	20.3623	20.3716	20.3716	20.3735	20.3679	20.3623	20.3586	20.3548 (88)
util rest of house	0.9880	0.9610	0.8869	0.7280	0.5407	0.3667	0.2493	0.2736	0.4601	0.7788	0.9625	0.9918 (89)
MIT 2	19.7350	19.9625	20.1848	20.3272	20.3590	20.3715	20.3716	20.3735	20.3672	20.3182	20.0304	19.6930 (90)
Living area fraction									fLA = Living area / (4) =			0.4409 (91)
MIT	20.0888	20.2861	20.4821	20.6097	20.6399	20.6485	20.6487	20.6497	20.6457	20.5994	20.3421	20.0506 (92)
Temperature adjustment												0.0000
adjusted MIT	20.0888	20.2861	20.4821	20.6097	20.6399	20.6485	20.6487	20.6497	20.6457	20.5994	20.3421	20.0506 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9868	0.9602	0.8910	0.7411	0.5575	0.3843	0.2676	0.2926	0.4803	0.7929	0.9623	0.9907 (94)	
Useful gains	508.2089	584.8828	612.5283	555.9172	435.0376	291.0280	194.8598	203.8850	316.5363	464.3676	494.2840	480.5774 (95)	
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)	
Heat loss rate W													
	791.1593	768.6400	696.3722	574.2826	437.0811	291.1168	194.8638	203.8930	317.0386	488.8850	651.4513	784.6052 (97)	
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)	
Space heating kWh													
	210.5151	123.4848	62.3798	13.2231	1.5204	0.0000	0.0000	0.0000	0.0000	18.2409	113.1604	226.1967 (98)	
Space heating													
Space heating per m2													
											(98) / (4) =	10.6250 (99)	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump	0.9500	(303a)
Fraction of heat from community Boilers	0.0500	(303b)
Fraction of total space heat from community Heat pump	0.9500	(304a)
Fraction of total space heat from community Boilers	0.0500	(304b)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000	(305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.0500	(306)
Space heating:		
Annual space heating requirement	768.7213	(98)
Space heat from Heat pump = (98) x 0.95 x 1.00 x 1.05	766.7995	(307a)
Space heat from Boilers = (98) x 0.05 x 1.00 x 1.05	40.3579	(307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	(309)
Water heating		
Annual water heating requirement	1844.8492	(64)
Water heat from Heat pump = (64) x 0.95 x 1.00 x 1.05	1840.2371	(310a)
Water heat from Boilers = (64) x 0.05 x 1.00 x 1.05	96.8546	(310b)
Electricity used for heat distribution	27.4425	(313)
Annual totals kWh/year		
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.8540)		
mechanical ventilation fans (SFP = 0.8540)	180.9120	(330a)
Total electricity for the above, kWh/year	180.9120	(331)
Electricity for lighting (calculated in Appendix L)	319.1660	(332)
Total delivered energy for all uses	3244.3271	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			323.0000 (367a)
Space heating from Heat pump	807.1321	0.5190	418.9015 (367)
Efficiency of heat source Boilers			95.0000 (367b)
Space heating from Boilers	144.4342	0.5190	74.9613 (368)
Electrical energy for heat distribution	27.4425	0.5190	14.2427 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			508.1055 (373)
Space and water heating			508.1055 (376)
Pumps and fans	180.9120	0.5190	93.8934 (378)
Energy for lighting	319.1660	0.5190	165.6472 (379)
Total CO2, kg/year			767.6460 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			10.6100 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		10.6100	ZC1
Total Floor Area	TFA	72.3500	
Assumed number of occupants	N	2.3018	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		16.6036	ZC2
CO2 emissions from cooking, equation (L16)		2.4083	ZC3
Total CO2 emissions		29.6219	ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000	ZC7
Net CO2 emissions		29.6219	ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	72.3500 (1b)	x 2.4000 (2b)	= 173.6400 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.3500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 173.6400 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				Air changes per hour
Pressure test					30.0000 / (5) = 0.1728 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.4228 (18)
					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3594 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4582	0.4492	0.4402	0.3953	0.3863	0.3414	0.3414	0.3324	0.3594	0.3863	0.4043	0.4222 (22b)
	0.6050	0.6009	0.5969	0.5781	0.5746	0.5583	0.5583	0.5552	0.5646	0.5746	0.5817	0.5891 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Opaque door			2.0900	1.0000	2.0900			(26)				
TER Opening Type (Uw = 1.40)			16.0000	1.3258	21.2121			(27)				
External Wall 1	43.4400	16.0000	27.4400	0.1800	4.9392			(29a)				
Corridor Wall	12.9600	2.0900	10.8700	0.1800	1.9566			(29a)				
Total net area of external elements Aum(A, m2)			56.4000					(31)				
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	30.1979		(33)				
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K									250.0000 (35)			
Thermal bridges (Sum(L x Psi) calculated using Appendix K)									5.7250 (36)			
Total fabric heat loss						(33) + (36) =	35.9229	(37)				
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	34.6651	34.4316	34.2027	33.1274	32.9262	31.9897	31.9897	31.8163	32.3504	32.9262	33.3332	33.7587 (38)
	70.5881	70.3545	70.1256	69.0503	68.8491	67.9126	67.9126	67.7392	68.2734	68.8491	69.2561	69.6816 (39)
Average = Sum(39)m / 12 =												69.0494 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.9756	0.9724	0.9693	0.9544	0.9516	0.9387	0.9387	0.9363	0.9437	0.9516	0.9572	0.9631 (40)
Days in month												0.9544 (40)
	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3018 (42)
Average daily hot water use (litres/day)												88.8677 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	97.7545	94.1998	90.6451	87.0904	83.5357	79.9809	79.9809	83.5357	87.0904	90.6451	94.1998	97.7545 (44)
Energy content (annual)	144.9671	126.7891	130.8350	114.0652	109.4482	94.4455	87.5176	100.4278	101.6272	118.4367	129.2829	140.3929 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		1398.2353 (45)
	21.7451	19.0184	19.6253	17.1098	16.4172	14.1668	13.1276	15.0642	15.2441	17.7655	19.3924	21.0589 (46)
Water storage loss:												
Store volume												3.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												0.2602 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.1405 (55)
Total storage loss												

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

If cylinder contains dedicated solar storage	4.3553	3.9338	4.3553	4.2148	4.3553	4.2148	4.3553	4.3553	4.2148	4.3553	4.2148	4.3553 (56)
Primary loss	4.3553	3.9338	4.3553	4.2148	4.3553	4.2148	4.3553	4.3553	4.2148	4.3553	4.2148	4.3553 (57)
Total heat required for water heating calculated for each month	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Solar input	172.5848	151.7341	158.4527	140.7919	137.0659	121.1723	115.1353	128.0454	128.3540	146.0544	156.0097	168.0106 (62)
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Heat gains from water heating, kWh/month	172.5848	151.7341	158.4527	140.7919	137.0659	121.1723	115.1353	128.0454	128.3540	146.0544	156.0097	168.0106 (64)
	70.2957	62.1134	65.5968	59.3081	58.4857	52.7846	51.1938	55.4864	55.1725	61.4743	64.3680	68.7748 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)
(66)m	115.0899	115.0899	115.0899	115.0899	115.0899	115.0899	115.0899	115.0899	115.0899	115.0899	115.0899	115.0899	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.0760	16.0549	13.0567	9.8848	7.3890	6.2381	6.7405	8.7615	11.7597	14.9317	17.4274	18.5783	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	202.7185	204.8221	199.5211	188.2360	173.9905	160.6018	151.6574	149.5538	154.8547	166.1399	180.3853	193.7740	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5090	34.5090	34.5090	34.5090	34.5090	34.5090	34.5090	34.5090	34.5090	34.5090	34.5090	34.5090	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-92.0719	-92.0719	-92.0719	-92.0719	-92.0719	-92.0719	-92.0719	-92.0719	-92.0719	-92.0719	-92.0719	-92.0719	(71)
Water heating gains (Table 5)	94.4835	92.4306	88.1677	82.3723	78.6098	73.3119	68.8088	74.5785	76.6284	82.6268	89.4000	92.4392	(72)
Total internal gains	375.8049	373.8346	361.2725	341.0201	320.5163	300.6788	287.7336	293.4207	303.7699	324.2253	347.7397	365.3185	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d	Gains W
East					8.0700	19.6403	0.6300	0.7000			0.7700	48.4387 (76)
South					7.9300	46.7521	0.6300	0.7000			0.7700	113.3041 (78)

Solar gains	161.7429	280.3194	392.4247	494.7444	557.3115	553.4382	533.5990	487.7118	428.4139	312.5836	194.7014	137.7389 (83)
Total gains	537.5477	654.1540	753.6972	835.7645	877.8278	854.1170	821.3326	781.1325	732.1837	636.8089	542.4412	503.0574 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	71.1778	71.4141	71.6473	72.7630	72.9756	73.9819	73.9819	74.1713	73.5910	72.9756	72.5467	72.1038	
alpha	5.7452	5.7609	5.7765	5.8509	5.8650	5.9321	5.9321	5.9448	5.9061	5.8650	5.8364	5.8069	
util living area	0.9940	0.9817	0.9472	0.8539	0.6944	0.5043	0.3632	0.3979	0.6256	0.8994	0.9843	0.9958	(86)
MIT	20.1359	20.3420	20.5934	20.8360	20.9586	20.9947	20.9994	20.9989	20.9824	20.8070	20.4232	20.1000	(87)
Th 2	20.1037	20.1064	20.1090	20.1215	20.1239	20.1348	20.1348	20.1368	20.1306	20.1239	20.1191	20.1142	(88)
util rest of house	0.9921	0.9763	0.9326	0.8198	0.6398	0.4382	0.2921	0.3238	0.5540	0.8665	0.9788	0.9944	(89)
MIT 2	18.9604	19.2592	19.6147	19.9448	20.0876	20.1315	20.1345	20.1364	20.1184	19.9189	19.3887	18.9162	(90)
Living area fraction	19.4787	19.7366	20.0462	20.3377	20.4716	20.5121	20.5158	20.5167	20.4994	20.3105	19.8448	19.4381	(92)
Temperature adjustment	19.4787	19.7366	20.0462	20.3377	20.4716	20.5121	20.5158	20.5167	20.4994	20.3105	19.8448	19.4381	(93)
adjusted MIT	19.4787	19.7366	20.0462	20.3377	20.4716	20.5121	20.5158	20.5167	20.4994	20.3105	19.8448	19.4381	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9904	0.9736	0.9314	0.8288	0.6620	0.4672	0.3235	0.3565	0.5850	0.8743	0.9767	0.9931	(94)
Ext temp.	532.4062	636.8787	702.0222	692.6829	581.1586	399.0785	265.7115	278.4672	428.3143	556.7471	529.7905	499.5777	(95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Month fracti	1071.4365	1043.8222	949.9367	789.7779	603.9191	401.5082	265.9353	278.8604	436.9070	668.5593	882.6581	1061.8184	(97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating per m2	401.0386	273.4660	184.4484	69.9084	16.9337	0.0000	0.0000	0.0000	0.0000	83.1883	254.0647	418.3070	(98)
												1701.3550	(98)
												23.5156	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1819.6310 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	401.0386	273.4660	184.4484	69.9084	16.9337	0.0000	0.0000	0.0000	0.0000	83.1883	254.0647	418.3070	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	428.9183	292.4770	197.2710	74.7683	18.1110	0.0000	0.0000	0.0000	0.0000	88.9714	271.7269	447.3872	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	172.5848	151.7341	158.4527	140.7919	137.0659	121.1723	115.1353	128.0454	128.3540	146.0544	156.0097	168.0106	(64)
Efficiency of water heater (217)m	86.9906	86.3674	85.2198	83.0582	80.8511	79.8000	79.8000	79.8000	79.8000	83.3773	86.1075	87.1514	(217)
Fuel for water heating, kWh/month	198.3947	175.6844	185.9342	169.5099	169.5288	151.8450	144.2798	160.4580	160.8446	175.1729	181.1801	192.7800	(219)
Water heating fuel used												2065.6124	(219)
Annual totals kWh/year													
Space heating fuel - main system												1819.6310	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												319.2270	(232)
Total delivered energy for all uses												4279.4704	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1819.6310	0.2160	393.0403 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2065.6124	0.2160	446.1723 (264)
Space and water heating			839.2126 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	319.2270	0.5190	165.6788 (268)
Total CO2, kg/m2/year			1043.8164 (272)
Emissions per m2 for space and water heating			11.5993 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.2900 (272b)
Emissions per m2 for pumps and fans			0.5380 (272c)
Target Carbon Dioxide Emission Rate (TER) = (11.5993 * 1.55) + 2.2900 + 0.5380, rounded to 2 d.p.			20.8100 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



Property Reference	Type 4 - Option 5 (Be Clean)			Issued on Date	18/07/2023
Assessment Reference	St Ann's Type 4	Prop Type Ref	St Ann's Type 4		
Property	Type 4 - 3B - First (Exposed)				
SAP Rating	86 B	DER	10.77	TER	22.59
Environmental	91 B	% DER<TER	52.33		
CO ₂ Emissions (t/year)	0.86	DFEE	35.02	TFEE	45.98
General Requirements Compliance	Fail	% DFEE<TFEE	23.83		
Assessor Details	Miss Eleanor Ballinger, Eleanor Ballinger, Tel: 02036031625, Eleanor@hodkinsonconsultancy.com			Assessor ID	M976-0001
Client					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Mid-floor flat, total floor area 92 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating: Electricity (c)
Fuel factor: 1.55 (electricity)
Target Carbon Dioxide Emission Rate (TER) 22.59 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 10.77 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 46.0 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 35.0 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.13 (max. 0.25)	0.13 (max. 0.70)	OK
Roof	(no roof)		
Openings	0.82 (max. 2.00)	1.00 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 2.50 (design value)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Community heating scheme -
Secondary heating system: None

5 Cylinder insulation

Hot water storage Nominal cylinder loss: 0.22 kWh/day
Permitted by DBSCG 0.35 OK
Primary pipework insulated: No primary pipework

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK
Hot water controls: No cylinder stat

7 Low energy lights

Percentage of fixed lights with low-energy fittings: 100%
Minimum 75% OK

8 Mechanical ventilation

Continuous supply and extract system
Specific fan power: 0.66
Maximum 1.5 OK
MVHR efficiency: 93%
Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): High Fail
Based on:
Overshading: Average
Windows facing South: 8.65 m², No overhang
Windows facing West: 13.28 m², No overhang
Air change rate: 2.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Door U-value 1.00 W/m²K
Window U-value 0.80 W/m²K
Air permeability 2.5 m³/m²h

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	91.5100 (1b)	x 2.4000 (2b)	= 219.6240 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	91.5100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 219.6240 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					2.5000
Infiltration rate					0.1250 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1063 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1355	0.1328	0.1302	0.1169	0.1142	0.1009	0.1009	0.0983	0.1063	0.1142	0.1195	0.1248 (22b)
Balanced mechanical ventilation with heat recovery												0.5000 (23a)
If mechanical ventilation:												79.0500 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.2402	0.2376	0.2349	0.2216	0.2190	0.2057	0.2057	0.2030	0.2110	0.2190	0.2243	0.2296 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Window (south) (Uw = 0.80)			21.9300	0.7752	17.0000		(27)
Door			2.0900	1.0000	2.0900		(26)
Heat Loss Floor 1			91.5100	0.1300	11.8963		(28b)
External Wall 1	47.2800	21.9300	25.3500	0.1800	4.5630		(29a)
Corridor Wall	14.6400	2.0900	12.5500	0.1786	2.2411		(29a)
Total net area of external elements Aum(A, m2)			153.4300				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		37.7904		(33)
Party Wall 1			33.6000	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							100.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							14.8144 (36)
Total fabric heat loss							(33) + (36) = 52.6048 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	17.4101	17.2176	17.0250	16.0625	15.8700	14.9074	14.9074	14.7149	15.2924	15.8700	16.2550	16.6400 (38)
Average = Sum(39)m / 12 =	70.0148	69.8223	69.6298	68.6672	68.4747	67.5122	67.5122	67.3196	67.8972	68.4747	68.8598	69.2448 (39)
												68.6191 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.7651	0.7630	0.7609	0.7504	0.7483	0.7378	0.7378	0.7357	0.7420	0.7483	0.7525	0.7567 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.6458 (42)
Average daily hot water use (litres/day)												97.0385 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	106.7423	102.8608	98.9792	95.0977	91.2161	87.3346	87.3346	91.2161	95.0977	98.9792	102.8608	106.7423 (44)
Energy content (annual)	158.2957	138.4465	142.8644	124.5526	119.5112	103.1291	95.5642	109.6614	110.9711	129.3261	141.1695	153.3010 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 1526.7927 (45)
	23.7444	20.7670	21.4297	18.6829	17.9267	15.4694	14.3346	16.4492	16.6457	19.3989	21.1754	22.9951 (46)

Water storage loss:												3.0000 (47)
Store volume												
b) If manufacturer declared loss factor is not known :												
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0212 (51)
Volume factor from Table 2a												3.4200 (52)
Temperature factor from Table 2b												1.0000 (53)
Enter (49) or (54) in (55)												0.2173 (55)
Total storage loss												
	6.7353	6.0835	6.7353	6.5180	6.7353	6.5180	6.7353	6.7353	6.5180	6.7353	6.5180	6.7353 (56)
If cylinder contains dedicated solar storage												
	6.7353	6.0835	6.7353	6.5180	6.7353	6.5180	6.7353	6.7353	6.5180	6.7353	6.5180	6.7353 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month												
	188.2934	165.5412	172.8620	153.5826	149.5089	132.1591	125.5619	139.6591	140.0011	159.3238	170.1996	183.2987 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Solar input (sum of months) = Sum (63)m =												0.0000 (63)
Output from w/h												
	188.2934	165.5412	172.8620	153.5826	149.5089	132.1591	125.5619	139.6591	140.0011	159.3238	170.1996	183.2987 (64)
Total per year (kWh/year) = Sum (64)m =												1879.9913 (64)
Heat gains from water heating, kWh/month												
	76.6315	67.7092	71.5006	64.6378	63.7356	57.5144	55.7733	60.4606	60.1219	66.9991	70.1629	74.9707 (65)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9279	0.8855	0.8183	0.7095	0.5699	0.4126	0.2897	0.3201	0.5143	0.7559	0.8910	0.9381 (94)
Useful gains	541.8891	619.7834	658.3235	635.8502	539.0071	380.4948	256.3515	267.8933	399.9460	511.0211	519.8787	514.1812 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	1004.3532	987.2321	906.6102	761.9083	587.2078	391.9129	258.8074	271.4092	424.8822	641.7465	835.7557	995.0226 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	344.0733	246.9255	184.7253	90.7618	35.8613	0.0000	0.0000	0.0000	0.0000	97.2596	227.4314	357.7461 (98)
Space heating												1584.7843 (98)
Space heating per m2												17.3182 (99)
										(98) / (4) =		

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Heat pump	0.9500 (303a)
Fraction of heat from community Boilers	0.0500 (303b)
Fraction of total space heat from community Heat pump	0.9500 (304a)
Fraction of total space heat from community Boilers	0.0500 (304b)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.0500 (306)
Space heating:	
Annual space heating requirement	1584.7843 (98)
Space heat from Heat pump = (98) x 0.95 x 1.00 x 1.05	1580.8223 (307a)
Space heat from Boilers = (98) x 0.05 x 1.00 x 1.05	83.2012 (307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	1879.9913 (64)
Water heat from Heat pump = (64) x 0.95 x 1.00 x 1.05	1875.2914 (310a)
Water heat from Boilers = (64) x 0.05 x 1.00 x 1.05	98.6995 (310b)
Electricity used for heat distribution	36.3801 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.8250)	
mechanical ventilation fans (SFP = 0.8250)	221.0516 (330a)
Total electricity for the above, kWh/year	221.0516 (331)
Electricity for lighting (calculated in Appendix L)	380.7419 (332)
Total delivered energy for all uses	4239.8079 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			323.0000 (367a)
Space heating from Heat pump	1070.0042	0.5190	555.3322 (367)
Efficiency of heat source Boilers			95.0000 (367b)
Space heating from Boilers	191.4744	0.5190	99.3752 (368)
Electrical energy for heat distribution	36.3801	0.5190	18.8813 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			673.5887 (373)
Space and water heating			673.5887 (376)
Pumps and fans	221.0516	0.5190	114.7258 (378)
Energy for lighting	380.7419	0.5190	197.6051 (379)
Total CO2, kg/year			985.9195 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			10.7700 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		10.7700 ZC1
Total Floor Area	TFA	91.5100
Assumed number of occupants	N	2.6458
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		15.6598 ZC2
CO2 emissions from cooking, equation (L16)		1.9943 ZC3
Total CO2 emissions		28.4241 ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000 ZC7
Net CO2 emissions		28.4241 ZC8

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	91.5100 (1b)	x 2.4000 (2b)	= 219.6240 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	91.5100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 219.6240 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour 30.0000 / (5) = 0.1366 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3866 (18)
Number of sides sheltered					2 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.8500 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3286 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4190	0.4108	0.4025	0.3615	0.3533	0.3122	0.3122	0.3040	0.3286	0.3533	0.3697	0.3861 (22b)
Effective ac	0.5878	0.5844	0.5810	0.5653	0.5624	0.5487	0.5487	0.5462	0.5540	0.5624	0.5683	0.5745 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.0900	1.0000	2.0900		(26)
TER Opening Type (Uw = 1.40)			20.8000	1.3258	27.5758		(27)
Heat Loss Floor 1			91.5100	0.1300	11.8963		(28b)
External Wall 1	47.2800	20.8000	26.4800	0.1800	4.7664		(29a)
Corridor Wall	14.6400	2.0900	12.5500	0.1800	2.2590		(29a)
Total net area of external elements Aum(A, m ²)			153.4300				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		48.5875		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							13.7040 (36)
Total fabric heat loss						(33) + (36) =	62.2915 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	42.5992	42.3521	42.1100	40.9728	40.7600	39.7695	39.7695	39.5861	40.1510	40.7600	41.1905	41.6405 (38)
Heat transfer coeff	104.8906	104.6436	104.4015	103.2642	103.0515	102.0610	102.0610	101.8775	102.4425	103.0515	103.4819	103.9319 (39)
Average = Sum(39)m / 12 =												103.2632 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1462	1.1435	1.1409	1.1284	1.1261	1.1153	1.1153	1.1133	1.1195	1.1261	1.1308	1.1357 (40)
HLP (average)												1.1284 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.6458 (42)
Average daily hot water use (litres/day)												97.0385 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	106.7423	102.8608	98.9792	95.0977	91.2161	87.3346	87.3346	91.2161	95.0977	98.9792	102.8608	106.7423 (44)
Energy conte	158.2957	138.4465	142.8644	124.5526	119.5112	103.1291	95.5642	109.6614	110.9711	129.3261	141.1695	153.3010 (45)
Energy content (annual)										Total = Sum(45)m =		1526.7927 (45)
Distribution loss (46)m = 0.15 x (45)m	23.7444	20.7670	21.4297	18.6829	17.9267	15.4694	14.3346	16.4492	16.6457	19.3989	21.1754	22.9951 (46)
Water storage loss:												3.0000 (47)
Store volume												0.2602 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.1405 (55)
Enter (49) or (54) in (55)												

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Total storage loss	4.3553	3.9338	4.3553	4.2148	4.3553	4.2148	4.3553	4.3553	4.2148	4.3553	4.2148	4.3553 (56)
If cylinder contains dedicated solar storage	4.3553	3.9338	4.3553	4.2148	4.3553	4.2148	4.3553	4.3553	4.2148	4.3553	4.2148	4.3553 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	185.9134	163.3915	170.4820	151.2794	147.1289	129.8559	123.1819	137.2790	137.6979	156.9438	167.8963	180.9186 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	185.9134	163.3915	170.4820	151.2794	147.1289	129.8559	123.1819	137.2790	137.6979	156.9438	167.8963	180.9186 (64)
Heat gains from water heating, kWh/month	74.7275	65.9894	69.5965	62.7952	61.8316	55.6718	53.8692	58.5565	58.2793	65.0951	68.3203	73.0667 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	132.2915	132.2915	132.2915	132.2915	132.2915	132.2915	132.2915	132.2915	132.2915	132.2915	132.2915	132.2915	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	21.5592	19.1487	15.5727	11.7896	8.8128	7.4402	8.0394	10.4499	14.0258	17.8090	20.7857	22.1584	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	241.8285	244.3379	238.0142	224.5519	207.5581	191.5864	180.9162	178.4068	184.7305	198.1928	215.1866	231.1583	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.2291	36.2291	36.2291	36.2291	36.2291	36.2291	36.2291	36.2291	36.2291	36.2291	36.2291	36.2291	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-105.8332	-105.8332	-105.8332	-105.8332	-105.8332	-105.8332	-105.8332	-105.8332	-105.8332	-105.8332	-105.8332	-105.8332	(71)
Water heating gains (Table 5)	100.4402	98.1986	93.5437	87.2155	83.1070	77.3220	72.4049	78.7050	80.9435	87.4934	94.8893	98.2079	(72)
Total internal gains	429.5152	427.3726	412.8181	389.2444	365.1654	342.0360	327.0480	333.2492	345.3872	369.1826	396.5490	417.2121	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W	
South					8.2000	46.7521	0.6300	0.7000	0.7700		117.1619	
West					12.6000	19.6403	0.6300	0.7000	0.7700		75.6292 (78)	
Solar gains	192.7911	339.8279	488.0697	631.5955	723.3588	722.8359	695.1007	627.4390	538.7000	382.5131	233.1776	163.4325 (83)
Total gains	622.3064	767.2004	900.8879	1020.8399	1088.5242	1064.8719	1022.1487	960.6882	884.0872	751.6957	629.7266	580.6446 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	60.5856	60.7286	60.8695	61.5398	61.6669	62.2653	62.2653	62.3774	62.0334	61.6669	61.4104	61.1445	
alpha	5.0390	5.0486	5.0580	5.1027	5.1111	5.1510	5.1510	5.1585	5.1356	5.1111	5.0940	5.0763	
util living area	0.9965	0.9896	0.9694	0.9079	0.7789	0.5933	0.4358	0.4816	0.7315	0.9450	0.9916	0.9975	(86)
MIT	19.8379	20.0490	20.3415	20.6676	20.8861	20.9779	20.9962	20.9938	20.9379	20.6275	20.1617	19.7993	(87)
Th 2	19.9633	19.9654	19.9676	19.9777	19.9796	19.9884	19.9884	19.9900	19.9850	19.9796	19.9757	19.9717	(88)
util rest of house	0.9953	0.9863	0.9595	0.8798	0.7208	0.5080	0.3375	0.3791	0.6483	0.9216	0.9883	0.9967	(89)
MIT 2	18.4237	18.7317	19.1520	19.6068	19.8760	19.9748	19.9871	19.9876	19.9401	19.5662	18.9047	18.3735	(90)
Living area fraction									fLA = Living area / (4) =			0.1929	(91)
MIT	18.6964	18.9858	19.3814	19.8114	20.0708	20.1682	20.1817	20.1817	20.1326	19.7709	19.1471	18.6485	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.6964	18.9858	19.3814	19.8114	20.0708	20.1682	20.1817	20.1817	20.1326	19.7709	19.1471	18.6485	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9932	0.9819	0.9523	0.8745	0.7264	0.5237	0.3565	0.3989	0.6614	0.9157	0.9845	0.9951	(94)
Useful gains	618.0856	753.3184	857.8954	892.6987	790.7522	557.6402	364.3732	383.1918	584.7212	688.3198	619.9634	577.7728	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1510.0518	1473.9853	1344.8418	1126.7538	862.6242	568.2987	365.5515	385.2703	617.9902	945.0763	1246.6593	1501.6641	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	663.6229	484.2882	362.2881	168.5197	53.4728	0.0000	0.0000	0.0000	0.0000	191.0268	451.2211	687.3751	(98)
Space heating												3061.8148	(98)
Space heating per m2										(98) / (4) =		33.4588	(99)

8c. Space cooling requirement

Not applicable

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3274.6682 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	663.6229	484.2882	362.2881	168.5197	53.4728	0.0000	0.0000	0.0000	0.0000	191.0268	451.2211	687.3751	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	709.7571	517.9553	387.4740	180.2350	57.1902	0.0000	0.0000	0.0000	0.0000	204.3068	482.5894	735.1606	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	185.9134	163.3915	170.4820	151.2794	147.1289	129.8559	123.1819	137.2790	137.6979	156.9438	167.8963	180.9186	(64)
Efficiency of water heater (217)m	87.9201	87.5389	86.7767	85.1021	82.3968	79.8000	79.8000	79.8000	79.8000	85.3390	87.3247	88.0403	(216)
Fuel for water heating, kWh/month	211.4572	186.6501	196.4605	177.7622	178.5613	162.7266	154.3633	172.0289	172.5537	183.9062	192.2667	205.4952	(219)
Water heating fuel used												2194.2319	(219)
Annual totals kWh/year													
Space heating fuel - main system												3274.6682	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												380.7419	(232)
Total delivered energy for all uses												5924.6420	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3274.6682	0.2160	707.3283 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2194.2319	0.2160	473.9541 (264)
Space and water heating			1181.2824 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	380.7419	0.5190	197.6051 (268)
Total CO2, kg/m2/year			1417.8125 (272)
Emissions per m2 for space and water heating			12.9088 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.1594 (272b)
Emissions per m2 for pumps and fans			0.4254 (272c)
Target Carbon Dioxide Emission Rate (TER) = (12.9088 * 1.55) + 2.1594 + 0.4254, rounded to 2 d.p.			22.5900 (273)

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Property Reference	Type 5 - Option 5 (Be Clean)				Issued on Date	18/07/2023
Assessment Reference	St Ann's Type 5	Prop Type Ref	St Ann's Type 5			
Property	Type 5 - 1B - Mid					
SAP Rating	85 B	DER	11.48	TER	23.61	
Environmental	93 A	% DER<TER	51.38			
CO ₂ Emissions (t/year)	0.52	DFEE	29.77	TFEE	36.61	
General Requirements Compliance	Fail	% DFEE<TFEE	18.69			
Assessor Details	Miss Eleanor Ballinger, Eleanor Ballinger, Tel: 02036031625, Eleanor@hodkinsonconsultancy.com				Assessor ID	M976-0001
Client						

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Calculation Type: New Build (As Designed)



REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Mid-floor flat, total floor area 52 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Electricity (c)

Fuel factor:1.55 (electricity)

Target Carbon Dioxide Emission Rate (TER) 23.61 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 11.48 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)36.6 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)29.8 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	0.83 (max. 2.00)	1.00 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals:	2.50 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system: None

5 Cylinder insulation

Hot water storage	Nominal cylinder loss: 0.22 kWh/day	
Permitted by DBSCG 0.35	OK	
Primary pipework insulated:	No primary pipework	

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls: No cylinderstat

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%	
Minimum	75% OK

8 Mechanical ventilation

Continuous supply and extract system	
Specific fan power:	0.68
Maximum	1.5 OK
MVHR efficiency:	87%
Minimum:	70% OK

9 Summertime temperature

Overheating risk (Thames Valley):	High	Fail
Based on:		
Overshading:	Average	
Windows facing East:	9.97 m ² , No overhang	
Air change rate:	2.00 ach	
Blinds/curtains:	None	

10 Key features

Party wall U-value	0.00 W/m ² K
Door U-value	1.00 W/m ² K
Window U-value	0.80 W/m ² K
Air permeability	2.5 m ³ /m ² h

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	52.1600 (1b)	x 2.4000 (2b)	= 125.1840 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.1600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 125.1840 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					2.5000
Infiltration rate					0.1250 (18)
Number of sides sheltered					3 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.0969 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1235	0.1211	0.1187	0.1066	0.1041	0.0920	0.0920	0.0896	0.0969	0.1041	0.1090	0.1138 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												0.5000 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												73.9500 (23c)
Effective ac	0.2538	0.2513	0.2489	0.2368	0.2344	0.2223	0.2223	0.2199	0.2271	0.2344	0.2392	0.2441 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Window (Uw = 0.80)			9.9700	0.7752	7.7287		(27)
Door			2.0900	1.0000	2.0900		(26)
External Wall 1	23.0400	9.9700	13.0700	0.1800	2.3526		(29a)
Corridor Wall	19.4400	2.0900	17.3500	0.1786	3.0982		(29a)
Total net area of external elements Aum(A, m ²)			42.4800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	15.2695		(33)
Party Wall 1			32.6400	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.8716 (36)
Total fabric heat loss						(33) + (36) =	23.1411 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	10.4832	10.3832	10.2831	9.7829	9.6828	9.1826	9.1826	9.0825	9.3827	9.6828	9.8829	10.0830 (38)
Heat transfer coeff	33.6243	33.5243	33.4242	32.9240	32.8239	32.3237	32.3237	32.2236	32.5238	32.8239	33.0240	33.2241 (39)
Average = Sum(39)m / 12 =												32.8990 (39)
HLP	0.6446	0.6427	0.6408	0.6312	0.6293	0.6197	0.6197	0.6178	0.6235	0.6293	0.6331	0.6370 (40)
HLP (average)												0.6307 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7538 (42)
Average daily hot water use (litres/day)												75.8525 (43)
Daily hot water use	83.4378	80.4037	77.3696	74.3355	71.3014	68.2673	68.2673	71.3014	74.3355	77.3696	80.4037	83.4378 (44)
Energy conte	123.7358	108.2201	111.6735	97.3597	93.4189	80.6134	74.7002	85.7196	86.7433	101.0910	110.3487	119.8315 (45)
Energy content (annual)										Total = Sum(45)m =		1193.4558 (45)
Distribution loss (46)m = 0.15 x (45)m	18.5604	16.2330	16.7510	14.6039	14.0128	12.0920	11.2050	12.8579	13.0115	15.1636	16.5523	17.9747 (46)
Water storage loss:												

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Store volume												3.0000 (47)
b) If manufacturer declared loss factor is not known :												
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0212 (51)
Volume factor from Table 2a												3.4200 (52)
Temperature factor from Table 2b												1.0000 (53)
Enter (49) or (54) in (55)												0.2173 (55)
Total storage loss												
6.7353 6.0835 6.7353 6.5180 6.7353 6.5180 6.7353 6.7353 6.5180 6.7353 6.5180 6.7353 (56)												
If cylinder contains dedicated solar storage												
6.7353 6.0835 6.7353 6.5180 6.7353 6.5180 6.7353 6.7353 6.5180 6.7353 6.5180 6.7353 (57)												
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month												
153.7335 135.3148 141.6712 126.3897 123.4166 109.6434 104.6979 115.7172 115.7733 131.0887 139.3787 149.8292 (62)												
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Solar input (sum of months) = Sum(63)m =												0.0000 (63)
Output from w/h												
153.7335 135.3148 141.6712 126.3897 123.4166 109.6434 104.6979 115.7172 115.7733 131.0887 139.3787 149.8292 (64)												
Heat gains from water heating, kWh/month												
65.1403 57.6590 61.1296 55.5961 55.0599 50.0280 48.8360 52.4999 52.0662 57.6109 59.9150 63.8421 (65)												

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
(66)m	87.6896	87.6896	87.6896	87.6896	87.6896	87.6896	87.6896	87.6896	87.6896	87.6896	87.6896	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
13.7954 12.2530 9.9648 7.5440 5.6392 4.7609 5.1443 6.6867 8.9749 11.3957 13.3005 14.1788 (67)												
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
152.8409 154.4269 150.4302 141.9217 131.1813 121.0868 114.3430 112.7570 116.7537 125.2622 136.0026 146.0971 (68)												
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
31.7690 31.7690 31.7690 31.7690 31.7690 31.7690 31.7690 31.7690 31.7690 31.7690 31.7690 31.7690 (69)												
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)												
-70.1516 -70.1516 -70.1516 -70.1516 -70.1516 -70.1516 -70.1516 -70.1516 -70.1516 -70.1516 -70.1516 -70.1516 (71)												
Water heating gains (Table 5)												
87.5542 85.8020 82.1634 77.2168 74.0053 69.4833 65.6397 70.5644 72.3141 77.4340 83.2152 85.8093 (72)												
Total internal gains												
303.4974 301.7888 291.8653 275.9894 260.1327 244.6378 234.4339 239.3150 247.3496 263.3988 281.8252 295.3922 (73)												

6. Solar gains

[Jan]												
Area												
m2												
Solar flux												
Table 6a												
W/m2												
Specific data												
or Table 6b												
Specific data												
or Table 6c												
Access												
factor												
Table 6d												
Gains												
W												
East												
9.9700 19.6403 0.4200 0.8000 0.7700 45.5948 (76)												
Solar gains	45.5948	89.1930	146.8882	214.2277	262.5441	268.7606	255.8711	219.7895	170.8371	105.8350	56.8513	37.4949 (83)
Total gains	349.0921	390.9818	438.7535	490.2171	522.6768	513.3984	490.3050	459.1045	418.1867	369.2339	338.6765	332.8871 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
Jan												
tau	107.7262	108.0477	108.3711	110.0177	110.3531	112.0609	112.0609	112.4088	111.3715	110.3531	109.6844	109.0238
alpha	8.1817	8.2032	8.2247	8.3345	8.3569	8.4707	8.4707	8.4939	8.4248	8.3569	8.3123	8.2683
util living area												
0.9922 0.9794 0.9304 0.7811 0.5813 0.4028 0.2901 0.3229 0.5353 0.8549 0.9778 0.9943 (86)												
MIT	20.5733	20.6889	20.8483	20.9692	20.9972	20.9999	21.0000	21.0000	20.9989	20.9489	20.7458	20.5488 (87)
Th 2	20.3900	20.3917	20.3934	20.4020	20.4037	20.4123	20.4123	20.4140	20.4089	20.4037	20.4003	20.3968 (88)
util rest of house												
0.9900 0.9740 0.9151 0.7500 0.5450 0.3659 0.2513 0.2817 0.4900 0.8225 0.9711 0.9927 (89)												
MIT 2	19.8224	19.9892	20.2107	20.3699	20.4013	20.4122	20.4123	20.4140	20.4081	20.3510	20.0790	19.7928 (90)
Living area fraction												
MIT	20.1876	20.3295	20.5208	20.6614	20.6911	20.6981	20.6981	20.6990	20.6955	20.6418	20.4033	20.1605 (92)
Temperature adjustment												
adjusted MIT	20.1876	20.3295	20.5208	20.6614	20.6911	20.6981	20.6981	20.6990	20.6955	20.6418	20.4033	20.1605 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0.9891 0.9734 0.9186 0.7638 0.5626 0.3839 0.2702 0.3017 0.5120 0.8360 0.9711 0.9920 (94)												
Useful gains	345.2925	380.5823	403.0257	374.4184	294.0359	197.0753	132.4657	138.5266	214.1316	308.6754	328.8861	330.2135 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W												
534.2107 517.2637 468.6357 387.2327 295.1235 197.1118 132.4672 138.5302 214.5094 329.6107 439.3295 530.2739 (97)												
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh												
140.5551 91.8499 48.8138 9.2263 0.8092 0.0000 0.0000 0.0000 0.0000 15.5758 79.5192 148.8449 (98)												
Space heating												
535.1944 (98)												
Space heating per m2												
(98) / (4) = 10.2606 (99)												

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump	0.9500	(303a)
Fraction of heat from community Boilers	0.0500	(303b)
Fraction of total space heat from community Heat pump	0.9500	(304a)
Fraction of total space heat from community Boilers	0.0500	(304b)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000	(305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.0500	(306)
Space heating:		
Annual space heating requirement	535.1944	(98)
Space heat from Heat pump = (98) x 0.95 x 1.00 x 1.05	533.8564	(307a)
Space heat from Boilers = (98) x 0.05 x 1.00 x 1.05	28.0977	(307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	(309)
Water heating		
Annual water heating requirement	1546.6544	(64)
Water heat from Heat pump = (64) x 0.95 x 1.00 x 1.05	1542.7878	(310a)
Water heat from Boilers = (64) x 0.05 x 1.00 x 1.05	81.1994	(310b)
Electricity used for heat distribution	21.8594	(313)
Annual totals kWh/year		
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.8500)		
mechanical ventilation fans (SFP = 0.8500)	129.8158	(330a)
Total electricity for the above, kWh/year	129.8158	(331)
Electricity for lighting (calculated in Appendix L)	243.6316	(332)
Total delivered energy for all uses	2559.3886	(338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			323.0000 (367a)
Space heating from Heat pump	642.9239	0.5190	333.6775 (367)
Efficiency of heat source Boilers			95.0000 (367b)
Space heating from Boilers	115.0495	0.5190	59.7107 (368)
Electrical energy for heat distribution	21.8594	0.5190	11.3450 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			404.7332 (373)
Space and water heating			404.7332 (376)
Pumps and fans	129.8158	0.5190	67.3744 (378)
Energy for lighting	243.6316	0.5190	126.4448 (379)
Total CO2, kg/year			598.5524 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			11.4800 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		11.4800	ZC1
Total Floor Area	TFA	52.1600	
Assumed number of occupants	N	1.7538	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		17.3639	ZC2
CO2 emissions from cooking, equation (L16)		3.0884	ZC3
Total CO2 emissions		31.9323	ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000	ZC7
Net CO2 emissions		31.9323	ZC8

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	52.1600 (1b)	x 2.4000 (2b)	= 125.1840 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.1600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 125.1840 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour 20.0000 / (5) = 0.1598 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4098 (18)
Number of sides sheltered					3 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.7750 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3176 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4049	0.3970	0.3890	0.3493	0.3414	0.3017	0.3017	0.2938	0.3176	0.3414	0.3573	0.3731 (22b)
	0.5820	0.5788	0.5757	0.5610	0.5583	0.5455	0.5455	0.5431	0.5504	0.5583	0.5638	0.5696 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K						
TER Opaque door			2.0900	1.0000	2.0900			(26)					
TER Opening Type (Uw = 1.40)			9.9700	1.3258	13.2178			(27)					
External Wall 1	23.0400	9.9700	13.0700	0.1800	2.3526			(29a)					
Corridor Wall	19.4400	2.0900	17.3500	0.1800	3.1230			(29a)					
Total net area of external elements Aum(A, m2)			42.4800					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	20.7834			(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								4.0960 (36)					
Total fabric heat loss						(33) + (36) =		24.8794 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 24.0417	Feb 23.9102	Mar 23.7813	Apr 23.1759	May 23.0626	Jun 22.5353	Jul 22.5353	Aug 22.4377	Sep 22.7384	Oct 23.0626	Nov 23.2918	Dec 23.5313	(38)
Heat transfer coeff	48.9211	48.7896	48.6607	48.0553	47.9420	47.4147	47.4147	47.3171	47.6178	47.9420	48.1712	48.4107	(39)
Average = Sum(39)m / 12 =												48.0547	(39)
HLP	Jan 0.9379	Feb 0.9354	Mar 0.9329	Apr 0.9213	May 0.9191	Jun 0.9090	Jul 0.9090	Aug 0.9072	Sep 0.9129	Oct 0.9191	Nov 0.9235	Dec 0.9281	(40)
HLP (average)												0.9213	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7538 (42)
Average daily hot water use (litres/day)												75.8525 (43)
Daily hot water use	83.4378	80.4037	77.3696	74.3355	71.3014	68.2673	68.2673	71.3014	74.3355	77.3696	80.4037	83.4378 (44)
Energy conte	123.7358	108.2201	111.6735	97.3597	93.4189	80.6134	74.7002	85.7196	86.7433	101.0910	110.3487	119.8315 (45)
Energy content (annual)										Total = Sum(45)m =		1193.4558 (45)
Distribution loss (46)m = 0.15 x (45)m	18.5604	16.2330	16.7510	14.6039	14.0128	12.0920	11.2050	12.8579	13.0115	15.1636	16.5523	17.9747 (46)
Water storage loss:												
Store volume												3.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												0.2602 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.1405 (55)
Total storage loss												

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If cylinder contains dedicated solar storage	4.3553	3.9338	4.3553	4.2148	4.3553	4.2148	4.3553	4.3553	4.2148	4.3553	4.2148	4.3553 (56)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (57)
Total heat required for water heating calculated for each month	151.3535	133.1651	139.2912	124.0864	121.0366	107.3402	102.3179	113.3372	113.4701	128.7086	137.0755	147.4492 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	151.3535	133.1651	139.2912	124.0864	121.0366	107.3402	102.3179	113.3372	113.4701	128.7086	137.0755	147.4492 (64)
Heat gains from water heating, kWh/month	63.2363	55.9392	59.2256	53.7535	53.1559	48.1854	46.9320	50.5959	50.2236	55.7069	58.0724	61.9381 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)
(66)m	87.6896	87.6896	87.6896	87.6896	87.6896	87.6896	87.6896	87.6896	87.6896	87.6896	87.6896	87.6896	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.7954	12.2530	9.9648	7.5440	5.6392	4.7609	5.1443	6.6867	8.9749	11.3957	13.3005	14.1788	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	152.8409	154.4269	150.4302	141.9217	131.1813	121.0868	114.3430	112.7570	116.7537	125.2622	136.0026	146.0971	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.7690	31.7690	31.7690	31.7690	31.7690	31.7690	31.7690	31.7690	31.7690	31.7690	31.7690	31.7690	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-70.1516	-70.1516	-70.1516	-70.1516	-70.1516	-70.1516	-70.1516	-70.1516	-70.1516	-70.1516	-70.1516	-70.1516	(71)
Water heating gains (Table 5)	84.9950	83.2429	79.6043	74.6577	71.4461	66.9241	63.0806	68.0052	69.7550	74.8748	80.6561	83.2502	(72)
Total internal gains	303.9382	302.2296	292.3061	276.4302	260.5735	245.0787	234.8748	239.7559	247.7905	263.8396	282.2661	295.8330	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d	Gains W	
East					9.9700	19.6403	0.6300	0.7000			0.7700	59.8431 (76)	
Solar gains	59.8431	117.0659	192.7908	281.1739	344.5891	352.7483	335.8308	288.4737	224.2237	138.9085	74.6173	49.2121	(83)
Total gains	363.7813	419.2954	485.0969	557.6041	605.1626	597.8270	570.7055	528.2295	472.0141	402.7481	356.8834	345.0451	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	74.0422	74.2417	74.4384	75.3761	75.5542	76.3944	76.3944	76.5521	76.0686	75.5542	75.1948	74.8227	
alpha	5.9361	5.9494	5.9626	6.0251	6.0369	6.0930	6.0930	6.1035	6.0712	6.0369	6.0130	5.9882	
util living area	0.9954	0.9887	0.9639	0.8750	0.7020	0.5035	0.3651	0.4110	0.6707	0.9318	0.9892	0.9966	(86)
MIT	20.1481	20.3049	20.5538	20.8242	20.9605	20.9954	20.9995	20.9989	20.9774	20.7683	20.4056	20.1192	(87)
Th 2	20.1354	20.1375	20.1396	20.1494	20.1513	20.1598	20.1598	20.1614	20.1565	20.1513	20.1475	20.1437	(88)
util rest of house	0.9940	0.9853	0.9532	0.8440	0.6486	0.4393	0.2956	0.3366	0.5987	0.9067	0.9853	0.9955	(89)
MIT 2	19.0023	19.2310	19.5869	19.9569	20.1165	20.1571	20.1596	20.1610	20.1405	19.8959	19.3860	18.9665	(90)
Living area fraction	19.5596	19.7534	20.0572	20.3787	20.5270	20.5648	20.5681	20.5686	20.5476	20.3202	19.8819	19.5271	(92)
MIT	19.5596	19.7534	20.0572	20.3787	20.5270	20.5648	20.5681	20.5686	20.5476	20.3202	19.8819	19.5271	(93)
Temperature adjustment												0.0000	
adjusted MIT	19.5596	19.7534	20.0572	20.3787	20.5270	20.5648	20.5681	20.5686	20.5476	20.3202	19.8819	19.5271	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	361.1485	412.3251	461.8294	475.6251	407.2102	281.2552	188.0011	196.9410	298.7421	367.4397	351.1086	343.1526	(94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	746.5148	724.6889	659.7018	551.6144	423.1847	282.8213	188.1472	197.2439	307.0196	466.0074	615.7190	741.9980	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	286.7125	209.9084	147.2171	54.7123	11.8850	0.0000	0.0000	0.0000	0.0000	73.3344	190.5195	296.7410	(98)
Space heating												1271.0302	(98)
Space heating per m2												24.3679	(99)

8c. Space cooling requirement

Not applicable

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1359.3905 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	286.7125	209.9084	147.2171	54.7123	11.8850	0.0000	0.0000	0.0000	0.0000	73.3344	190.5195	296.7410	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	306.6444	224.5010	157.4514	58.5159	12.7112	0.0000	0.0000	0.0000	0.0000	78.4325	203.7641	317.3700	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	151.3535	133.1651	139.2912	124.0864	121.0366	107.3402	102.3179	113.3372	113.4701	128.7086	137.0755	147.4492	(64)
Efficiency of water heater (217)m	86.4930	86.0229	84.9615	82.7955	80.6526	79.8000	79.8000	79.8000	79.8000	83.3781	85.6922	79.8000	(216)
Fuel for water heating, kWh/month	174.9892	154.8020	163.9462	149.8711	150.0715	134.5115	128.2179	142.0266	142.1931	154.3675	159.9626	170.1792	(219)
Water heating fuel used												1825.1383	(219)
Annual totals kWh/year													
Space heating fuel - main system												1359.3905	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												243.6316	(232)
Total delivered energy for all uses												3503.1604	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1359.3905	0.2160	293.6284 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1825.1383	0.2160	394.2299 (264)
Space and water heating			687.8582 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	243.6316	0.5190	126.4448 (268)
Total CO2, kg/m2/year			853.2280 (272)
Emissions per m2 for space and water heating			13.1875 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.4242 (272b)
Emissions per m2 for pumps and fans			0.7463 (272c)
Target Carbon Dioxide Emission Rate (TER) = (13.1875 * 1.55) + 2.4242 + 0.7463, rounded to 2 d.p.			23.6100 (273)

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Property Reference	Type 6 - Option 5 (Be Clean)				Issued on Date	18/07/2023
Assessment Reference	St Ann's Type 6	Prop Type Ref	St Ann's Type 6			
Property	Type 6 - 4B - Mid Terrace					
SAP Rating	86 B	DER	11.94	TER	15.54	
Environmental	90 B	% DER<TER	23.16			
CO ₂ Emissions (t/year)	1.13	DFEE	35.84	TFEE	52.02	
General Requirements Compliance	Pass	% DFEE<TFEE	31.10			
Assessor Details	Miss Eleanor Ballinger, Eleanor Ballinger, Tel: 02036031625, Eleanor@hodkinsonconsultancy.com				Assessor ID	M976-0001
Client						

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Mid-Terrace House, total floor area 116 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Mains gas (c)

Fuel factor:1.00 (mains gas)

Target Carbon Dioxide Emission Rate (TER) 15.54 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 11.94 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 52.0 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE) 35.8 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.13 (max. 0.25)	0.13 (max. 0.70)	OK
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	OK
Openings	0.85 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals:	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system:	Community heating scheme	-
Secondary heating system:	None	

5 Cylinder insulation

Hot water storage	Nominal cylinder loss: 0.22 kWh/day	
Permitted by DBSCG 0.35	OK	
Primary pipework insulated:	No primary pipework	

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls: No cylinderstat

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%	
Minimum	75% OK

8 Mechanical ventilation

Continuous supply and extract system	
Specific fan power:	0.83
Maximum	1.5 OK
MVHR efficiency:	92%
Minimum:	70% OK

9 Summertime temperature

Overheating risk (Thames Valley):	Medium	OK
Based on:		
Overshading:	Average	
Windows facing East:	8.61 m ² , No overhang	
Windows facing West:	14.61 m ² , No overhang	
Air change rate:	2.00 ach	
Blinds/curtains:	None	

10 Key features

Party wall U-value	0.00 W/m ² K
Roof U-value	0.10 W/m ² K
Floor U-value	0.10 W/m ² K
Window U-value	0.80 W/m ² K
Door U-value	0.80 W/m ² K
Air permeability	3.0 m ³ /m ² h

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	44.9000 (1b)	x 2.4900 (2b)	= 111.8010 (1b) - (3b)
First floor	35.5300 (1c)	x 3.0700 (2c)	= 109.0771 (1c) - (3c)
Second floor	35.5300 (1d)	x 2.9200 (2d)	= 103.7476 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	115.9600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 324.6257 (5)

2. Ventilation rate

					main heating	+	secondary heating	+	other	=	total	m3 per hour
Number of chimneys					0	+	0	+	0	=	0 * 40 =	0.0000 (6a)
Number of open flues					0	+	0	+	0	=	0 * 20 =	0.0000 (6b)
Number of intermittent fans											0 * 10 =	0.0000 (7a)
Number of passive vents											0 * 10 =	0.0000 (7b)
Number of flueless gas fires											0 * 40 =	0.0000 (7c)
												Air changes per hour
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =										0.0000 / (5) =	0.0000 (8)
Pressure test											Yes	
Measured/design AP50												3.0000
Infiltration rate												0.1500 (18)
Number of sides sheltered												2 (19)
Shelter factor											(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor											(21) = (18) x (20) =	0.1275 (21)
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												0.5000 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												78.2000 (23c)
Effective ac	0.2716	0.2684	0.2652	0.2493	0.2461	0.2301	0.2301	0.2269	0.2365	0.2461	0.2524	0.2588 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Window (East) (Uw = 0.80)			23.2200	0.7752	18.0000		(27)					
Door			2.2600	1.2000	2.7120		(26)					
Roof Window (Uw = 1.20)			1.4400	1.1450	1.6489		(27a)					
Heat Loss Floor 1			44.9000	0.1300	5.8370		(28a)					
External Wall 1	25.4000	10.8300	14.5700	0.1800	2.6226		(29a)					
External Wall 2 (FF)	31.3100	6.9700	24.3400	0.1800	4.3812		(29a)					
External Wall 3 (SF)	29.7800	7.6800	22.1000	0.1800	3.9780		(29a)					
External Roof 1	37.2000	1.4400	35.7600	0.1000	3.5760		(30)					
External Roof 2 (1st Floor)	11.0500		11.0500	0.1000	1.1050		(30)					
Total net area of external elements Aum(A, m2)			179.6400				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	43.8607		(33)					
Party Wall 1			129.3800	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								9.7206 (36)				
Total fabric heat loss								(33) + (36) = 53.5813 (37)				
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 29.0915	Feb 28.7501	Mar 28.4086	Apr 26.7013	May 26.3598	Jun 24.6525	Jul 24.6525	Aug 24.3110	Sep 25.3354	Oct 26.3598	Nov 27.0427	Dec 27.7257 (38)
Heat transfer coeff	82.6728	82.3313	81.9899	80.2825	79.9411	78.2337	78.2337	77.8923	78.9167	79.9411	80.6240	81.3069 (39)
Average = Sum(39)m / 12 =												80.1972 (39)
HLP	Jan 0.7129	Feb 0.7100	Mar 0.7071	Apr 0.6923	May 0.6894	Jun 0.6747	Jul 0.6747	Aug 0.6717	Sep 0.6806	Oct 0.6894	Nov 0.6953	Dec 0.7012 (40)
HLP (average)												0.6916 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy											
2.8463 (42)											
Average daily hot water use (litres/day)											
101.7986 (43)											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Daily hot water use												
	111.9784	107.9065	103.8345	99.7626	95.6906	91.6187	91.6187	95.6906	99.7626	103.8345	107.9065	111.9784 (44)
Energy conte	166.0607	145.2378	149.8724	130.6624	125.3737	108.1879	100.2520	115.0407	116.4146	135.6700	148.0944	160.8210 (45)
Energy content (annual)										Total = Sum (45)m =		1601.6876 (45)
Distribution loss (46)m = 0.15 x (45)m												
	24.9091	21.7857	22.4809	19.5994	18.8060	16.2282	15.0378	17.2561	17.4622	20.3505	22.2142	24.1231 (46)
Water storage loss:												
Store volume												3.0000 (47)
b) If manufacturer declared loss factor is not known :												
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0212 (51)
Volume factor from Table 2a												3.4200 (52)
Temperature factor from Table 2b												1.0000 (53)
Enter (49) or (54) in (55)												0.2173 (55)
Total storage loss												
	6.7353	6.0835	6.7353	6.5180	6.7353	6.5180	6.7353	6.7353	6.5180	6.7353	6.5180	6.7353 (56)
If cylinder contains dedicated solar storage												
	6.7353	6.0835	6.7353	6.5180	6.7353	6.5180	6.7353	6.7353	6.5180	6.7353	6.5180	6.7353 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month												
	196.0584	172.3325	179.8701	159.6924	155.3714	137.2180	130.2497	145.0384	145.4446	165.6677	177.1245	190.8187 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
								Solar input (sum of months) =	Sum (63)m =			0.0000 (63)
Output from w/h												
	196.0584	172.3325	179.8701	159.6924	155.3714	137.2180	130.2497	145.0384	145.4446	165.6677	177.1245	190.8187 (64)
								Total per year (kWh/year) =	Sum (64)m =			1954.8862 (64)
Heat gains from water heating, kWh/month												
	79.2134	69.9673	73.8307	66.6693	65.6849	59.1965	57.3320	62.2492	61.9319	69.1084	72.4654	77.4711 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	142.3127	142.3127	142.3127	142.3127	142.3127	142.3127	142.3127	142.3127	142.3127	142.3127	142.3127	142.3127 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	24.9808	22.1877	18.0442	13.6607	10.2115	8.6210	9.3153	12.1083	16.2518	20.6354	24.0845	25.6751 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	279.8563	282.7603	275.4422	259.8629	240.1969	221.7135	209.3655	206.4615	213.7796	229.3589	249.0249	267.5083 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	37.2313	37.2313	37.2313	37.2313	37.2313	37.2313	37.2313	37.2313	37.2313	37.2313	37.2313	37.2313 (69)
Pumps, fans												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)												
	-113.8502	-113.8502	-113.8502	-113.8502	-113.8502	-113.8502	-113.8502	-113.8502	-113.8502	-113.8502	-113.8502	-113.8502 (71)
Water heating gains (Table 5)												
	106.4696	104.1180	99.2348	92.5962	88.2862	82.2174	77.0591	83.6682	86.0165	92.8877	100.6464	104.1279 (72)
Total internal gains	477.0004	474.7598	458.4151	431.8136	404.3883	378.2457	361.4337	367.9319	381.7417	408.5757	439.4497	463.0050 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	Access factor Table 6d	Gains W
East	8.6100	19.6403	0.5000	0.8000	0.7700	46.8753 (76)
West	14.6100	19.6403	0.5000	0.8000	0.7700	79.5409 (80)
Horizontal	1.4400	26.0000	0.5000	0.8000	1.0000	13.4784 (82)
Solar gains						
	139.8946	275.2905	457.0292	671.7285	827.4635	848.8466
Total gains						
	616.8950	750.0503	915.4443	1103.5421	1231.8518	1227.0923

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	97.4054	97.8094	98.2168	100.3055	100.7339	102.9323	102.9323	103.3835	102.0415	100.7339	99.8807	99.0417
alpha	7.4937	7.5206	7.5478	7.6870	7.7156	7.8622	7.8622	7.8922	7.8028	7.7156	7.6587	7.6028
util living area	0.9987	0.9940	0.9642	0.8212	0.5986	0.4078	0.2945	0.3384	0.5909	0.9314	0.9955	0.9992 (86)
MIT	20.3272	20.4893	20.7302	20.9424	20.9946	20.9998	21.0000	21.0000	20.9966	20.8712	20.5503	20.3045 (87)
Th 2	20.3294	20.3320	20.3346	20.3476	20.3502	20.3633	20.3633	20.3659	20.3580	20.3502	20.3450	20.3398 (88)
util rest of house												
	0.9983	0.9921	0.9544	0.7899	0.5585	0.3674	0.2519	0.2918	0.5377	0.9089	0.9938	0.9989 (89)
MIT 2	19.4152	19.6532	19.9984	20.2864	20.3456	20.3631	20.3633	20.3659	20.3556	20.2074	19.7533	19.3902 (90)
Living area fraction												
									fLA = Living area / (4) =			0.1369 (91)
MIT	19.5400	19.7676	20.0986	20.3762	20.4344	20.4503	20.4504	20.4526	20.4434	20.2982	19.8624	19.5154 (92)
Temperature adjustment												
												0.0000
adjusted MIT	19.5400	19.7676	20.0986	20.3762	20.4344	20.4503	20.4504	20.4526	20.4434	20.2982	19.8624	19.5154 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9976	0.9901	0.9504	0.7914	0.5637	0.3729	0.2577	0.2981	0.5448	0.9068	0.9922	0.9984 (94)
Useful gains	615.3986	742.6362	870.0365	873.3273	694.4263	457.5643	301.2262	315.6541	498.5367	667.6023	609.3701	576.9453 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W												
	1259.9322	1224.0714	1114.9445	921.3367	698.2411	457.6875	301.2315	315.6699	500.5962	775.2867	1028.9552	1245.2443 (97)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	479.5330	323.5245	182.2116	34.5667	2.8381	0.0000	0.0000	0.0000	0.0000	80.1172	302.1013	497.2144 (98)
Space heating												1902.1068 (98)
Space heating per m2										(98) / (4) =		16.4031 (99)

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Boilers	1.0000 (303a)
Fraction of total space heat from community Boilers	1.0000 (304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.0500 (306)
Space heating:	
Annual space heating requirement	1902.1068 (98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05	1997.2122 (307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	1954.8862 (64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05	2052.6306 (310a)
Electricity used for heat distribution	40.4984 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 1.0375)	
mechanical ventilation fans (SFP = 1.0375)	410.8950 (330a)
Total electricity for the above, kWh/year	410.8950 (331)
Electricity for lighting (calculated in Appendix L)	441.1680 (332)
Total delivered energy for all uses	4901.9057 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Boilers			95.0000 (367a)
Space heating from Boilers	4262.9923	0.2160	920.8063 (367)
Electrical energy for heat distribution	40.4984	0.5190	21.0187 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			941.8250 (373)
Space and water heating			941.8250 (376)
Pumps and fans	410.8950	0.5190	213.2545 (378)
Energy for lighting	441.1680	0.5190	228.9662 (379)
Total CO2, kg/year			1384.0457 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			11.9400 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		11.9400 ZC1
Total Floor Area	TFA	115.9600
Assumed number of occupants	N	2.8463
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		14.3012 ZC2
CO2 emissions from cooking, equation (L16)		1.6153 ZC3
Total CO2 emissions		27.8565 ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000 ZC7
Net CO2 emissions		27.8565 ZC8

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Calculation Type: New Build (As Designed)



CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	44.9000 (1b)	x 2.4900 (2b)	= 111.8010 (1b) - (3b)
First floor	35.5300 (1c)	x 3.0700 (2c)	= 109.0771 (1c) - (3c)
Second floor	35.5300 (1d)	x 2.9200 (2d)	= 103.7476 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	115.9600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 324.6257 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					4 * 10 = 40.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				40.0000 / (5) = 0.1232 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3732 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3172 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4045	0.3965	0.3886	0.3490	0.3410	0.3014	0.3014	0.2934	0.3172	0.3410	0.3569	0.3728 (22b)
Effective ac	0.5818	0.5786	0.5755	0.5609	0.5582	0.5454	0.5454	0.5431	0.5503	0.5582	0.5637	0.5695 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.2600	1.0000	2.2600		(26)
TER Opening Type (Uw = 1.40)			23.2200	1.3258	30.7841		(27)
TER Room Window (Uw = 1.70)			1.4400	1.5918	2.2921		(27a)
Heat Loss Floor 1			44.9000	0.1300	5.8370		(28a)
External Wall 1	25.4000	10.8300	14.5700	0.1800	2.6226		(29a)
External Wall 2 (FF)	31.3100	6.9700	24.3400	0.1800	4.3812		(29a)
External Wall 3 (SF)	29.7800	7.6800	22.1000	0.1800	3.9780		(29a)
External Roof 1	37.2000	1.4400	35.7600	0.1300	4.6488		(30)
External Roof 2 (1st Floor)	11.0500		11.0500	0.1300	1.4365		(30)
Total net area of external elements Aum(A, m ²)			179.6400				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		58.2403		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							13.7312 (36)
Total fabric heat loss						(33) + (36) =	71.9715 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	62.3262	61.9860	61.6524	60.0858	59.7927	58.4282	58.4282	58.1755	58.9538	59.7927	60.3856	61.0055 (38)
Average = Sum(39)m / 12 =	134.2978	133.9575	133.6239	132.0573	131.7642	130.3997	130.3997	130.1470	130.9253	131.7642	132.3572	132.9771 (39)
												132.0559 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1581	1.1552	1.1523	1.1388	1.1363	1.1245	1.1245	1.1223	1.1291	1.1363	1.1414	1.1467 (40)
Days in month												
	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.8463 (42)
Average daily hot water use (litres/day)												101.7986 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	111.9784	107.9065	103.8345	99.7626	95.6906	91.6187	91.6187	95.6906	99.7626	103.8345	107.9065	111.9784 (44)
Energy content (annual)	166.0607	145.2378	149.8724	130.6624	125.3737	108.1879	100.2520	115.0407	116.4146	135.6700	148.0944	160.8210 (45)
Distribution loss (46)m = 0.15 x (45)m												1601.6876 (45)

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Calculation Type: New Build (As Designed)



CALCULATION OF TARGET EMISSIONS 09 Jan 2014

24.9091	21.7857	22.4809	19.5994	18.8060	16.2282	15.0378	17.2561	17.4622	20.3505	22.2142	24.1231 (46)
Water storage loss:											
Store volume											3.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):											0.2602 (48)
Temperature factor from Table 2b											0.5400 (49)
Enter (49) or (54) in (55)											0.1405 (55)
Total storage loss											
4.3553	3.9338	4.3553	4.2148	4.3553	4.2148	4.3553	4.3553	4.2148	4.3553	4.2148	4.3553 (56)
If cylinder contains dedicated solar storage											
4.3553	3.9338	4.3553	4.2148	4.3553	4.2148	4.3553	4.3553	4.2148	4.3553	4.2148	4.3553 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month											
193.6784	170.1828	177.4901	157.3892	152.9913	134.9147	127.8697	142.6583	143.1414	163.2877	174.8212	188.4386 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Solar input (sum of months) = Sum(63)m =											0.0000 (63)
Output from w/h											
193.6784	170.1828	177.4901	157.3892	152.9913	134.9147	127.8697	142.6583	143.1414	163.2877	174.8212	188.4386 (64)
Heat gains from water heating, kWh/month											
77.3093	68.2476	71.9267	64.8267	63.7809	57.3539	55.4279	60.3452	60.0893	67.2044	70.6228	75.5671 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	142.3127	142.3127	142.3127	142.3127	142.3127	142.3127	142.3127	142.3127	142.3127	142.3127	142.3127	142.3127 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	24.9808	22.1877	18.0442	13.6607	10.2115	8.6210	9.3153	12.1083	16.2518	20.6354	24.0845	25.6751 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	279.8563	282.7603	275.4422	259.8629	240.1969	221.7135	209.3655	206.4615	213.7796	229.3589	249.0249	267.5083 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.2313	37.2313	37.2313	37.2313	37.2313	37.2313	37.2313	37.2313	37.2313	37.2313	37.2313	37.2313 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-113.8502	-113.8502	-113.8502	-113.8502	-113.8502	-113.8502	-113.8502	-113.8502	-113.8502	-113.8502	-113.8502	-113.8502 (71)
Water heating gains (Table 5)	103.9104	101.5589	96.6757	90.0370	85.7270	79.6582	74.4999	81.1091	83.4573	90.3285	98.0873	101.5687 (72)
Total internal gains	477.4412	475.2007	458.8560	432.2544	404.8292	378.6865	361.8745	368.3727	382.1825	409.0166	439.8905	463.4458 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
East				8.6100	19.6403	0.6300	0.7000	0.7700	51.6800 (76)			
West				14.6100	19.6403	0.6300	0.7000	0.7700	87.6939 (80)			
Horizontal				1.4400	26.0000	0.6300	0.7000	1.0000	14.8599 (82)			
Solar gains	154.2338	303.5078	503.8747	740.5807	912.2785	935.8534	890.1658	761.5826	587.9406	361.2375	192.6435	126.6165 (83)
Total gains	631.6750	778.7085	962.7307	1172.8351	1317.1077	1314.5399	1252.0403	1129.9553	970.1231	770.2540	632.5340	590.0624 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	59.9621	60.1144	60.2645	60.9794	61.1151	61.7546	61.7546	61.8745	61.5067	61.1151	60.8413	60.5576
alpha	4.9975	5.0076	5.0176	5.0653	5.0743	5.1170	5.1170	5.1250	5.1004	5.0743	5.0561	5.0372
util living area												
	0.9987	0.9961	0.9847	0.9344	0.8038	0.6107	0.4536	0.5200	0.8049	0.9757	0.9970	0.9991 (86)
MIT	19.6965	19.8826	20.1989	20.5926	20.8647	20.9741	20.9953	20.9910	20.9004	20.4976	20.0192	19.6673 (87)
Th 2	19.9536	19.9560	19.9583	19.9693	19.9713	19.9809	19.9809	19.9826	19.9772	19.9713	19.9672	19.9628 (88)
util rest of house												
	0.9983	0.9948	0.9793	0.9121	0.7476	0.5235	0.3510	0.4100	0.7267	0.9636	0.9958	0.9988 (89)
MIT 2	18.2105	18.4838	18.9439	19.5033	19.8462	19.9648	19.9792	19.9791	19.9004	19.3856	18.6921	18.1744 (90)
Living area fraction												
	18.4139	18.6753	19.1157	19.6524	19.9856	20.1029	20.1183	20.1176	20.0372	19.5377	18.8737	18.3788 (92)
Temperature adjustment												
	18.4139	18.6753	19.1157	19.6524	19.9856	20.1029	20.1183	20.1176	20.0372	19.5377	18.8737	18.3788 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9972	0.9923	0.9733	0.9037	0.7484	0.5344	0.3651	0.4250	0.7319	0.9566	0.9938	0.9980 (94)
Useful gains	629.9366	772.6907	937.0085	1059.9341	985.7636	702.4955	457.0716	480.2324	710.0068	736.8157	628.5809	588.8957 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W												
	1895.4615	1845.2986	1685.7540	1419.9278	1091.7395	717.5831	458.7827	483.8341	777.3331	1177.6744	1558.3399	1885.4501 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh												
	941.5505	720.7925	557.0667	259.1955	78.8460	0.0000	0.0000	0.0000	0.0000	327.9989	669.4265	964.6364 (98)
Space heating												
												4519.5129 (98)
Space heating per m2												
												(98) / (4) = 38.9748 (99)

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

8c. Space cooling requirement

Not applicable

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000	(201)
Fraction of space heat from main system(s)													1.0000	(202)
Efficiency of main space heating system 1 (in %)													93.5000	(206)
Efficiency of secondary/supplementary heating system, %													0.0000	(208)
Space heating requirement													4833.7036	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	941.5505	720.7925	557.0667	259.1955	78.8460	0.0000	0.0000	0.0000	0.0000	327.9989	669.4265	964.6364	(98)	
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)	
Space heating fuel (main heating system)	1007.0059	770.9011	595.7932	277.2144	84.3273	0.0000	0.0000	0.0000	0.0000	350.8010	715.9641	1031.6967	(211)	
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)	
Water heating														
Water heating requirement	193.6784	170.1828	177.4901	157.3892	152.9913	134.9147	127.8697	142.6583	143.1414	163.2877	174.8212	188.4386	(64)	
Efficiency of water heater	88.4760	88.2401	87.6599	86.1365	83.1432	79.8000	79.8000	79.8000	79.8000	86.6389	88.0551	88.5594	(216)	
(217)m	218.9050	192.8634	202.4757	182.7207	184.0095	169.0661	160.2377	178.7698	179.3752	188.4693	198.5361	212.7821	(219)	
Fuel for water heating, kWh/month												2268.2106	(219)	
Water heating fuel used														
Annual totals kWh/year														
Space heating fuel - main system													4833.7036	(211)
Space heating fuel - secondary													0.0000	(215)
Electricity for pumps and fans:														
central heating pump													30.0000	(230c)
main heating flue fan													45.0000	(230e)
Total electricity for the above, kWh/year													75.0000	(231)
Electricity for lighting (calculated in Appendix L)													441.1680	(232)
Total delivered energy for all uses													7618.0823	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	4833.7036	0.2160	1044.0800 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2268.2106	0.2160	489.9335 (264)
Space and water heating			1534.0135 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	441.1680	0.5190	228.9662 (268)
Total CO2, kg/m2/year			1801.9047 (272)
Emissions per m2 for space and water heating			13.2288 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			1.9745 (272b)
Emissions per m2 for pumps and fans			0.3357 (272c)
Target Carbon Dioxide Emission Rate (TER) = (13.2288 * 1.00) + 1.9745 + 0.3357, rounded to 2 d.p.			15.5400 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



Property Reference	Type 7 - Option 5 (Be Clean)				Issued on Date	18/07/2023
Assessment Reference	St Ann's Type 7	Prop Type Ref	St Ann's Type 7			
Property	Type 7 - 4B - End Terrace					
SAP Rating	85 B	DER	13.83	TER	17.27	
Environmental	88 B	% DER<TER	19.90			
CO ₂ Emissions (t/year)	1.31	DFEE	43.56	TFEE	61.27	
General Requirements Compliance	Pass	% DFEE<TFEE	28.91			
Assessor Details	Miss Eleanor Ballinger, Eleanor Ballinger, Tel: 02036031625, Eleanor@hodkinsonconsultancy.com				Assessor ID	M976-0001
Client						

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

End-Terrace House, total floor area 116 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Mains gas (c)
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 17.27 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 13.83 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)61.3 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)43.6 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.13 (max. 0.25)	0.13 (max. 0.70)	OK
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	OK
Openings	0.85 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 3.00 (design value)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Community heating scheme -
Secondary heating system: None

5 Cylinder insulation

Hot water storage Nominal cylinder loss: 0.22 kWh/day
Permitted by DBSCG 0.35 OK
Primary pipework insulated: No primary pipework

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK
Hot water controls: No cylinderstat

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%
Minimum 75% OK

8 Mechanical ventilation

Continuous supply and extract system
Specific fan power: 0.83
Maximum 1.5 OK
MVHR efficiency: 92%
Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): Medium OK
Based on:
Overshading: Average
Windows facing East: 8.61 m², No overhang
Windows facing South: 5.68 m², No overhang
Windows facing West: 14.61 m², No overhang
Air change rate: 2.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Roof U-value 0.10 W/m²K
Roof U-value 0.10 W/m²K
Window U-value 0.80 W/m²K
Window U-value 0.80 W/m²K
Air permeability 3.0 m³/m²h

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	45.0400 (1b)	x 2.4900 (2b)	= 112.1496 (1b) - (3b)
First floor	35.5000 (1c)	x 3.0700 (2c)	= 108.9850 (1c) - (3c)
Second floor	35.5000 (1d)	x 2.9200 (2d)	= 103.6600 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	116.0400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 324.7946 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour							
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)							
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)							
Number of intermittent fans					0 * 10 = 0.0000 (7a)							
Number of passive vents					0 * 10 = 0.0000 (7b)							
Number of flueless gas fires					0 * 40 = 0.0000 (7c)							
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					0.0000 / (5) = 0.0000 (8)							
Pressure test					Yes							
Measured/design AP50					3.0000							
Infiltration rate					0.1500 (18)							
Number of sides sheltered					1 (19)							
Shelter factor					(20) = 1 - [0.075 x (19)] = 0.9250 (20)							
Infiltration rate adjusted to include shelter factor					(21) = (18) x (20) = 0.1388 (21)							
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
	0.1769	0.1734	0.1700	0.1526	0.1492	0.1318	0.1318	0.1283	0.1388	0.1492	0.1561	0.1630 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
												0.5000 (23a)
												78.2000 (23c)
Effective ac	0.2859	0.2824	0.2790	0.2616	0.2582	0.2408	0.2408	0.2373	0.2478	0.2582	0.2651	0.2720 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Window (west) (Uw = 0.80)			5.6800	0.7752	4.4031		(27)					
Door			2.2600	1.2000	2.7120		(26)					
Window (east) (Uw = 0.80)			23.2200	0.7752	18.0000		(27)					
Roof Window (Uw = 1.20)			1.4400	1.1450	1.6489		(27a)					
Heat Loss Floor 1			45.0400	0.1300	5.8552		(28a)					
External Wall 1 GF	47.5600	13.9900	33.5700	0.1800	6.0426		(29a)					
External Wall 2 (FF)	53.4200	8.2300	45.1900	0.1800	8.1342		(29a)					
External Wall 3 (SF)	50.8100	8.9400	41.8700	0.1800	7.5366		(29a)					
External Roof 1	37.2000	1.4400	35.7600	0.1000	3.5760		(30)					
External Roof 2 (1st Floor)	11.0500		11.0500	0.1000	1.1050		(30)					
Total net area of external elements Aum(A, m2)			245.0800				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		59.0136		(33)					
Party Wall 1			65.2900	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							16.5714 (36)					
Total fabric heat loss							(33) + (36) = 75.5850 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 30.6441	Feb 30.2723	Mar 29.9005	Apr 28.0415	May 27.6698	Jun 25.8108	Jul 25.8108	Aug 25.4390	Sep 26.5544	Oct 27.6698	Nov 28.4133	Dec 29.1569 (38)
Heat transfer coeff	106.2290	105.8572	105.4854	103.6265	103.2547	101.3958	101.3958	101.0240	102.1394	103.2547	103.9983	104.7419 (39)
Average = Sum(39)m / 12 =	103.5336 (39)											
HLP	Jan 0.9155	Feb 0.9122	Mar 0.9090	Apr 0.8930	May 0.8898	Jun 0.8738	Jul 0.8738	Aug 0.8706	Sep 0.8802	Oct 0.8898	Nov 0.8962	Dec 0.9026 (40)
HLP (average)	0.8922 (40)											
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.8466 (42)
Average daily hot water use (litres/day)	101.8073 (43)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	111.9880	107.9157	103.8434	99.7711	95.6989	91.6266	91.6266	95.6989	99.7711	103.8434	107.9157	111.9880 (44)
Energy content (annual)	166.0750	145.2503	149.8852	130.6736	125.3844	108.1972	100.2606	115.0505	116.4246	135.6817	148.1071	160.8348 (45)
Distribution loss	Total = Sum (45)m = 1601.8251 (45)											
(46)m = 0.15 x (45)m	24.9112	21.7875	22.4828	19.6010	18.8077	16.2296	15.0391	17.2576	17.4637	20.3522	22.2161	24.1252 (46)
Water storage loss:												
Store volume	3.0000 (47)											
b) If manufacturer declared loss factor is not known :												
Hot water storage loss factor from Table 2 (kWh/litre/day)	0.0212 (51)											
Volume factor from Table 2a	3.4200 (52)											
Temperature factor from Table 2b	1.0000 (53)											
Enter (49) or (54) in (55)	0.2173 (55)											
Total storage loss	6.7353	6.0835	6.7353	6.5180	6.7353	6.5180	6.7353	6.7353	6.5180	6.7353	6.5180	6.7353 (56)
If cylinder contains dedicated solar storage	6.7353	6.0835	6.7353	6.5180	6.7353	6.5180	6.7353	6.7353	6.5180	6.7353	6.5180	6.7353 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	196.0727	172.3449	179.8829	159.7036	155.3821	137.2272	130.2583	145.0482	145.4546	165.6794	177.1372	190.8325 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Solar input (sum of months) = Sum (63)m =	0.0000 (63)											
Output from w/h	196.0727	172.3449	179.8829	159.7036	155.3821	137.2272	130.2583	145.0482	145.4546	165.6794	177.1372	190.8325 (64)
Heat gains from water heating, kWh/month	79.2181	69.9715	73.8350	66.6730	65.6885	59.1996	57.3348	62.2525	61.9352	69.1123	72.4696	77.4757 (65)
Total per year (kWh/year) = Sum (64)m = 1955.0237 (64)												

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	142.3311	142.3311	142.3311	142.3311	142.3311	142.3311	142.3311	142.3311	142.3311	142.3311	142.3311	142.3311 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	24.9590	22.1684	18.0285	13.6488	10.2026	8.6135	9.3072	12.0978	16.2376	20.6174	24.0636	25.6527 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	279.9643	282.8695	275.5486	259.9633	240.2896	221.7991	209.4464	206.5412	213.8621	229.4474	249.1211	267.6115 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.2331	37.2331	37.2331	37.2331	37.2331	37.2331	37.2331	37.2331	37.2331	37.2331	37.2331	37.2331 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-113.8649	-113.8649	-113.8649	-113.8649	-113.8649	-113.8649	-113.8649	-113.8649	-113.8649	-113.8649	-113.8649	-113.8649 (71)
Water heating gains (Table 5)	106.4759	104.1242	99.2406	92.6014	88.2910	82.2217	77.0629	83.6727	86.0211	92.8929	100.6523	104.1340 (72)
Total internal gains	477.0986	474.8614	458.5170	431.9127	404.4825	378.3336	361.5158	368.0110	381.8202	408.6571	439.5363	463.0976 (73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d	Gains W
South					5.6800	46.7521		0.4200	0.8000		0.7700	61.8332 (78)
Horizontal					1.4400	26.0000		0.5000	0.8000		1.0000	13.4784 (82)
East					8.6100	19.6403		0.5000	0.8000		0.7700	46.8753 (76)
West					14.6100	19.6403		0.5000	0.8000		0.7700	79.5409 (80)

Solar gains	201.7278	376.5573	586.0252	817.5220	979.3893	995.0545	950.2606	829.5089	668.0310	436.8788	248.0268	168.2745 (83)
Total gains	678.8264	851.4187	1044.5422	1249.4347	1383.8718	1373.3881	1311.7764	1197.5199	1049.8512	845.5359	687.5630	631.3721 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)

Utilisation factor for gains for living area, nil,m (see Table 9a)												21.0000 (85)
tau	75.8581	76.1245	76.3928	77.7632	78.0432	79.4741	79.4741	79.7665	78.8955	78.0432	77.4852	76.9352
alpha	6.0572	6.0750	6.0929	6.1842	6.2029	6.2983	6.2983	6.3178	6.2597	6.2029	6.1657	6.1290
util living area	0.9982	0.9926	0.9667	0.8623	0.6702	0.4703	0.3399	0.3875	0.6520	0.9412	0.9946	0.9988 (86)
MIT	20.0730	20.2731	20.5600	20.8502	20.9721	20.9974	20.9997	20.9994	20.9828	20.7638	20.3536	20.0431 (87)
Th 2	20.1544	20.1571	20.1598	20.1734	20.1762	20.1898	20.1898	20.1926	20.1844	20.1762	20.1707	20.1653 (88)
util rest of house	0.9976	0.9902	0.9568	0.8303	0.6184	0.4118	0.2774	0.3198	0.5827	0.9188	0.9926	0.9984 (89)
MIT 2	18.9074	19.2006	19.6125	20.0107	20.1519	20.1882	20.1897	20.1923	20.1722	19.9125	19.3294	18.8720 (90)
Living area fraction	fLA = Living area / (4) =											0.1368 (91)
MIT	19.0668	19.3473	19.7421	20.1255	20.2641	20.2989	20.3005	20.3027	20.2831	20.0289	19.4695	19.0321 (92)
Temperature adjustment												0.0000
adjusted MIT	19.0668	19.3473	19.7421	20.1255	20.2641	20.2989	20.3005	20.3027	20.2831	20.0289	19.4695	19.0321 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9964	0.9872	0.9508	0.8282	0.6241	0.4197	0.2860	0.3290	0.5913	0.9140	0.9901	0.9976 (94)
Useful gains	676.4094	840.4913	993.1669	1034.8321	863.6191	576.4084	375.1143	394.0295	620.8184	772.8346	680.7604	629.8662 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Heat loss rate W	1568.6630	1529.3469	1396.8487	1163.2610	884.2835	577.8453	375.2153	394.2662	631.5349	973.5819	1286.4079	1553.5454 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	663.8367	462.9110	300.3393	92.4688	15.3743	0.0000	0.0000	0.0000	0.0000	149.3560	436.0662	687.2173 (98)
Space heating												2807.5696 (98)
Space heating per m2										(98) / (4) =		24.1948 (99)

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Boilers	1.0000 (303a)
Fraction of total space heat from community Boilers	1.0000 (304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.0500 (306)
Space heating:	
Annual space heating requirement	2807.5696 (98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05	2947.9481 (307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	1955.0237 (64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05	2052.7749 (310a)
Electricity used for heat distribution	50.0072 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 1.0375)	
mechanical ventilation fans (SFP = 1.0375)	411.1088 (330a)
Total electricity for the above, kWh/year	411.1088 (331)
Electricity for lighting (calculated in Appendix L)	440.7841 (332)
Total delivered energy for all uses	5852.6159 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Boilers			95.0000 (367a)
Space heating from Boilers	5263.9190	0.2160	1137.0065 (367)
Electrical energy for heat distribution	50.0072	0.5190	25.9538 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			1162.9602 (373)
Space and water heating			1162.9602 (376)
Pumps and fans	411.1088	0.5190	213.3654 (378)
Energy for lighting	440.7841	0.5190	228.7670 (379)
Total CO2, kg/year			1605.0927 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			13.8300 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		13.8300 ZC1
Total Floor Area	TFA	116.0400
Assumed number of occupants	N	2.8466
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		14.2969 ZC2
CO2 emissions from cooking, equation (L16)		1.6143 ZC3
Total CO2 emissions		29.7411 ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000 ZC7
Net CO2 emissions		29.7411 ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	45.0400 (1b)	x 2.4900 (2b)	= 112.1496 (1b) - (3b)
First floor	35.5000 (1c)	x 3.0700 (2c)	= 108.9850 (1c) - (3c)
Second floor	35.5000 (1d)	x 2.9200 (2d)	= 103.6600 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	116.0400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 324.7946 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					4 * 10 = 40.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour 40.0000 / (5) = 0.1232 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3732 (18)
Number of sides sheltered					1 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.9250 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3452 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4401	0.4315	0.4228	0.3797	0.3711	0.3279	0.3279	0.3193	0.3452	0.3711	0.3883	0.4056 (22b)
Effective ac	0.5968	0.5931	0.5894	0.5721	0.5688	0.5538	0.5538	0.5510	0.5596	0.5688	0.5754	0.5822 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.2600	1.0000	2.2600		(26)
TER Opening Type (Uw = 1.40)			25.4700	1.3258	33.7670		(27)
TER Room Window (Uw = 1.70)			1.2700	1.5918	2.0215		(27a)
Heat Loss Floor 1			45.0400	0.1300	5.8552		(28a)
External Wall 1 GF	47.5600	12.5900	34.9700	0.1800	6.2946		(29a)
External Wall 2 (FF)	53.4200	7.2600	46.1600	0.1800	8.3088		(29a)
External Wall 3 (SF)	50.8100	7.8800	42.9300	0.1800	7.7274		(29a)
External Roof 1	37.2000	1.2700	35.9300	0.1300	4.6709		(30)
External Roof 2 (1st Floor)	11.0500		11.0500	0.1300	1.4365		(30)
Total net area of external elements Aum(A, m ²)			245.0800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	72.3420		(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K		250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)		21.0000 (36)
Total fabric heat loss	(33) + (36) =	93.3420 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)		
(38)m	Jan 63.9706	Feb 63.5675
Heat transfer coeff	Mar 63.1725	Apr 61.3168
Average = Sum(39)m / 12 =	May 60.9697	Jun 59.3535
	Jul 59.3535	Aug 59.0542
	Sep 59.9760	Oct 60.9697
	Nov 61.6720	Dec 62.4063 (38)
		155.7482 (39)
		154.6572 (39)
HLP	Jan 1.3557	Feb 1.3522
HLP (average)	Mar 1.3488	Apr 1.3328
Days in month	May 1.3298	Jun 1.3159
	Jul 1.3159	Aug 1.3133
	Sep 1.3213	Oct 1.3298
	Nov 1.3359	Dec 1.3422 (40)
		1.3328 (40)
		31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.8466 (42)
Average daily hot water use (litres/day)		101.8073 (43)
Daily hot water use	Jan 111.9880	Feb 107.9157
Energy conte	Mar 103.8434	Apr 99.7711
Energy content (annual)	May 95.6989	Jun 91.6266
Distribution loss (46)m = 0.15 x (45)m	Jul 91.6266	Aug 95.6989
	Sep 99.7711	Oct 103.8434
	Nov 107.9157	Dec 111.9880 (44)
		135.6817
		148.1071
		160.8348 (45)
		1601.8251 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF TARGET EMISSIONS 09 Jan 2014

24.9112	21.7875	22.4828	19.6010	18.8077	16.2296	15.0391	17.2576	17.4637	20.3522	22.2161	24.1252 (46)
Water storage loss:											
Store volume											3.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):											0.2602 (48)
Temperature factor from Table 2b											0.5400 (49)
Enter (49) or (54) in (55)											0.1405 (55)
Total storage loss											
4.3553	3.9338	4.3553	4.2148	4.3553	4.2148	4.3553	4.3553	4.2148	4.3553	4.2148	4.3553 (56)
If cylinder contains dedicated solar storage											
4.3553	3.9338	4.3553	4.2148	4.3553	4.2148	4.3553	4.3553	4.2148	4.3553	4.2148	4.3553 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month											
193.6927	170.1952	177.5029	157.4004	153.0021	134.9240	127.8783	142.6682	143.1514	163.2993	174.8339	188.4524 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Solar input (sum of months) = Sum(63)m =											0.0000 (63)
Output from w/h											
193.6927	170.1952	177.5029	157.4004	153.0021	134.9240	127.8783	142.6682	143.1514	163.2993	174.8339	188.4524 (64)
Heat gains from water heating, kWh/month											
77.3141	68.2517	71.9310	64.8304	63.7845	57.3570	55.4308	60.3484	60.0926	67.2083	70.6270	75.5717 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	142.3311	142.3311	142.3311	142.3311	142.3311	142.3311	142.3311	142.3311	142.3311	142.3311	142.3311 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5											
24.9590	22.1684	18.0285	13.6488	10.2026	8.6135	9.3072	12.0978	16.2376	20.6174	24.0636	25.6527 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5											
279.9643	282.8695	275.5486	259.9633	240.2896	221.7991	209.4464	206.5412	213.8621	229.4474	249.1211	267.6115 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5											
37.2331	37.2331	37.2331	37.2331	37.2331	37.2331	37.2331	37.2331	37.2331	37.2331	37.2331	37.2331 (69)
Pumps, fans											
3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)											
-113.8649	-113.8649	-113.8649	-113.8649	-113.8649	-113.8649	-113.8649	-113.8649	-113.8649	-113.8649	-113.8649	-113.8649 (71)
Water heating gains (Table 5)											
103.9168	101.5650	96.6814	90.0422	85.7318	79.6625	74.5038	81.1135	83.4620	90.3337	98.0931	101.5749 (72)
Total internal gains											
477.5394	475.3022	458.9579	432.3536	404.9233	378.7744	361.9566	368.4518	382.2610	409.0979	439.9771	463.5385 (73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W		
East					7.5800	19.6403	0.6300	0.7000	0.7700	45.4976 (76)		
South					5.0000	46.7521	0.6300	0.7000	0.7700	71.4402 (78)		
West					12.8900	19.6403	0.6300	0.7000	0.7700	77.3699 (80)		
Horizontal					1.2700	26.0000	0.6300	0.7000	1.0000	13.1056 (82)		

Solar gains	207.4133	384.5749	593.2583	821.3496	979.8070	993.9853	949.8312	831.7060	674.0220	444.6656	254.5164	173.3565 (83)
Total gains	684.9528	859.8771	1052.2162	1253.7032	1384.7304	1372.7598	1311.7879	1200.1578	1056.2831	853.7635	694.4935	636.8949 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	51.2250	51.3566	51.4862	52.1039	52.2212	52.7739	52.7739	52.8775	52.5596	52.2212	51.9846	51.7395
alpha	4.4150	4.4238	4.4324	4.4736	4.4814	4.5183	4.5183	4.5252	4.5040	4.4814	4.4656	4.4493
util living area	0.9980	0.9944	0.9819	0.9381	0.8319	0.6597	0.4997	0.5616	0.8189	0.9714	0.9957	0.9986 (86)
MIT	19.4838	19.6955	20.0344	20.4554	20.7781	20.9437	20.9872	20.9788	20.8486	20.3923	19.8545	19.4513 (87)
Th 2	19.7975	19.8002	19.8028	19.8152	19.8176	19.8284	19.8284	19.8304	19.8242	19.8176	19.8128	19.8079 (88)
util rest of house	0.9974	0.9924	0.9754	0.9154	0.7744	0.5594	0.3730	0.4298	0.7355	0.9568	0.9938	0.9981 (89)
MIT 2	17.7924	18.1028	18.5950	19.1952	19.6106	19.7935	19.8241	19.8224	19.7084	19.1225	18.3447	17.7518 (90)
Living area fraction									fLA =	Living area / (4) =		0.1368 (91)
MIT	18.0238	18.3206	18.7919	19.3675	19.7702	19.9508	19.9832	19.9806	19.8643	19.2962	18.5512	17.9843 (92)
Temperature adjustment												0.0000
adjusted MIT	18.0238	18.3206	18.7919	19.3675	19.7702	19.9508	19.9832	19.9806	19.8643	19.2962	18.5512	17.9843 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9957	0.9887	0.9675	0.9046	0.7717	0.5707	0.3902	0.4476	0.7388	0.9477	0.9907	0.9968 (94)
Useful gains	682.0045	850.1246	1018.0681	1134.0581	1068.6292	783.4003	511.9244	537.1525	780.3651	809.0849	688.0561	634.8824 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	2158.9200	2105.8213	1923.8570	1618.8960	1245.3300	817.0381	516.5987	545.6678	883.7736	1341.9244	1775.0938	2146.8745 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	1098.8251	843.8282	673.9069	349.0833	131.4654	0.0000	0.0000	0.0000	0.0000	396.4326	782.6671	1124.9221 (98)
Space heating												5401.1307 (98)
Space heating per m2											(98) / (4) =	46.5454 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF TARGET EMISSIONS 09 Jan 2014

8c. Space cooling requirement

Not applicable

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													5776.6104 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	1098.8251	843.8282	673.9069	349.0833	131.4654	0.0000	0.0000	0.0000	0.0000	396.4326	782.6671	1124.9221	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	1175.2140	902.4900	720.7561	373.3511	140.6047	0.0000	0.0000	0.0000	0.0000	423.9921	837.0771	1203.1253	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	193.6927	170.1952	177.5029	157.4004	153.0021	134.9240	127.8783	142.6682	143.1514	163.2993	174.8339	188.4524	(64)
Efficiency of water heater (217)m	88.7173	88.5081	88.0389	86.8797	84.4123	79.8000	79.8000	79.8000	79.8000	87.0930	88.3372	79.8000	(216)
Fuel for water heating, kWh/month	218.3256	192.2934	201.6187	181.1704	181.2556	169.0777	160.2485	178.7822	179.3877	187.4999	197.9165	212.2411	(219)
Water heating fuel used												2259.8172	(219)
Annual totals kWh/year													
Space heating fuel - main system												5776.6104	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												440.7841	(232)
Total delivered energy for all uses												8552.2118	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	5776.6104	0.2160	1247.7479	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2259.8172	0.2160	488.1205	(264)
Space and water heating			1735.8684	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	440.7841	0.5190	228.7670	(268)
Total CO2, kg/m2/year			2003.5603	(272)
Emissions per m2 for space and water heating			14.9592	(272a)
Fuel factor (mains gas)			1.0000	
Emissions per m2 for lighting			1.9714	(272b)
Emissions per m2 for pumps and fans			0.3354	(272c)
Target Carbon Dioxide Emission Rate (TER) = (14.9592 * 1.00) + 1.9714 + 0.3354, rounded to 2 d.p.			17.2700	(273)

Appendix E

**DER Worksheets (Part L 2013) &
BRUKL Output (Part L 2021) –
Be Green**

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



Property Reference	Type 1 - Option 5			Issued on Date	18/07/2023
Assessment Reference	St Ann's Type 1	Prop Type Ref	St Ann's Type 1		
Property	Type 1 - 1B - Top				
SAP Rating	88 B	DER	7.73	TER	30.76
Environmental	96 A	% DER<TER	74.87		
CO ₂ Emissions (t/year)	0.26	DFEE	44.14	TFEE	59.39
General Requirements Compliance	Fail	% DFEE<TFEE	25.68		
Assessor Details	Miss Eleanor Ballinger, Eleanor Ballinger, Tel: 02036031625, Eleanor@hodkinsonconsultancy.com			Assessor ID	M976-0001
Client					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Top-floor flat, total floor area 50 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating: Electricity (c)
Fuel factor: 1.55 (electricity)
Target Carbon Dioxide Emission Rate (TER) 30.76 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 7.73 kgCO₂/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 59.4 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 44.1 kWh/m²/yr OK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	OK
Openings	0.83 (max. 2.00)	1.00 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 2.50 (design value)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Community heating scheme -
Secondary heating system: None

5 Cylinder insulation

Hot water storage: Nominal cylinder loss: 0.22 kWh/day
Permitted by DBSCG 0.35 OK
Primary pipework insulated: No primary pipework

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room stats OK
Hot water controls: No cylinder stat

7 Low energy lights

Percentage of fixed lights with low-energy fittings: 100%
Minimum 75% OK

8 Mechanical ventilation

Continuous supply and extract system
Specific fan power: 0.61
Maximum 1.5 OK
MVHR efficiency: 93%
Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): High Fail
Based on:
Overshading: Average
Windows facing North: 1.76 m², No overhang
Windows facing South: 1.76 m², No overhang
Windows facing West: 9.60 m², No overhang
Air change rate: 2.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Roof U-value 0.10 W/m²K
Door U-value 1.00 W/m²K
Window U-value 0.80 W/m²K
Window U-value 0.80 W/m²K
Air permeability 2.5 m³/m²h
Photovoltaic array 0.78 kW

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.2400 (1b)	x 2.4000 (2b)	= 120.5760 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.2400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 120.5760 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					2.5000
Infiltration rate					0.1250 (18)
Number of sides sheltered					3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.0969 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1235	0.1211	0.1187	0.1066	0.1041	0.0920	0.0920	0.0896	0.0969	0.1041	0.1090	0.1138 (22b)
Balanced mechanical ventilation with heat recovery												0.5000 (23a)
If mechanical ventilation:												79.0500 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.2283	0.2258	0.2234	0.2113	0.2089	0.1968	0.1968	0.1944	0.2016	0.2089	0.2137	0.2186 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Window (West) (Uw = 0.80)			11.3600	0.7752	8.8062		(27)
Door			2.0900	1.0000	2.0900		(26)
Window (East) (Uw = 0.80)			1.7600	0.7752	1.3643		(27)
External Wall 1	31.4400	13.1200	18.3200	0.1800	3.2976		(29a)
Corridor Wall	23.0400	2.0900	20.9500	0.1786	3.7411		(29a)
External Roof 1	50.2400		50.2400	0.1000	5.0240		(30)
Total net area of external elements Aum(A, m ²)			104.7200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	24.3232		(33)
Party Wall 1			29.7600	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							13.0134 (36)
Total fabric heat loss							(33) + (36) = 37.3366 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	9.0827	8.9863	8.8900	8.4081	8.3118	7.8299	7.8299	7.7336	8.0227	8.3118	8.5045	8.6972 (38)
Average = Sum(39)m / 12 =	46.4193	46.3230	46.2266	45.7448	45.6484	45.1666	45.1666	45.0702	45.3593	45.6484	45.8411	46.0339 (39)
												45.7207 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.9240	0.9220	0.9201	0.9105	0.9086	0.8990	0.8990	0.8971	0.9029	0.9086	0.9124	0.9163 (40)
Days in month												0.9100 (40)
	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.6972 (42)
Average daily hot water use (litres/day)												74.5078 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	81.9585	78.9782	75.9979	73.0176	70.0373	67.0570	67.0570	70.0373	73.0176	75.9979	78.9782	81.9585 (44)
Energy content (annual)	121.5421	106.3015	109.6937	95.6336	91.7627	79.1842	73.3758	84.1998	85.2055	99.2987	108.3923	117.7071 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 1172.2972 (45)

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	18.2313	15.9452	16.4540	14.3450	13.7644	11.8776	11.0064	12.6300	12.7808	14.8948	16.2589	17.6561 (46)
Water storage loss:												
Store volume												3.0000 (47)
b) If manufacturer declared loss factor is not known :												
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0212 (51)
Volume factor from Table 2a												3.4200 (52)
Temperature factor from Table 2b												1.0000 (53)
Enter (49) or (54) in (55)												0.2173 (55)
Total storage loss												
6.7353	6.0835	6.7353	6.5180	6.7353	6.5180	6.7353	6.7353	6.5180	6.7353	6.5180	6.7353	(56)
If cylinder contains dedicated solar storage												
6.7353	6.0835	6.7353	6.5180	6.7353	6.5180	6.7353	6.7353	6.5180	6.7353	6.5180	6.7353	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month												
151.5398	133.3962	139.6914	124.6636	121.7604	108.2143	103.3735	114.1975	114.2355	129.2964	137.4224	147.7048	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Solar input (sum of months) = Sum(63)m =												0.0000 (63)
Output from w/h												
151.5398	133.3962	139.6914	124.6636	121.7604	108.2143	103.3735	114.1975	114.2355	129.2964	137.4224	147.7048	(64)
Heat gains from water heating, kWh/month												
64.4109	57.0210	60.4713	55.0222	54.5093	49.5528	48.3956	51.9946	51.5548	57.0150	59.2645	63.1358	(65)
Total per year (kWh/year) = Sum(64)m =												1525.4958 (64)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
(66)m	84.8584	84.8584	84.8584	84.8584	84.8584	84.8584	84.8584	84.8584	84.8584	84.8584	84.8584	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
13.1816	11.7078	9.5214	7.2083	5.3883	4.5490	4.9154	6.3892	8.5756	10.8887	12.7087	13.5479	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
147.8573	149.3916	145.5252	137.2941	126.9039	117.1385	110.6147	109.0804	112.9468	121.1778	131.5681	141.3334	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
31.4858	31.4858	31.4858	31.4858	31.4858	31.4858	31.4858	31.4858	31.4858	31.4858	31.4858	31.4858	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)												
-67.8868	-67.8868	-67.8868	-67.8868	-67.8868	-67.8868	-67.8868	-67.8868	-67.8868	-67.8868	-67.8868	-67.8868	(71)
Water heating gains (Table 5)												
86.5738	84.8527	81.2786	76.4197	73.2651	68.8233	65.0479	69.8852	71.6039	76.6330	82.3118	84.8599	(72)
Total internal gains												
296.0702	294.4095	284.7827	269.3797	254.0148	238.9684	229.0355	233.8123	241.5838	257.1571	275.0460	288.1988	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
South				1.7600	46.7521	0.4200	0.8000	0.7700	19.1596 (78)			
West				9.6000	19.6403	0.4200	0.8000	0.7700	43.9027 (80)			
North				1.7600	10.6334	0.5000	0.8000	0.7700	5.1877 (74)			
Solar gains	68.2500	127.1754	198.2539	278.5124	336.3281	343.1130	327.0726	283.5245	226.5059	147.5533	83.8519	56.9838 (83)
Total gains	364.3202	421.5850	483.0367	547.8921	590.3429	582.0814	556.1081	517.3368	468.0897	404.7104	358.8979	345.1826 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
75.1603	75.3166	75.4736	76.2686	76.4296	77.2450	77.2450	77.4101	76.9167	76.4296	76.1083	75.7896	
6.0107	6.0211	6.0316	6.0846	6.0953	6.1497	6.1497	6.1607	6.1278	6.0953	6.0739	6.0526	
util living area												
0.9943	0.9857	0.9570	0.8632	0.6892	0.4932	0.3570	0.3999	0.6487	0.9177	0.9864	0.9958 (86)	
MIT	20.1949	20.3559	20.5941	20.8425	20.9654	20.9961	20.9996	20.9991	20.9817	20.7980	20.4467	20.1611 (87)
Th 2	20.1472	20.1488	20.1504	20.1586	20.1602	20.1683	20.1683	20.1700	20.1651	20.1602	20.1569	20.1537 (88)
util rest of house												
0.9926	0.9815	0.9448	0.8309	0.6363	0.4307	0.2897	0.3282	0.5782	0.8893	0.9816	0.9945 (89)	
MIT 2	19.0792	19.3130	19.6514	19.9875	20.1299	20.1660	20.1682	20.1696	20.1523	19.9411	19.4522	19.0352 (90)
Living area fraction												
19.6033	19.8029	20.0942	20.3891	20.5224	20.5559	20.5587	20.5593	20.5419	20.3436	19.9194	19.5641 (91)	
MIT												
Temperature adjustment												0.0000
adjusted MIT	19.6033	19.8029	20.0942	20.3891	20.5224	20.5559	20.5587	20.5593	20.5419	20.3436	19.9194	19.5641 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0.9911	0.9794	0.9439	0.8404	0.6596	0.4600	0.3213	0.3619	0.6107	0.8962	0.9799	0.9933 (94)	
Useful gains	361.0837	412.8873	455.9149	460.4330	389.4054	267.7481	178.6882	187.2295	285.8626	362.7066	351.6873	342.8682 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W												
710.3686	690.3473	628.4143	525.5677	402.7277	269.0091	178.8013	187.4595	292.2002	444.7800	587.6544	707.2685 (97)	
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh												
259.8680	186.4531	128.3395	46.8970	9.9118	0.0000	0.0000	0.0000	0.0000	61.0626	169.8963	271.1138 (98)	
Space heating												1133.5422 (98)
Space heating per m2												(98) / (4) = 22.5625 (99)

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8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump	0.9500	(303a)
Fraction of heat from community Boilers	0.0500	(303b)
Fraction of total space heat from community Heat pump	0.9500	(304a)
Fraction of total space heat from community Boilers	0.0500	(304b)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000	(305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.0500	(306)
Space heating:		
Annual space heating requirement	1133.5422	(98)
Space heat from Heat pump = (98) x 0.95 x 1.00 x 1.05	1130.7083	(307a)
Space heat from Boilers = (98) x 0.05 x 1.00 x 1.05	59.5110	(307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	(309)
Water heating		
Annual water heating requirement	1525.4958	(64)
Water heat from Heat pump = (64) x 0.95 x 1.00 x 1.05	1521.6821	(310a)
Water heat from Boilers = (64) x 0.05 x 1.00 x 1.05	80.0885	(310b)
Electricity used for heat distribution	27.9199	(313)
Annual totals kWh/year		
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7625)		
mechanical ventilation fans (SFP = 0.7625)	112.1658	(330a)
Total electricity for the above, kWh/year	112.1658	(331)
Electricity for lighting (calculated in Appendix L)	232.7909	(332)
Energy saving/generation technologies (Appendices M, N and Q)		
PV Unit 0 (0.80 * 0.78 * 951 * 1.00) =	-593.1844	-593.1844 (333)
Total delivered energy for all uses		2543.7622 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			323.0000 (367a)
Space heating from Heat pump	821.1735	0.5190	426.1890 (367)
Efficiency of heat source Boilers			95.0000 (367b)
Space heating from Boilers	146.9468	0.5190	76.2654 (368)
Electrical energy for heat distribution	27.9199	0.5190	14.4904 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			516.9449 (373)
Space and water heating			516.9449 (376)
Pumps and fans	112.1658	0.5190	58.2141 (378)
Energy for lighting	232.7909	0.5190	120.8185 (379)
Energy saving/generation technologies			
PV Unit	-593.1844	0.5190	-307.8627 (380)
Total CO2, kg/year			388.1147 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			7.7300 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		7.7300	ZC1
Total Floor Area		50.2400	
Assumed number of occupants		1.6972	
CO2 emission factor in Table 12 for electricity displaced from grid		0.5190	
CO2 emissions from appliances, equation (L14)		17.4397	ZC2
CO2 emissions from cooking, equation (L16)		3.1794	ZC3
Total CO2 emissions		28.3491	ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000	ZC7
Net CO2 emissions		28.3491	ZC8

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.2400 (1b)	x 2.4000 (2b)	= 120.5760 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.2400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 120.5760 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				20.0000 / (5) =	0.1659 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4159 (18)
Number of sides sheltered					3 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.7750 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3223 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4109	0.4029	0.3948	0.3545	0.3465	0.3062	0.3062	0.2981	0.3223	0.3465	0.3626	0.3787 (22b)
Effective ac	0.5844	0.5812	0.5779	0.5628	0.5600	0.5469	0.5469	0.5444	0.5519	0.5600	0.5657	0.5717 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.0900	1.0000	2.0900		(26)
TER Opening Type (Uw = 1.40)			10.4600	1.3258	13.8674		(27)
External Wall 1	31.4400	10.4600	20.9800	0.1800	3.7764		(29a)
Corridor Wall	23.0400	2.0900	20.9500	0.1800	3.7710		(29a)
External Roof 1	50.2400		50.2400	0.1300	6.5312		(30)
Total net area of external elements Aum(A, m ²)			104.7200				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	30.0360	(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							12.7410 (36)
Total fabric heat loss						(33) + (36) =	42.7770 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	23.2546	23.1242	22.9963	22.3957	22.2833	21.7602	21.7602	21.6633	21.9617	22.2833	22.5106	22.7483 (38)
Heat transfer coeff	66.0316	65.9012	65.7733	65.1727	65.0603	64.5372	64.5372	64.4403	64.7387	65.0603	65.2877	65.5253 (39)
Average = Sum(39)m / 12 =												65.1722 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.3143	1.3117	1.3092	1.2972	1.2950	1.2846	1.2846	1.2826	1.2886	1.2950	1.2995	1.3042 (40)
HLP (average)												1.2972 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.6972 (42)
Average daily hot water use (litres/day)												74.5078 (43)
Daily hot water use	81.9585	78.9782	75.9979	73.0176	70.0373	67.0570	67.0570	70.0373	73.0176	75.9979	78.9782	81.9585 (44)
Energy conte	121.5421	106.3015	109.6937	95.6336	91.7627	79.1842	73.3758	84.1998	85.2055	99.2987	108.3923	117.7071 (45)
Energy content (annual)												Total = Sum(45)m = 1172.2972 (45)
Distribution loss (46)m = 0.15 x (45)m	18.2313	15.9452	16.4540	14.3450	13.7644	11.8776	11.0064	12.6300	12.7808	14.8948	16.2589	17.6561 (46)
Water storage loss:												3.0000 (47)
Store volume												0.2602 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.1405 (55)
Enter (49) or (54) in (55)												

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Total storage loss	4.3553	3.9338	4.3553	4.2148	4.3553	4.2148	4.3553	4.3553	4.2148	4.3553	4.2148	4.3553 (56)
If cylinder contains dedicated solar storage	4.3553	3.9338	4.3553	4.2148	4.3553	4.2148	4.3553	4.3553	4.2148	4.3553	4.2148	4.3553 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	149.1598	131.2465	137.3113	122.3604	119.3804	105.9110	100.9935	111.8175	111.9322	126.9164	135.1191	145.3247 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	149.1598	131.2465	137.3113	122.3604	119.3804	105.9110	100.9935	111.8175	111.9322	126.9164	135.1191	145.3247 (64)
Heat gains from water heating, kWh/month	62.5069	55.3013	58.5673	53.1796	52.6052	47.7102	46.4916	50.0906	49.7122	55.1110	57.4219	61.2317 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	84.8584	84.8584	84.8584	84.8584	84.8584	84.8584	84.8584	84.8584	84.8584	84.8584	84.8584	84.8584	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.2261	11.7473	9.5535	7.2326	5.4065	4.5644	4.9320	6.4108	8.6045	10.9254	12.7516	13.5937	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	147.8573	149.3916	145.5252	137.2941	126.9039	117.1385	110.6147	109.0804	112.9468	121.1778	131.5681	141.3334	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.4858	31.4858	31.4858	31.4858	31.4858	31.4858	31.4858	31.4858	31.4858	31.4858	31.4858	31.4858	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-67.8868	-67.8868	-67.8868	-67.8868	-67.8868	-67.8868	-67.8868	-67.8868	-67.8868	-67.8868	-67.8868	-67.8868	(71)
Water heating gains (Table 5)	84.0147	82.2935	78.7195	73.8605	70.7060	66.2641	62.4887	67.3261	69.0448	74.0739	79.7526	82.3007	(72)
Total internal gains	296.5555	294.8899	285.2557	269.8448	254.4739	239.4246	229.4929	234.2748	242.0536	257.6347	275.5298	288.6853	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W	
North					1.4000	10.6334	0.6300	0.7000	0.7700		4.5496 (74)	
South					1.4000	46.7521	0.6300	0.7000	0.7700		20.0033 (78)	
West					7.6600	19.6403	0.6300	0.7000	0.7700		45.9778 (80)	
Solar gains	70.5306	131.3969	204.6268	286.9229	345.8658	352.5394	336.1852	291.8648	233.6279	152.4087	86.6521	58.8873 (83)
Total gains	367.0861	426.2869	489.8825	556.7677	600.3397	591.9640	565.6781	526.1395	475.6816	410.0433	362.1818	347.5726 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	52.8366	52.9412	53.0441	53.5330	53.6254	54.0601	54.0601	54.1414	53.8919	53.6254	53.4387	53.2449	
alpha	4.5224	4.5294	4.5363	4.5689	4.5750	4.6040	4.6040	4.6094	4.5928	4.5750	4.5626	4.5497	
util living area	0.9954	0.9903	0.9757	0.9300	0.8238	0.6513	0.4913	0.5452	0.7945	0.9576	0.9909	0.9964	(86)
MIT	19.6617	19.8399	20.1358	20.5070	20.7988	20.9499	20.9890	20.9825	20.8746	20.4828	20.0016	19.6281	(87)
Th 2	19.8296	19.8317	19.8336	19.8430	19.8448	19.8529	19.8529	19.8544	19.8498	19.8448	19.8412	19.8375	(88)
util rest of house	0.9938	0.9871	0.9672	0.9054	0.7660	0.5530	0.3687	0.4184	0.7086	0.9375	0.9872	0.9952	(89)
MIT 2	18.0734	18.3337	18.7609	19.2855	19.6579	19.8218	19.8492	19.8479	19.7559	19.2657	18.5770	18.0299	(90)
Living area fraction	18.8195	19.0412	19.4067	19.8593	20.1938	20.3517	20.3846	20.3809	20.2814	19.8374	19.2462	18.7806	(92)
Temperature adjustment	18.8195	19.0412	19.4067	19.8593	20.1938	20.3517	20.3846	20.3809	20.2814	19.8374	19.2462	18.7806	(93)
adjusted MIT	18.8195	19.0412	19.4067	19.8593	20.1938	20.3517	20.3846	20.3809	20.2814	19.8374	19.2462	18.7806	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9919	0.9841	0.9633	0.9058	0.7851	0.5976	0.4266	0.4783	0.7438	0.9373	0.9846	0.9936	(94)
Ext temp.	364.1231	419.5041	471.9178	504.3309	471.3001	353.7803	241.3176	251.6470	353.8297	384.3330	356.6012	345.3427	(95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Month fracti	958.7476	931.9235	848.9192	714.2474	552.6094	371.2005	244.2488	256.5289	400.1738	600.9907	792.9974	955.4011	(97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000	(97a)
Space heating per m2	442.4006	344.3458	280.4891	151.1399	60.4941	0.0000	0.0000	0.0000	0.0000	161.1933	314.2053	453.8835	(98)
												2208.1515	(98)
												43.9521	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2361.6594 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	442.4006	344.3458	280.4891	151.1399	60.4941	0.0000	0.0000	0.0000	0.0000	161.1933	314.2053	453.8835	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	473.1557	368.2843	299.9883	161.6469	64.6996	0.0000	0.0000	0.0000	0.0000	172.3992	336.0484	485.4369	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	149.1598	131.2465	137.3113	122.3604	119.3804	105.9110	100.9935	111.8175	111.9322	126.9164	135.1191	145.3247	(64)
Efficiency of water heater (217)m	87.5403	87.2707	86.6802	85.3783	83.1045	79.8000	79.8000	79.8000	79.8000	85.4526	86.9923	87.6497	(216)
Fuel for water heating, kWh/month	170.3898	150.3901	158.4114	143.3155	143.6510	132.7206	126.5583	140.1222	140.2660	148.5226	155.3230	165.8018	(219)
Water heating fuel used												1775.4721	(219)
Annual totals kWh/year													
Space heating fuel - main system												2361.6594	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												233.5768	(232)
Total delivered energy for all uses												4445.7084	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2361.6594	0.2160	510.1184 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1775.4721	0.2160	383.5020 (264)
Space and water heating			893.6204 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	233.5768	0.5190	121.2264 (268)
Total CO2, kg/m2/year			1053.7718 (272)
Emissions per m2 for space and water heating			17.7870 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.4129 (272b)
Emissions per m2 for pumps and fans			0.7748 (272c)
Target Carbon Dioxide Emission Rate (TER) = (17.7870 * 1.55) + 2.4129 + 0.7748, rounded to 2 d.p.			30.7600 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



Property Reference	Type 2 - Option 5			Issued on Date	18/07/2023
Assessment Reference	St Ann's Type 2	Prop Type Ref	St Ann's Type 2		
Property	Type 2 - 2B - Ground				
SAP Rating	89 B	DER	7.66	TER	26.05
Environmental	95 A	% DER<TER	70.59		
CO ₂ Emissions (t/year)	0.38	DFEE	39.93	TFEE	51.53
General Requirements Compliance	Fail	% DFEE<TFEE	22.51		
Assessor Details	Miss Eleanor Ballinger, Eleanor Ballinger, Tel: 02036031625, Eleanor@hodkinsonconsultancy.com			Assessor ID	M976-0001
Client					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Ground-floor flat, total floor area 71 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating: Electricity (c)
Fuel factor: 1.55 (electricity)
Target Carbon Dioxide Emission Rate (TER) 26.05 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 7.66 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 51.5 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 39.9 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.13 (max. 0.25)	0.13 (max. 0.70)	OK
Roof	(no roof)		
Openings	0.82 (max. 2.00)	1.00 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 2.50 (design value)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system: None

5 Cylinder insulation

Hot water storage
Permitted by DBSCG 0.35
Primary pipework insulated: Nominal cylinder loss: 0.22 kWh/day
OK
No primary pipework

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK

Hot water controls: No cylinder stat

7 Low energy lights

Percentage of fixed lights with low-energy fittings: 100%
Minimum 75% OK

8 Mechanical ventilation

Continuous supply and extract system
Specific fan power: 0.61
Maximum 1.5 OK
MVHR efficiency: 93%
Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): High Fail
Based on:
Overshading: Average
Windows facing North: 8.20 m², No overhang
Windows facing East: 8.04 m², No overhang
Air change rate: 2.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Door U-value 1.00 W/m²K
Window U-value 0.80 W/m²K
Window U-value 0.80 W/m²K
Air permeability 2.5 m³/m²h
Photovoltaic array 0.78 kW

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	71.4900 (1b)	x 2.4000 (2b)	= 171.5760 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.4900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 171.5760 (5)

2. Ventilation rate

	main		secondary		other		total	m3 per hour				
	heating		heating									
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000 (6a)				
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000 (6b)				
Number of intermittent fans							0 * 10 =	0.0000 (7a)				
Number of passive vents							0 * 10 =	0.0000 (7b)				
Number of flueless gas fires							0 * 40 =	0.0000 (7c)				
Air changes per hour												
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =						0.0000 / (5) =	0.0000 (8)				
Pressure test							Yes					
Measured/design AP50							2.5000					
Infiltration rate							0.1250	(18)				
Number of sides sheltered							2	(19)				
Shelter factor							(20) = 1 - [0.075 x (19)] =	0.8500 (20)				
Infiltration rate adjusted to include shelter factor							(21) = (18) x (20) =	0.1063 (21)				
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
	0.1355	0.1328	0.1302	0.1169	0.1142	0.1009	0.1009	0.0983	0.1063	0.1142	0.1195	0.1248 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												0.5000 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												79.0500 (23c)
Effective ac	0.2402	0.2376	0.2349	0.2216	0.2190	0.2057	0.2057	0.2030	0.2110	0.2190	0.2243	0.2296 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Window (Uw = 0.80)			8.2000	0.7752	6.3566		(27)					
Door			2.0900	1.0000	2.0900		(26)					
Window (east, west, south (Uw = 0.80)			8.0400	0.7752	6.2326		(27)					
Heat Loss Floor 1			71.4900	0.1300	9.2937		(28a)					
External Wall 1	42.7200	16.2400	26.4800	0.1800	4.7664		(29a)					
Corridor Wall	7.9200	2.0900	5.8300	0.1786	1.0411		(29a)					
Total net area of external elements Aum(A, m2)			122.1300				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		29.7803		(33)					
Party Wall 1			34.3200	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												
Thermal bridges (Sum(L x Psi) calculated using Appendix K)												
Total fabric heat loss						(33) + (36) =	42.0409 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 13.6012	Feb 13.4508	Mar 13.3004	Apr 12.5484	May 12.3980	Jun 11.6460	Jul 11.6460	Aug 11.4956	Sep 11.9468	Oct 12.3980	Nov 12.6988	Dec 12.9996 (38)
Heat transfer coeff	55.6421	55.4917	55.3413	54.5893	54.4389	53.6870	53.6870	53.5366	53.9878	54.4389	54.7397	55.0405 (39)
Average = Sum(39)m / 12 =	54.5517 (39)											
HLP	Jan 0.7783	Feb 0.7762	Mar 0.7741	Apr 0.7636	May 0.7615	Jun 0.7510	Jul 0.7510	Aug 0.7489	Sep 0.7552	Oct 0.7615	Nov 0.7657	Dec 0.7699 (40)
HLP (average)	0.7631 (40)											
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2817 (42)
Average daily hot water use (litres/day)												88.3915 (43)
Daily hot water use	Jan 97.2307	Feb 93.6950	Mar 90.1593	Apr 86.6237	May 83.0880	Jun 79.5524	Jul 79.5524	Aug 83.0880	Sep 86.6237	Oct 90.1593	Nov 93.6950	Dec 97.2307 (44)
Energy conte	144.1903	126.1097	130.1340	113.4539	108.8617	93.9394	87.0487	99.8896	101.0826	117.8021	128.5902	139.6406 (45)
Energy content (annual)												Total = Sum(45)m = 1390.7428 (45)
Distribution loss (46)m = 0.15 x (45)m												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

21.6285	18.9165	19.5201	17.0181	16.3293	14.0909	13.0573	14.9834	15.1624	17.6703	19.2885	20.9461 (46)
Water storage loss:											
Store volume											3.0000 (47)
b) If manufacturer declared loss factor is not known :											
Hot water storage loss factor from Table 2 (kWh/litre/day)											0.0212 (51)
Volume factor from Table 2a											3.4200 (52)
Temperature factor from Table 2b											1.0000 (53)
Enter (49) or (54) in (55)											0.2173 (55)
Total storage loss											
6.7353	6.0835	6.7353	6.5180	6.7353	6.5180	6.7353	6.7353	6.5180	6.7353	6.5180	6.7353 (56)
If cylinder contains dedicated solar storage											
6.7353	6.0835	6.7353	6.5180	6.7353	6.5180	6.7353	6.7353	6.5180	6.7353	6.5180	6.7353 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month											
174.1880	153.2044	160.1316	142.4840	138.8594	122.9694	117.0464	129.8873	130.1127	147.7997	157.6202	169.6383 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Solar input (sum of months) = Sum(63)m =											0.0000 (63)
Output from w/h											
174.1880	153.2044	160.1316	142.4840	138.8594	122.9694	117.0464	129.8873	130.1127	147.7997	157.6202	169.6383 (64)
Heat gains from water heating, kWh/month											
71.9414	63.6072	67.2677	60.9475	60.1947	54.4589	52.9418	57.2115	56.8340	63.1673	65.9802	70.4286 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	114.0874	114.0874	114.0874	114.0874	114.0874	114.0874	114.0874	114.0874	114.0874	114.0874	114.0874 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5											
17.8969	15.8959	12.9274	9.7869	7.3158	6.1763	6.6737	8.6748	11.6433	14.7838	17.2549	18.3944 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5											
200.7493	202.8325	197.5830	186.4075	172.3004	159.0418	150.1842	148.1011	153.3505	164.5260	178.6331	191.8917 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5											
34.4087	34.4087	34.4087	34.4087	34.4087	34.4087	34.4087	34.4087	34.4087	34.4087	34.4087	34.4087 (69)
Pumps, fans											
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)											
-91.2699	-91.2699	-91.2699	-91.2699	-91.2699	-91.2699	-91.2699	-91.2699	-91.2699	-91.2699	-91.2699	-91.2699 (71)
Water heating gains (Table 5)											
96.6955	94.6536	90.4136	84.6492	80.9068	75.6373	71.1584	76.8971	78.9361	84.9023	91.6392	94.6622 (72)
Total internal gains											
372.5680	370.6082	358.1502	338.0699	317.7493	298.0817	285.2425	290.8992	301.1561	321.4384	344.7534	362.1745 (73)

6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains
	m2	Table 6a	or Table 6b	Specific data	factor	W
		W/m2		or Table 6c	Table 6d	
North	8.2000	10.6334	0.5000	0.8000	0.7700	24.1701 (74)
East	8.0400	19.6403	0.4200	0.8000	0.7700	36.7685 (76)
Solar gains						
60.9386	118.1173	196.9422	298.8303	381.5524	398.5437	376.0822
Total gains						
433.5066	488.7256	555.0924	636.9002	699.3018	696.6254	661.3248

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)											
Utilisation factor for gains for living area, nil,m (see Table 9a)											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	89.2235	89.4653	89.7084	90.9442	91.1954	92.4728	92.4728	92.7326	91.9576	91.1954	90.6943
alpha	6.9482	6.9644	6.9806	7.0629	7.0797	7.1649	7.1822	7.1305	7.0797	7.0463	7.0132
util living area											
0.9973	0.9932	0.9752	0.8913	0.7021	0.4916	0.3571	0.4081	0.6813	0.9460	0.9931	0.9981 (86)
MIT											
20.2999	20.4248	20.6317	20.8688	20.9783	20.9984	20.9999	20.9997	20.9870	20.8172	20.5150	20.2761 (87)
Th 2											
20.2722	20.2740	20.2758	20.2850	20.2868	20.2960	20.2960	20.2979	20.2923	20.2868	20.2832	20.2795 (88)
util rest of house											
0.9965	0.9911	0.9678	0.8650	0.6551	0.4383	0.3000	0.3461	0.6183	0.9262	0.9906	0.9975 (89)
MIT 2											
19.3295	19.5126	19.8107	20.1389	20.2676	20.2950	20.2960	20.2977	20.2829	20.0805	19.6518	19.3006 (90)
Living area fraction											
fLA = Living area / (4) =											
MIT	19.7111	19.8713	20.1335	20.4259	20.5470	20.5716	20.5727	20.5737	20.5597	20.3702	19.9912
Temperature adjustment											
adjusted MIT	19.7111	19.8713	20.1335	20.4259	20.5470	20.5716	20.5727	20.5737	20.5597	20.3702	19.9912

8. Space heating requirement

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9957	0.9896	0.9661	0.8706	0.6726	0.4593	0.3224	0.3705	0.6426	0.9288	0.9893
Useful gains	431.6242	483.6518	536.2470	554.4707	470.3737	319.9312	213.2411	223.3343	342.7160	428.9035	415.9262
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000
Heat loss rate W											
857.5047	830.7828	754.4981	629.1913	481.6232	320.5982	213.2846	223.4472	348.7465	531.8769	705.6601	852.2578 (97)
Month fracti											
1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh											
316.8551	233.2720	162.3788	53.7988	8.3696	0.0000	0.0000	0.0000	0.0000	76.6122	208.6084	328.1147 (98)
Space heating											
Space heating per m2											1388.0096 (98)
											(98) / (4) = 19.4154 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump	0.9500	(303a)
Fraction of heat from community Boilers	0.0500	(303b)
Fraction of total space heat from community Heat pump	0.9500	(304a)
Fraction of total space heat from community Boilers	0.0500	(304b)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000	(305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.0500	(306)
Space heating:		
Annual space heating requirement	1388.0096	(98)
Space heat from Heat pump = (98) x 0.95 x 1.00 x 1.05	1384.5396	(307a)
Space heat from Boilers = (98) x 0.05 x 1.00 x 1.05	72.8705	(307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	(309)
Water heating		
Annual water heating requirement	1743.9414	(64)
Water heat from Heat pump = (64) x 0.95 x 1.00 x 1.05	1739.5816	(310a)
Water heat from Boilers = (64) x 0.05 x 1.00 x 1.05	91.5569	(310b)
Electricity used for heat distribution	32.8855	(313)
Annual totals kWh/year		
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7625)		
mechanical ventilation fans (SFP = 0.7625)	159.6086	(330a)
Total electricity for the above, kWh/year	159.6086	(331)
Electricity for lighting (calculated in Appendix L)	316.0657	(332)
Energy saving/generation technologies (Appendices M,N and Q)		
PV Unit 0 (0.80 * 0.78 * 951 * 1.00) =	-593.1844	-593.1844 (333)
Total delivered energy for all uses		3171.0385 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			323.0000	(367a)
Space heating from Heat pump	967.2202	0.5190	501.9873	(367)
Efficiency of heat source Boilers			95.0000	(367b)
Space heating from Boilers	173.0815	0.5190	89.8293	(368)
Electrical energy for heat distribution	32.8855	0.5190	17.0676	(372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			608.8841	(373)
Space and water heating			608.8841	(376)
Pumps and fans	159.6086	0.5190	82.8368	(378)
Energy for lighting	316.0657	0.5190	164.0381	(379)
Energy saving/generation technologies				
PV Unit	-593.1844	0.5190	-307.8627	(380)
Total CO2, kg/year			547.8964	(383)
Dwelling Carbon Dioxide Emission Rate (DER)			7.6600	(384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER	7.6600	ZC1
Total Floor Area	71.4900	TFA
Assumed number of occupants	2.2817	N
CO2 emission factor in Table 12 for electricity displaced from grid	0.5190	EF
CO2 emissions from appliances, equation (L14)	16.6401	ZC2
CO2 emissions from cooking, equation (L16)	2.4306	ZC3
Total CO2 emissions	26.7306	ZC4
Residual CO2 emissions offset from biofuel CHP	0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year	0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation	0.0000	ZC7
Net CO2 emissions	26.7306	ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	71.4900 (1b)	x 2.4000 (2b)	= 171.5760 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.4900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 171.5760 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour
Pressure test					30.0000 / (5) = 0.1748 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.4248 (18)
					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3611 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4604	0.4514	0.4424	0.3972	0.3882	0.3431	0.3431	0.3340	0.3611	0.3882	0.4063	0.4243 (22b)
Effective ac	0.6060	0.6019	0.5978	0.5789	0.5754	0.5588	0.5588	0.5558	0.5652	0.5754	0.5825	0.5900 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.0900	1.0000	2.0900		(26)
TER Opening Type (Uw = 1.40)			15.7700	1.3258	20.9072		(27)
Heat Loss Floor 1			71.4900	0.1300	9.2937		(28a)
External Wall 1	42.7200	15.7700	26.9500	0.1800	4.8510		(29a)
Corridor Wall	7.9200	2.0900	5.8300	0.1800	1.0494		(29a)
Total net area of external elements Aum(A, m ²)			122.1300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	38.1913		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.8140 (36)
Total fabric heat loss						(33) + (36) =	47.0053 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	34.3117	34.0786	33.8502	32.7772	32.5765	31.6420	31.6420	31.4689	32.0019	32.5765	32.9826	33.4072 (38)
Heat transfer coeff	81.3170	81.0839	80.8555	79.7825	79.5818	78.6473	78.6473	78.4742	79.0072	79.5818	79.9879	80.4125 (39)
Average = Sum(39)m / 12 =												79.7816 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1375	1.1342	1.1310	1.1160	1.1132	1.1001	1.1001	1.0977	1.1052	1.1132	1.1189	1.1248 (40)
HLP (average)												1.1160 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2817 (42)
Average daily hot water use (litres/day)												88.3915 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	97.2307	93.6950	90.1593	86.6237	83.0880	79.5524	79.5524	83.0880	86.6237	90.1593	93.6950	97.2307 (44)
Energy conte	144.1903	126.1097	130.1340	113.4539	108.8617	93.9394	87.0487	99.8896	101.0826	117.8021	128.5902	139.6406 (45)
Energy content (annual)										Total = Sum(45)m =		1390.7428 (45)
Distribution loss (46)m = 0.15 x (45)m	21.6285	18.9165	19.5201	17.0181	16.3293	14.0909	13.0573	14.9834	15.1624	17.6703	19.2885	20.9461 (46)
Water storage loss:												
Store volume												3.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												0.2602 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.1405 (55)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Total storage loss	4.3553	3.9338	4.3553	4.2148	4.3553	4.2148	4.3553	4.3553	4.2148	4.3553	4.2148	4.3553 (56)
If cylinder contains dedicated solar storage	4.3553	3.9338	4.3553	4.2148	4.3553	4.2148	4.3553	4.3553	4.2148	4.3553	4.2148	4.3553 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	171.8079	151.0547	157.7516	140.1807	136.4794	120.6662	114.6663	127.5073	127.8094	145.4197	155.3169	167.2583 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	171.8079	151.0547	157.7516	140.1807	136.4794	120.6662	114.6663	127.5073	127.8094	145.4197	155.3169	167.2583 (64)
Heat gains from water heating, kWh/month	70.0374	61.8875	65.3637	59.1049	58.2907	52.6163	51.0378	55.3074	54.9914	61.2633	64.1377	68.5246 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	114.0874	114.0874	114.0874	114.0874	114.0874	114.0874	114.0874	114.0874	114.0874	114.0874	114.0874	114.0874 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.9016	15.9001	12.9308	9.7895	7.3177	6.1779	6.6755	8.6770	11.6463	14.7877	17.2594	18.3992 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	200.7493	202.8325	197.5830	186.4075	172.3004	159.0418	150.1842	148.1011	153.3505	164.5260	178.6331	191.8917 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4087	34.4087	34.4087	34.4087	34.4087	34.4087	34.4087	34.4087	34.4087	34.4087	34.4087	34.4087 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-91.2699	-91.2699	-91.2699	-91.2699	-91.2699	-91.2699	-91.2699	-91.2699	-91.2699	-91.2699	-91.2699	-91.2699 (71)
Water heating gains (Table 5)	94.1363	92.0945	87.8544	82.0901	78.3477	73.0782	68.5992	74.3380	76.3769	82.3432	89.0801	92.1030 (72)
Total internal gains	373.0135	371.0533	358.5945	338.5133	318.1921	298.5241	285.6851	291.3423	301.6000	321.8831	345.1988	362.6201 (73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	Specific data g or Table 6b	Specific data FF or Table 6c	Access factor Table 6d	Gains W		
North					7.9600	10.6334	0.6300	0.7000	0.7700	25.8676 (74)		
East					7.8100	19.6403	0.6300	0.7000	0.7700	46.8781 (76)		
Solar gains	72.7458	141.1379	235.0238	355.1849	451.6933	470.9042	444.7372	370.1032	276.6421	167.6591	90.3626	60.1148 (83)
Total gains	445.7592	512.1912	593.6182	693.6981	769.8854	769.4283	730.4224	661.4455	578.2421	489.5422	435.5613	422.7350 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	61.0522	61.2277	61.4007	62.2265	62.3834	63.1247	63.1247	63.2639	62.8371	62.3834	62.0667	61.7390
alpha	5.0701	5.0818	5.0934	5.1484	5.1589	5.2083	5.2083	5.2176	5.1891	5.1589	5.1378	5.1159
util living area	0.9976	0.9947	0.9843	0.9409	0.8207	0.6274	0.4686	0.5350	0.8127	0.9717	0.9951	0.9982 (86)
MIT	19.7975	19.9513	20.2248	20.5867	20.8568	20.9727	20.9950	20.9906	20.9004	20.5345	20.1037	19.7740 (87)
Th 2	19.9704	19.9730	19.9756	19.9878	19.9901	20.0007	20.0007	20.0027	19.9966	19.9901	19.9855	19.9806 (88)
util rest of house	0.9968	0.9930	0.9788	0.9204	0.7668	0.5405	0.3649	0.4245	0.7365	0.9580	0.9931	0.9976 (89)
MIT 2	18.3699	18.5960	18.9937	19.5113	19.8557	19.9836	19.9990	19.9990	19.9190	19.4510	18.8280	18.3429 (90)
Living area fraction									fLA = Living area / (4) =			0.3932 (91)
MIT	18.9312	19.1289	19.4778	19.9341	20.2493	20.3725	20.3906	20.3889	20.3049	19.8770	19.3296	18.9056 (92)
Temperature adjustment												0.0000
adjusted MIT	18.9312	19.1289	19.4778	19.9341	20.2493	20.3725	20.3906	20.3889	20.3049	19.8770	19.3296	18.9056 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9957	0.9910	0.9754	0.9191	0.7818	0.5739	0.4059	0.4682	0.7622	0.9560	0.9913	0.9967 (94)
Useful gains	443.8334	507.5627	579.0005	637.6060	601.9171	441.5987	296.4576	309.6649	440.7468	468.0225	431.7522	421.3248 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	1189.7645	1153.7383	1049.3248	880.3317	680.3720	453.9924	298.1222	313.0227	490.2325	738.2816	978.2197	1182.5161 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	554.9727	434.2300	349.9213	174.7625	58.3704	0.0000	0.0000	0.0000	0.0000	201.0728	393.4566	566.3263 (98)
Space heating												2733.1127 (98)
Space heating per m2										(98) / (4) =		38.2307 (99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2923.1152 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	554.9727	434.2300	349.9213	174.7625	58.3704	0.0000	0.0000	0.0000	0.0000	201.0728	393.4566	566.3263	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	593.5537	464.4171	374.2473	186.9118	62.4283	0.0000	0.0000	0.0000	0.0000	215.0511	420.8092	605.6966	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	171.8079	151.0547	157.7516	140.1807	136.4794	120.6662	114.6663	127.5073	127.8094	145.4197	155.3169	167.2583	(64)
Efficiency of water heater (217)m	87.7195	87.4729	86.8801	85.4031	82.7302	79.8000	79.8000	79.8000	79.8000	85.6785	87.1911	79.8000	(216)
Fuel for water heating, kWh/month	195.8605	172.6874	181.5739	164.1402	164.9694	151.2108	143.6922	159.7836	160.1622	169.7272	178.1339	190.4659	(219)
Water heating fuel used												2032.4069	(219)
Annual totals kWh/year												2923.1152	(211)
Space heating fuel - main system												0.0000	(215)
Space heating fuel - secondary													
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												316.1486	(232)
Total delivered energy for all uses												5346.6707	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2923.1152	0.2160	631.3929 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2032.4069	0.2160	438.9999 (264)
Space and water heating			1070.3928 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	316.1486	0.5190	164.0811 (268)
Total CO2, kg/m2/year			1273.3989 (272)
Emissions per m2 for space and water heating			14.9726 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.2952 (272b)
Emissions per m2 for pumps and fans			0.5445 (272c)
Target Carbon Dioxide Emission Rate (TER) = (14.9726 * 1.55) + 2.2952 + 0.5445, rounded to 2 d.p.			26.0500 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



Property Reference	Type 3 - Option 5			Issued on Date	18/07/2023
Assessment Reference	St Ann's Type 3	Prop Type Ref	St Ann's Type 3		
Property	Type 3 - 2B - Mid				
SAP Rating	90 B	DER	6.35	TER	20.81
Environmental	96 A	% DER<TER	69.48		
CO ₂ Emissions (t/year)	0.34	DFEE	27.31	TFEE	34.71
General Requirements Compliance	Fail	% DFEE<TFEE	21.33		
Assessor Details	Miss Eleanor Ballinger, Eleanor Ballinger, Tel: 02036031625, Eleanor@hodkinsonconsultancy.com			Assessor ID	M976-0001
Client					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Mid-floor flat, total floor area 72 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating: Electricity (c)
Fuel factor: 1.55 (electricity)
Target Carbon Dioxide Emission Rate (TER) 20.81 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 6.35 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 34.7 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 27.3 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	0.82 (max. 2.00)	1.00 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 2.50 (design value)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Community heating scheme -
Secondary heating system: None

5 Cylinder insulation

Hot water storage Nominal cylinder loss: 0.47 kWh/day
Permitted by DBSCG 0.35 Fail
Primary pipework insulated: No primary pipework

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK
Hot water controls: No cylinder stat

7 Low energy lights

Percentage of fixed lights with low-energy fittings: 100%
Minimum 75% OK

8 Mechanical ventilation

Continuous supply and extract system
Specific fan power: 0.61
Maximum 1.5 OK
MVHR efficiency: 93%
Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): High Fail
Based on:
Overshading: Average
Windows facing East: 8.58 m², Overhang width less than twice window, ratio 13.71
Windows facing South: 8.44 m², No overhang
Air change rate: 2.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Door U-value 1.00 W/m²K
Window U-value 0.80 W/m²K
Window U-value 0.80 W/m²K
Air permeability 2.5 m³/m²h
Photovoltaic array 0.78 kW

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	72.3500 (1b)	x 2.4000 (2b)	= 173.6400 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.3500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 173.6400 (5)

2. Ventilation rate

					main	secondary		other		total	m3 per hour	
					heating	+	heating	+		=		
Number of chimneys					0	+	0	+	0	=	0 * 40 =	0.0000 (6a)
Number of open flues					0	+	0	+	0	=	0 * 20 =	0.0000 (6b)
Number of intermittent fans											0 * 10 =	0.0000 (7a)
Number of passive vents											0 * 10 =	0.0000 (7b)
Number of flueless gas fires											0 * 40 =	0.0000 (7c)
												Air changes per hour
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =										0.0000 / (5) =	0.0000 (8)	
Pressure test												Yes
Measured/design AP50												2.5000
Infiltration rate												0.1250 (18)
Number of sides sheltered												2 (19)
Shelter factor										(20) = 1 - [0.075 x (19)] =	0.8500 (20)	
Infiltration rate adjusted to include shelter factor										(21) = (18) x (20) =	0.1063 (21)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1355	0.1328	0.1302	0.1169	0.1142	0.1009	0.1009	0.0983	0.1063	0.1142	0.1195	0.1248 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												0.5000 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												65.1000 (23c)
Effective ac	0.3100	0.3073	0.3047	0.2914	0.2887	0.2754	0.2754	0.2728	0.2808	0.2887	0.2940	0.2993 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Window (South) (Uw = 0.80)			17.0200	0.7752	13.1938		(27)					
Door			2.0900	1.0000	2.0900		(26)					
External Wall 1	43.4400	17.0200	26.4200	0.1800	4.7556		(29a)					
Corridor Wall	12.9600	2.0900	10.8700	0.1786	1.9411		(29a)					
Total net area of external elements Aum(A, m2)			56.4000				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	21.9805		(33)					
Party Wall 1			30.7200	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.3668 (36)					
Total fabric heat loss						(33) + (36) =	32.3473 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 17.7616	Feb 17.6094	Mar 17.4572	Apr 16.6961	May 16.5439	Jun 15.7829	Jul 15.7829	Aug 15.6307	Sep 16.0873	Oct 16.5439	Nov 16.8483	Dec 17.1528 (38)
Heat transfer coeff	50.1089	49.9566	49.8044	49.0434	48.8912	48.1302	48.1302	47.9780	48.4346	48.8912	49.1956	49.5000 (39)
Average = Sum(39)m / 12 =												49.0054 (39)
HLP	Jan 0.6926	Feb 0.6905	Mar 0.6884	Apr 0.6779	May 0.6758	Jun 0.6652	Jul 0.6652	Aug 0.6631	Sep 0.6694	Oct 0.6758	Nov 0.6800	Dec 0.6842 (40)
HLP (average)												0.6773 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3018 (42)
Average daily hot water use (litres/day)												88.8677 (43)
Daily hot water use	Jan 97.7545	Feb 94.1998	Mar 90.6451	Apr 87.0904	May 83.5357	Jun 79.9809	Jul 79.9809	Aug 83.5357	Sep 87.0904	Oct 90.6451	Nov 94.1998	Dec 97.7545 (44)
Energy conte	144.9671	126.7891	130.8350	114.0652	109.4482	94.4455	87.5176	100.4278	101.6272	118.4367	129.2829	140.3929 (45)
Energy content (annual)										Total = Sum(45)m =		1398.2353 (45)
Distribution loss (46)m = 0.15 x (45)m												
	21.7451	19.0184	19.6253	17.1098	16.4172	14.1668	13.1276	15.0642	15.2441	17.7655	19.3924	21.0589 (46)
Water storage loss:												

store volume												3.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0461	(51)
Volume factor from Table 2a												3.4200	(52)
Temperature factor from Table 2b												1.0000	(53)
Enter (49) or (54) in (55)												0.4732	(55)
Total storage loss													
14.6692	13.2496	14.6692	14.1960	14.6692	14.1960	14.6692	14.6692	14.1960	14.6692	14.1960	14.6692	(56)	
If cylinder contains dedicated solar storage													
14.6692	13.2496	14.6692	14.1960	14.6692	14.1960	14.6692	14.6692	14.1960	14.6692	14.1960	14.6692	(57)	
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month													
182.8987	161.0499	168.7666	150.7732	147.3798	131.1535	125.4492	138.3594	138.3352	156.3683	165.9909	178.3245	(62)	
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)	
							Solar input	(sum of months) = Sum(63)m =			0.0000	(63)	
Output from w/h													
182.8987	161.0499	168.7666	150.7732	147.3798	131.1535	125.4492	138.3594	138.3352	156.3683	165.9909	178.3245	(64)	
							Total per year (kWh/year) = Sum(64)m =				1844.8492	(64)	
Heat gains from water heating, kWh/month													
78.5468	69.5660	73.8479	67.2931	66.7368	60.7695	59.4449	63.7375	63.1574	69.7255	72.3530	77.0259	(65)	

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	115.0899	115.0899	115.0899	115.0899	115.0899	115.0899	115.0899	115.0899	115.0899	115.0899	115.0899	115.0899 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.0725	16.0518	13.0542	9.8829	7.3876	6.2369	6.7392	8.7599	11.7575	14.9288	17.4241	18.5748 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	202.7185	204.8221	199.5211	188.2360	173.9905	160.6018	151.6574	149.5538	154.8547	166.1399	180.3853	193.7740 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5090	34.5090	34.5090	34.5090	34.5090	34.5090	34.5090	34.5090	34.5090	34.5090	34.5090	34.5090 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-92.0719	-92.0719	-92.0719	-92.0719	-92.0719	-92.0719	-92.0719	-92.0719	-92.0719	-92.0719	-92.0719	-92.0719 (71)
Water heating gains (Table 5)	105.5737	103.5209	99.2580	93.4626	89.7000	84.4021	79.8990	85.6687	87.7187	93.7170	100.4902	103.5294 (72)
Total internal gains	383.8917	381.9218	369.3603	349.1084	328.6051	308.7678	295.8226	301.5093	311.8579	332.3127	355.8266	373.4052 (73)

[Jan]					Area m ²	Solar flux Table 6a W/m ²	g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
East					8.5800	19.6403	0.4200		0.8000		0.7700		39.2380
South					8.4400	46.7521	0.4200		0.8000		0.7700		91.8789 (78)
Solar gains	131.1169	227.2318	318.0864	400.9972	451.6896	448.5431	432.4670	395.2894	347.2487	253.3800	157.8330	111.6593 (83)	
Total gains	515.0086	609.1536	687.4467	750.1057	780.2947	757.3109	728.2896	696.7987	659.1065	585.6927	513.6597	485.0645 (84)	

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	100.2678	100.5733	100.8807	102.4461	102.7650	104.3899	104.3899	104.7211	103.7338	102.7650	102.1291	101.5011
alpha	7.6845	7.7049	7.7254	7.8297	7.8510	7.9593	7.9593	7.9814	7.9156	7.8510	7.8086	7.7667
util living area												
	0.9906	0.9687	0.9060	0.7609	0.5792	0.4066	0.2908	0.3167	0.5059	0.8153	0.9710	0.9936 (86)
MIT	20.5375	20.6965	20.8592	20.9678	20.9961	20.9998	21.0000	21.0000	20.9989	20.9560	20.7373	20.5041 (87)
Th 2	20.3474	20.3492	20.3511	20.3604	20.3623	20.3716	20.3716	20.3735	20.3679	20.3623	20.3586	20.3548 (88)
util rest of house												
	0.9880	0.9610	0.8869	0.7280	0.5407	0.3667	0.2493	0.2736	0.4601	0.7788	0.9625	0.9918 (89)
MIT 2	19.7350	19.9625	20.1848	20.3272	20.3590	20.3715	20.3716	20.3735	20.3672	20.3182	20.0304	19.6930 (90)
Living area fraction									fLA = Living area / (4) =			0.4409 (91)
MIT	20.0888	20.2861	20.4821	20.6097	20.6399	20.6485	20.6487	20.6497	20.6457	20.5994	20.3421	20.0506 (92)
Temperature adjustment												0.0000
adjusted MIT	20.0888	20.2861	20.4821	20.6097	20.6399	20.6485	20.6487	20.6497	20.6457	20.5994	20.3421	20.0506 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9868	0.9602	0.8910	0.7411	0.5575	0.3843	0.2676	0.2926	0.4803	0.7929	0.9623	0.9907 (94)
Useful gains	508.2089	584.8828	612.5283	555.9172	435.0376	291.0280	194.8598	203.8850	316.5363	464.3676	494.2840	480.5774 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	791.1593	768.6400	696.3722	574.2826	437.0811	291.1168	194.8638	203.8930	317.0386	488.8850	651.4513	784.6052 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	210.5151	123.4848	62.3798	13.2231	1.5204	0.0000	0.0000	0.0000	0.0000	18.2409	113.1604	226.1967 (98)
Space heating												768.7213 (98)
Space heating per m2												10.6250 (99)
										(98) / (4) =		

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump	0.9500	(303a)
Fraction of heat from community Boilers	0.0500	(303b)
Fraction of total space heat from community Heat pump	0.9500	(304a)
Fraction of total space heat from community Boilers	0.0500	(304b)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000	(305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.0500	(306)
Space heating:		
Annual space heating requirement	768.7213	(98)
Space heat from Heat pump = (98) x 0.95 x 1.00 x 1.05	766.7995	(307a)
Space heat from Boilers = (98) x 0.05 x 1.00 x 1.05	40.3579	(307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	(309)
Water heating		
Annual water heating requirement	1844.8492	(64)
Water heat from Heat pump = (64) x 0.95 x 1.00 x 1.05	1840.2371	(310a)
Water heat from Boilers = (64) x 0.05 x 1.00 x 1.05	96.8546	(310b)
Electricity used for heat distribution	27.4425	(313)
Annual totals kWh/year		
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.8540)		
mechanical ventilation fans (SFP = 0.8540)	180.9120	(330a)
Total electricity for the above, kWh/year	180.9120	(331)
Electricity for lighting (calculated in Appendix L)	319.1660	(332)
Energy saving/generation technologies (Appendices M, N and Q)		
PV Unit 0 (0.80 * 0.78 * 951 * 1.00) =	-593.1844	-593.1844 (333)
Total delivered energy for all uses		2651.1427 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			323.0000	(367a)
Space heating from Heat pump	807.1321	0.5190	418.9015	(367)
Efficiency of heat source Boilers			95.0000	(367b)
Space heating from Boilers	144.4342	0.5190	74.9613	(368)
Electrical energy for heat distribution	27.4425	0.5190	14.2427	(372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			508.1055	(373)
Space and water heating			508.1055	(376)
Pumps and fans	180.9120	0.5190	93.8934	(378)
Energy for lighting	319.1660	0.5190	165.6472	(379)
Energy saving/generation technologies				
PV Unit	-593.1844	0.5190	-307.8627	(380)
Total CO2, kg/year			459.7833	(383)
Dwelling Carbon Dioxide Emission Rate (DER)			6.3500	(384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		6.3500	ZC1
Total Floor Area		72.3500	
Assumed number of occupants	TFA	2.3018	
CO2 emission factor in Table 12 for electricity displaced from grid	N	0.5190	
CO2 emissions from appliances, equation (L14)	EF	16.6036	ZC2
CO2 emissions from cooking, equation (L16)		2.4083	ZC3
Total CO2 emissions		25.3619	ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000	ZC7
Net CO2 emissions		25.3619	ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	72.3500 (1b)	x 2.4000 (2b)	= 173.6400 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.3500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 173.6400 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour
Pressure test					30.0000 / (5) = 0.1728 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.4228 (18)
					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3594 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4582	0.4492	0.4402	0.3953	0.3863	0.3414	0.3414	0.3324	0.3594	0.3863	0.4043	0.4222 (22b)
Effective ac	0.6050	0.6009	0.5969	0.5781	0.5746	0.5583	0.5583	0.5552	0.5646	0.5746	0.5817	0.5891 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K						
TER Opaque door			2.0900	1.0000	2.0900			(26)					
TER Opening Type (Uw = 1.40)			16.0000	1.3258	21.2121			(27)					
External Wall 1	43.4400	16.0000	27.4400	0.1800	4.9392			(29a)					
Corridor Wall	12.9600	2.0900	10.8700	0.1800	1.9566			(29a)					
Total net area of external elements Aum(A, m2)			56.4000					(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	30.1979		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								5.7250 (36)					
Total fabric heat loss						(33) + (36) =		35.9229 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 34.6651	Feb 34.4316	Mar 34.2027	Apr 33.1274	May 32.9262	Jun 31.9897	Jul 31.9897	Aug 31.8163	Sep 32.3504	Oct 32.9262	Nov 33.3332	Dec 33.7587	(38)
Heat transfer coeff	70.5881	70.3545	70.1256	69.0503	68.8491	67.9126	67.9126	67.7392	68.2734	68.8491	69.2561	69.6816	(39)
Average = Sum(39)m / 12 =												69.0494	(39)
HLP	Jan 0.9756	Feb 0.9724	Mar 0.9693	Apr 0.9544	May 0.9516	Jun 0.9387	Jul 0.9387	Aug 0.9363	Sep 0.9437	Oct 0.9516	Nov 0.9572	Dec 0.9631	(40)
HLP (average)												0.9544	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3018 (42)
Average daily hot water use (litres/day)												88.8677 (43)
Daily hot water use	Jan 97.7545	Feb 94.1998	Mar 90.6451	Apr 87.0904	May 83.5357	Jun 79.9809	Jul 79.9809	Aug 83.5357	Sep 87.0904	Oct 90.6451	Nov 94.1998	Dec 97.7545 (44)
Energy conte	144.9671	126.7891	130.8350	114.0652	109.4482	94.4455	87.5176	100.4278	101.6272	118.4367	129.2829	140.3929 (45)
Energy content (annual)										Total = Sum(45)m =		1398.2353 (45)
Distribution loss (46)m = 0.15 x (45)m	21.7451	19.0184	19.6253	17.1098	16.4172	14.1668	13.1276	15.0642	15.2441	17.7655	19.3924	21.0589 (46)
Water storage loss:												
Store volume												3.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												0.2602 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.1405 (55)
Total storage loss												

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

If cylinder contains dedicated solar storage	4.3553	3.9338	4.3553	4.2148	4.3553	4.2148	4.3553	4.3553	4.2148	4.3553	4.2148	4.3553 (56)
Primary loss	4.3553	3.9338	4.3553	4.2148	4.3553	4.2148	4.3553	4.3553	4.2148	4.3553	4.2148	4.3553 (57)
Total heat required for water heating calculated for each month	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Solar input	172.5848	151.7341	158.4527	140.7919	137.0659	121.1723	115.1353	128.0454	128.3540	146.0544	156.0097	168.0106 (62)
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Heat gains from water heating, kWh/month	172.5848	151.7341	158.4527	140.7919	137.0659	121.1723	115.1353	128.0454	128.3540	146.0544	156.0097	168.0106 (64)
	70.2957	62.1134	65.5968	59.3081	58.4857	52.7846	51.1938	55.4864	55.1725	61.4743	64.3680	68.7748 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)
(66)m	115.0899	115.0899	115.0899	115.0899	115.0899	115.0899	115.0899	115.0899	115.0899	115.0899	115.0899	115.0899	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.0760	16.0549	13.0567	9.8848	7.3890	6.2381	6.7405	8.7615	11.7597	14.9317	17.4274	18.5783	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	202.7185	204.8221	199.5211	188.2360	173.9905	160.6018	151.6574	149.5538	154.8547	166.1399	180.3853	193.7740	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5090	34.5090	34.5090	34.5090	34.5090	34.5090	34.5090	34.5090	34.5090	34.5090	34.5090	34.5090	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-92.0719	-92.0719	-92.0719	-92.0719	-92.0719	-92.0719	-92.0719	-92.0719	-92.0719	-92.0719	-92.0719	-92.0719	(71)
Water heating gains (Table 5)	94.4835	92.4306	88.1677	82.3723	78.6098	73.3119	68.8088	74.5785	76.6284	82.6268	89.4000	92.4392	(72)
Total internal gains	375.8049	373.8346	361.2725	341.0201	320.5163	300.6788	287.7336	293.4207	303.7699	324.2253	347.7397	365.3185	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d	Gains W
East					8.0700	19.6403	0.6300	0.7000			0.7700	48.4387
South					7.9300	46.7521	0.6300	0.7000			0.7700	113.3041 (76)

Solar gains	161.7429	280.3194	392.4247	494.7444	557.3115	553.4382	533.5990	487.7118	428.4139	312.5836	194.7014	137.7389 (83)
Total gains	537.5477	654.1540	753.6972	835.7645	877.8278	854.1170	821.3326	781.1325	732.1837	636.8089	542.4412	503.0574 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	71.1778	71.4141	71.6473	72.7630	72.9756	73.9819	73.9819	74.1713	73.5910	72.9756	72.5467	72.1038	
alpha	5.7452	5.7609	5.7765	5.8509	5.8650	5.9321	5.9321	5.9448	5.9061	5.8650	5.8364	5.8069	
util living area	0.9940	0.9817	0.9472	0.8539	0.6944	0.5043	0.3632	0.3979	0.6256	0.8994	0.9843	0.9958	(86)
MIT	20.1359	20.3420	20.5934	20.8360	20.9586	20.9947	20.9994	20.9989	20.9824	20.8070	20.4232	20.1000	(87)
Th 2	20.1037	20.1064	20.1090	20.1215	20.1239	20.1348	20.1348	20.1368	20.1306	20.1239	20.1191	20.1142	(88)
util rest of house	0.9921	0.9763	0.9326	0.8198	0.6398	0.4382	0.2921	0.3238	0.5540	0.8665	0.9788	0.9944	(89)
MIT 2	18.9604	19.2592	19.6147	19.9448	20.0876	20.1315	20.1345	20.1364	20.1184	19.9189	19.3887	18.9162	(90)
Living area fraction	19.4787	19.7366	20.0462	20.3377	20.4716	20.5121	20.5158	20.5167	20.4994	20.3105	19.8448	19.4381	(92)
Temperature adjustment	19.4787	19.7366	20.0462	20.3377	20.4716	20.5121	20.5158	20.5167	20.4994	20.3105	19.8448	19.4381	(93)
adjusted MIT	19.4787	19.7366	20.0462	20.3377	20.4716	20.5121	20.5158	20.5167	20.4994	20.3105	19.8448	19.4381	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9904	0.9736	0.9314	0.8288	0.6620	0.4672	0.3235	0.3565	0.5850	0.8743	0.9767	0.9931	(94)
Ext temp.	532.4062	636.8787	702.0222	692.6829	581.1586	399.0785	265.7115	278.4672	428.3143	556.7471	529.7905	499.5777	(95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Month fracti	1071.4365	1043.8222	949.9367	789.7779	603.9191	401.5082	265.9353	278.8604	436.9070	668.5593	882.6581	1061.8184	(97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating per m2	401.0386	273.4660	184.4484	69.9084	16.9337	0.0000	0.0000	0.0000	0.0000	83.1883	254.0647	418.3070	(98)
												1701.3550	(98)
												23.5156	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1819.6310 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	401.0386	273.4660	184.4484	69.9084	16.9337	0.0000	0.0000	0.0000	0.0000	83.1883	254.0647	418.3070	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	428.9183	292.4770	197.2710	74.7683	18.1110	0.0000	0.0000	0.0000	0.0000	88.9714	271.7269	447.3872	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	172.5848	151.7341	158.4527	140.7919	137.0659	121.1723	115.1353	128.0454	128.3540	146.0544	156.0097	168.0106	(64)
Efficiency of water heater (217)m	86.9906	86.3674	85.2198	83.0582	80.8511	79.8000	79.8000	79.8000	79.8000	83.3773	86.1075	87.1514	(217)
Fuel for water heating, kWh/month	198.3947	175.6844	185.9342	169.5099	169.5288	151.8450	144.2798	160.4580	160.8446	175.1729	181.1801	192.7800	(219)
Water heating fuel used												2065.6124	(219)
Annual totals kWh/year													
Space heating fuel - main system												1819.6310	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												319.2270	(232)
Total delivered energy for all uses												4279.4704	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1819.6310	0.2160	393.0403 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2065.6124	0.2160	446.1723 (264)
Space and water heating			839.2126 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	319.2270	0.5190	165.6788 (268)
Total CO2, kg/m2/year			1043.8164 (272)
Emissions per m2 for space and water heating			11.5993 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.2900 (272b)
Emissions per m2 for pumps and fans			0.5380 (272c)
Target Carbon Dioxide Emission Rate (TER) = (11.5993 * 1.55) + 2.2900 + 0.5380, rounded to 2 d.p.			20.8100 (273)

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Calculation Type: New Build (As Designed)



Property Reference	Type 4 - Option 5			Issued on Date	18/07/2023
Assessment Reference	St Ann's Type 4	Prop Type Ref	St Ann's Type 4		
Property	Type 4 - 3B - First (Exposed)				
SAP Rating	89 B	DER	7.41	TER	22.59
Environmental	94 A	% DER<TER	67.20		
CO ₂ Emissions (t/year)	0.53	DFEE	35.02	TFEE	45.98
General Requirements Compliance	Fail	% DFEE<TFEE	23.83		
Assessor Details	Miss Eleanor Ballinger, Eleanor Ballinger, Tel: 02036031625, Eleanor@hodkinsonconsultancy.com			Assessor ID	M976-0001
Client					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Mid-floor flat, total floor area 92 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating: Electricity (c)
Fuel factor: 1.55 (electricity)
Target Carbon Dioxide Emission Rate (TER) 22.59 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 7.41 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 46.0 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 35.0 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.13 (max. 0.25)	0.13 (max. 0.70)	OK
Roof	(no roof)		
Openings	0.82 (max. 2.00)	1.00 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 2.50 (design value)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Community heating scheme -
Secondary heating system: None

5 Cylinder insulation

Hot water storage: Nominal cylinder loss: 0.22 kWh/day
Permitted by DBSCG 0.35 OK
Primary pipework insulated: No primary pipework

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK
Hot water controls: No cylinder stat

7 Low energy lights

Percentage of fixed lights with low-energy fittings: 100%
Minimum 75% OK

8 Mechanical ventilation

Continuous supply and extract system
Specific fan power: 0.66
Maximum 1.5 OK
MVHR efficiency: 93%
Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): High Fail
Based on:
Overshading: Average
Windows facing South: 8.65 m², No overhang
Windows facing West: 13.28 m², No overhang
Air change rate: 2.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Door U-value 1.00 W/m²K
Window U-value 0.80 W/m²K
Air permeability 2.5 m³/m²h
Photovoltaic array 0.78 kW

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	91.5100 (1b)	x 2.4000 (2b)	= 219.6240 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	91.5100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 219.6240 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					2.5000
Infiltration rate					0.1250 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1063 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1355	0.1328	0.1302	0.1169	0.1142	0.1009	0.1009	0.0983	0.1063	0.1142	0.1195	0.1248 (22b)
Balanced mechanical ventilation with heat recovery												0.5000 (23a)
If mechanical ventilation:												79.0500 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.2402	0.2376	0.2349	0.2216	0.2190	0.2057	0.2057	0.2030	0.2110	0.2190	0.2243	0.2296 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Window (south) (Uw = 0.80)			21.9300	0.7752	17.0000		(27)
Door			2.0900	1.0000	2.0900		(26)
Heat Loss Floor 1			91.5100	0.1300	11.8963		(28b)
External Wall 1	47.2800	21.9300	25.3500	0.1800	4.5630		(29a)
Corridor Wall	14.6400	2.0900	12.5500	0.1786	2.2411		(29a)
Total net area of external elements Aum(A, m ²)			153.4300				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =			37.7904	(33)
Party Wall 1			33.6000	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							100.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							14.8144 (36)
Total fabric heat loss							(33) + (36) = 52.6048 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	17.4101	17.2176	17.0250	16.0625	15.8700	14.9074	14.9074	14.7149	15.2924	15.8700	16.2550	16.6400 (38)
Average = Sum(39)m / 12 =	70.0148	69.8223	69.6298	68.6672	68.4747	67.5122	67.5122	67.3196	67.8972	68.4747	68.8598	69.2448 (39)
												68.6191 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.7651	0.7630	0.7609	0.7504	0.7483	0.7378	0.7378	0.7357	0.7420	0.7483	0.7525	0.7567 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.6458 (42)
Average daily hot water use (litres/day)												97.0385 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	106.7423	102.8608	98.9792	95.0977	91.2161	87.3346	87.3346	91.2161	95.0977	98.9792	102.8608	106.7423 (44)
Energy content (annual)	158.2957	138.4465	142.8644	124.5526	119.5112	103.1291	95.5642	109.6614	110.9711	129.3261	141.1695	153.3010 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 1526.7927 (45)
	23.7444	20.7670	21.4297	18.6829	17.9267	15.4694	14.3346	16.4492	16.6457	19.3989	21.1754	22.9951 (46)

Water storage loss:												3.0000 (47)
Store volume												
b) If manufacturer declared loss factor is not known :												
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0212 (51)
Volume factor from Table 2a												3.4200 (52)
Temperature factor from Table 2b												1.0000 (53)
Enter (49) or (54) in (55)												0.2173 (55)
Total storage loss												
	6.7353	6.0835	6.7353	6.5180	6.7353	6.5180	6.7353	6.7353	6.5180	6.7353	6.5180	6.7353 (56)
If cylinder contains dedicated solar storage												
	6.7353	6.0835	6.7353	6.5180	6.7353	6.5180	6.7353	6.7353	6.5180	6.7353	6.5180	6.7353 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month												
	188.2934	165.5412	172.8620	153.5826	149.5089	132.1591	125.5619	139.6591	140.0011	159.3238	170.1996	183.2987 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Solar input (sum of months) = Sum (63)m =												0.0000 (63)
Output from w/h												
	188.2934	165.5412	172.8620	153.5826	149.5089	132.1591	125.5619	139.6591	140.0011	159.3238	170.1996	183.2987 (64)
Total per year (kWh/year) = Sum (64)m =												1879.9913 (64)
Heat gains from water heating, kWh/month												
	76.6315	67.7092	71.5006	64.6378	63.7356	57.5144	55.7733	60.4606	60.1219	66.9991	70.1629	74.9707 (65)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	132.2915	132.2915	132.2915	132.2915	132.2915	132.2915	132.2915	132.2915	132.2915	132.2915	132.2915	132.2915 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	21.5592	19.1487	15.5727	11.7896	8.8128	7.4402	8.0394	10.4499	14.0258	17.8090	20.7857	22.1584 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	241.8285	244.3379	238.0142	224.5519	207.5581	191.5864	180.9162	178.4068	184.7305	198.1928	215.1866	231.1583 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.2291	36.2291	36.2291	36.2291	36.2291	36.2291	36.2291	36.2291	36.2291	36.2291	36.2291	36.2291 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-105.8332	-105.8332	-105.8332	-105.8332	-105.8332	-105.8332	-105.8332	-105.8332	-105.8332	-105.8332	-105.8332	-105.8332 (71)
Water heating gains (Table 5)	102.9993	100.7577	96.1029	89.7747	85.6662	79.8812	74.9641	81.2642	83.5026	90.0525	97.4485	100.7671 (72)
Total internal gains	429.0744	426.9317	412.3773	388.8036	364.7246	341.5951	326.6071	332.8083	344.9464	368.7418	396.1082	416.7713 (73)

[Jan											Area	Solar flux	g	FF	Access	Gains
											m2	Table 6a	Table 6b	Table 6c	factor	W
												W/m2	or Table 6b	or Table 6c	Table 6d	
South											8.6500	46.7521	0.4200	0.8000	0.7700	94.1650
West											13.2800	19.6403	0.4200	0.8000	0.7700	60.7320 (80)
Solar gains	154.8970	273.0227	392.1009	507.3775	581.0736	580.6462	558.3698	504.0304	432.7657	307.3104	187.3433	131.3103 (83)				
Total gains	583.9714	699.9545	804.4782	896.1810	945.7981	922.2414	884.9769	836.8388	777.7121	676.0522	583.4515	548.0816 (84)				

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil/m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	36.3058	36.4059	36.5066	37.0183	37.1224	37.6517	37.6517	37.7593	37.4381	37.1224	36.9148	36.7095	
alpha	3.4204	3.4271	3.4338	3.4679	3.4748	3.5101	3.5101	3.5173	3.4959	3.4748	3.4610	3.4473	
util living area	0.9512	0.9152	0.8532	0.7460	0.6062	0.4505	0.3308	0.3629	0.5570	0.7963	0.9209	0.9591	(86)
MIT	19.6173	19.9097	20.2706	20.6321	20.8561	20.9622	20.9902	20.9864	20.9198	20.6058	20.0494	19.5586	(87)
Th 2	20.2837	20.2855	20.2873	20.2965	20.2984	20.3076	20.3076	20.3094	20.3039	20.2984	20.2947	20.2910	(88)
util rest of house	0.9452	0.9056	0.8375	0.7209	0.5711	0.4062	0.2804	0.3108	0.5105	0.7695	0.9103	0.9540	(89)
MIT 2	18.4125	18.8312	19.3412	19.8436	20.1368	20.2719	20.3005	20.2991	20.2234	19.8206	19.0429	18.3333	(90)
Living area fraction									fLA = Living area / (4) =			0.1929	(91)
MIT	18.6449	19.0392	19.5204	19.9957	20.2755	20.4051	20.4335	20.4316	20.3577	19.9720	19.2371	18.5696	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.6449	19.0392	19.5204	19.9957	20.2755	20.4051	20.4335	20.4316	20.3577	19.9720	19.2371	18.5696	(93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9279	0.8855	0.8183	0.7095	0.5699	0.4126	0.2897	0.3201	0.5143	0.7559	0.8910	0.9381 (94)
Useful gains	541.8891	619.7834	658.3235	635.8502	539.0071	380.4948	256.3515	267.8933	399.9460	511.0211	519.8787	514.1812 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	1004.3532	987.2321	906.6102	761.9083	587.2078	391.9129	258.8074	271.4092	424.8822	641.7465	835.7557	995.0226 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	344.0733	246.9255	184.7253	90.7618	35.8613	0.0000	0.0000	0.0000	0.0000	97.2596	227.4314	357.7461 (98)
Space heating												1584.7843 (98)
Space heating per m2												17.3182 (99)
										(98) / (4) =		

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump	0.9500	(303a)
Fraction of heat from community Boilers	0.0500	(303b)
Fraction of total space heat from community Heat pump	0.9500	(304a)
Fraction of total space heat from community Boilers	0.0500	(304b)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000	(305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.0500	(306)
Space heating:		
Annual space heating requirement	1584.7843	(98)
Space heat from Heat pump = (98) x 0.95 x 1.00 x 1.05	1580.8223	(307a)
Space heat from Boilers = (98) x 0.05 x 1.00 x 1.05	83.2012	(307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	(309)
Water heating		
Annual water heating requirement	1879.9913	(64)
Water heat from Heat pump = (64) x 0.95 x 1.00 x 1.05	1875.2914	(310a)
Water heat from Boilers = (64) x 0.05 x 1.00 x 1.05	98.6995	(310b)
Electricity used for heat distribution	36.3801	(313)
Annual totals kWh/year		
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.8250)		
mechanical ventilation fans (SFP = 0.8250)	221.0516	(330a)
Total electricity for the above, kWh/year	221.0516	(331)
Electricity for lighting (calculated in Appendix L)	380.7419	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV Unit 0 (0.80 * 0.78 * 951 * 1.00) =	-593.1844	-593.1844 (333)
Total delivered energy for all uses		3646.6235 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			323.0000	(367a)
Space heating from Heat pump	1070.0042	0.5190	555.3322	(367)
Efficiency of heat source Boilers			95.0000	(367b)
Space heating from Boilers	191.4744	0.5190	99.3752	(368)
Electrical energy for heat distribution	36.3801	0.5190	18.8813	(372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			673.5887	(373)
Space and water heating			673.5887	(376)
Pumps and fans	221.0516	0.5190	114.7258	(378)
Energy for lighting	380.7419	0.5190	197.6051	(379)
Energy saving/generation technologies				
PV Unit	-593.1844	0.5190	-307.8627	(380)
Total CO2, kg/year			678.0568	(383)
Dwelling Carbon Dioxide Emission Rate (DER)			7.4100	(384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		7.4100	ZC1
Total Floor Area	TFA	91.5100	
Assumed number of occupants	N	2.6458	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		15.6598	ZC2
CO2 emissions from cooking, equation (L16)		1.9943	ZC3
Total CO2 emissions		25.0641	ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000	ZC7
Net CO2 emissions		25.0641	ZC8

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	91.5100 (1b)	x 2.4000 (2b)	= 219.6240 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	91.5100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 219.6240 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour 30.0000 / (5) = 0.1366 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3866 (18)
Number of sides sheltered					2 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.8500 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3286 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4190	0.4108	0.4025	0.3615	0.3533	0.3122	0.3122	0.3040	0.3286	0.3533	0.3697	0.3861 (22b)
Effective ac	0.5878	0.5844	0.5810	0.5653	0.5624	0.5487	0.5487	0.5462	0.5540	0.5624	0.5683	0.5745 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.0900	1.0000	2.0900		(26)
TER Opening Type (Uw = 1.40)			20.8000	1.3258	27.5758		(27)
Heat Loss Floor 1			91.5100	0.1300	11.8963		(28b)
External Wall 1	47.2800	20.8000	26.4800	0.1800	4.7664		(29a)
Corridor Wall	14.6400	2.0900	12.5500	0.1800	2.2590		(29a)
Total net area of external elements Aum(A, m ²)			153.4300				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		48.5875		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							13.7040 (36)
Total fabric heat loss						(33) + (36) =	62.2915 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	42.5992	42.3521	42.1100	40.9728	40.7600	39.7695	39.7695	39.5861	40.1510	40.7600	41.1905	41.6405 (38)
Heat transfer coeff	104.8906	104.6436	104.4015	103.2642	103.0515	102.0610	102.0610	101.8775	102.4425	103.0515	103.4819	103.9319 (39)
Average = Sum(39)m / 12 =												103.2632 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1462	1.1435	1.1409	1.1284	1.1261	1.1153	1.1153	1.1133	1.1195	1.1261	1.1308	1.1357 (40)
HLP (average)												1.1284 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.6458 (42)
Average daily hot water use (litres/day)												97.0385 (43)
Daily hot water use	106.7423	102.8608	98.9792	95.0977	91.2161	87.3346	87.3346	91.2161	95.0977	98.9792	102.8608	106.7423 (44)
Energy conte	158.2957	138.4465	142.8644	124.5526	119.5112	103.1291	95.5642	109.6614	110.9711	129.3261	141.1695	153.3010 (45)
Energy content (annual)										Total = Sum(45)m =		1526.7927 (45)
Distribution loss (46)m = 0.15 x (45)m	23.7444	20.7670	21.4297	18.6829	17.9267	15.4694	14.3346	16.4492	16.6457	19.3989	21.1754	22.9951 (46)
Water storage loss:												3.0000 (47)
Store volume												0.2602 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.1405 (55)
Enter (49) or (54) in (55)												

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Calculation Type: New Build (As Designed)



CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Total storage loss	4.3553	3.9338	4.3553	4.2148	4.3553	4.2148	4.3553	4.3553	4.2148	4.3553	4.2148	4.3553 (56)
If cylinder contains dedicated solar storage	4.3553	3.9338	4.3553	4.2148	4.3553	4.2148	4.3553	4.3553	4.2148	4.3553	4.2148	4.3553 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	185.9134	163.3915	170.4820	151.2794	147.1289	129.8559	123.1819	137.2790	137.6979	156.9438	167.8963	180.9186 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	185.9134	163.3915	170.4820	151.2794	147.1289	129.8559	123.1819	137.2790	137.6979	156.9438	167.8963	180.9186 (64)
Heat gains from water heating, kWh/month	74.7275	65.9894	69.5965	62.7952	61.8316	55.6718	53.8692	58.5565	58.2793	65.0951	68.3203	73.0667 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	132.2915	132.2915	132.2915	132.2915	132.2915	132.2915	132.2915	132.2915	132.2915	132.2915	132.2915	132.2915 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	21.5592	19.1487	15.5727	11.7896	8.8128	7.4402	8.0394	10.4499	14.0258	17.8090	20.7857	22.1584 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	241.8285	244.3379	238.0142	224.5519	207.5581	191.5864	180.9162	178.4068	184.7305	198.1928	215.1866	231.1583 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.2291	36.2291	36.2291	36.2291	36.2291	36.2291	36.2291	36.2291	36.2291	36.2291	36.2291	36.2291 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-105.8332	-105.8332	-105.8332	-105.8332	-105.8332	-105.8332	-105.8332	-105.8332	-105.8332	-105.8332	-105.8332	-105.8332 (71)
Water heating gains (Table 5)	100.4402	98.1986	93.5437	87.2155	83.1070	77.3220	72.4049	78.7050	80.9435	87.4934	94.8893	98.2079 (72)
Total internal gains	429.5152	427.3726	412.8181	389.2444	365.1654	342.0360	327.0480	333.2492	345.3872	369.1826	396.5490	417.2121 (73)

6. Solar gains

[Jan]						Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W
South						8.2000	46.7521	0.6300	0.7000	0.7700		117.1619 (78)
West						12.6000	19.6403	0.6300	0.7000	0.7700		75.6292 (80)
Solar gains	192.7911	339.8279	488.0697	631.5955	723.3588	722.8359	695.1007	627.4390	538.7000	382.5131	233.1776	163.4325 (83)
Total gains	622.3064	767.2004	900.8879	1020.8399	1088.5242	1064.8719	1022.1487	960.6882	884.0872	751.6957	629.7266	580.6446 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	60.5856	60.7286	60.8695	61.5398	61.6669	62.2653	62.2653	62.3774	62.0334	61.6669	61.4104	61.1445
alpha	5.0390	5.0486	5.0580	5.1027	5.1111	5.1510	5.1510	5.1585	5.1356	5.1111	5.0940	5.0763
util living area	0.9965	0.9896	0.9694	0.9079	0.7789	0.5933	0.4358	0.4816	0.7315	0.9450	0.9916	0.9975 (86)
MIT	19.8379	20.0490	20.3415	20.6676	20.8861	20.9779	20.9962	20.9938	20.9379	20.6275	20.1617	19.7993 (87)
Th 2	19.9633	19.9654	19.9676	19.9777	19.9796	19.9884	19.9884	19.9900	19.9850	19.9796	19.9757	19.9717 (88)
util rest of house	0.9953	0.9863	0.9595	0.8798	0.7208	0.5080	0.3375	0.3791	0.6483	0.9216	0.9883	0.9967 (89)
MIT 2	18.4237	18.7317	19.1520	19.6068	19.8760	19.9748	19.9871	19.9876	19.9401	19.5662	18.9047	18.3735 (90)
Living area fraction									fLA = Living area / (4) =			0.1929 (91)
MIT	18.6964	18.9858	19.3814	19.8114	20.0708	20.1682	20.1817	20.1817	20.1326	19.7709	19.1471	18.6485 (92)
Temperature adjustment												0.0000
adjusted MIT	18.6964	18.9858	19.3814	19.8114	20.0708	20.1682	20.1817	20.1817	20.1326	19.7709	19.1471	18.6485 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9932	0.9819	0.9523	0.8745	0.7264	0.5237	0.3565	0.3989	0.6614	0.9157	0.9845	0.9951 (94)
Useful gains	618.0856	753.3184	857.8954	892.6987	790.7522	557.6402	364.3732	383.1918	584.7212	688.3198	619.9634	577.7728 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	1510.0518	1473.9853	1344.8418	1126.7538	862.6242	568.2987	365.5515	385.2703	617.9902	945.0763	1246.6593	1501.6641 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	663.6229	484.2882	362.2881	168.5197	53.4728	0.0000	0.0000	0.0000	0.0000	191.0268	451.2211	687.3751 (98)
Space heating												3061.8148 (98)
Space heating per m2										(98) / (4) =		33.4588 (99)

8c. Space cooling requirement

Not applicable

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Calculation Type: New Build (As Designed)



CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3274.6682 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	663.6229	484.2882	362.2881	168.5197	53.4728	0.0000	0.0000	0.0000	0.0000	191.0268	451.2211	687.3751	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	709.7571	517.9553	387.4740	180.2350	57.1902	0.0000	0.0000	0.0000	0.0000	204.3068	482.5894	735.1606	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	185.9134	163.3915	170.4820	151.2794	147.1289	129.8559	123.1819	137.2790	137.6979	156.9438	167.8963	180.9186	(64)
Efficiency of water heater (217)m	87.9201	87.5389	86.7767	85.1021	82.3968	79.8000	79.8000	79.8000	79.8000	85.3390	87.3247	88.0403	(216)
Fuel for water heating, kWh/month	211.4572	186.6501	196.4605	177.7622	178.5613	162.7266	154.3633	172.0289	172.5537	183.9062	192.2667	205.4952	(219)
Water heating fuel used												2194.2319	(219)
Annual totals kWh/year													
Space heating fuel - main system												3274.6682	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												380.7419	(232)
Total delivered energy for all uses												5924.6420	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3274.6682	0.2160	707.3283 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2194.2319	0.2160	473.9541 (264)
Space and water heating			1181.2824 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	380.7419	0.5190	197.6051 (268)
Total CO2, kg/m2/year			1417.8125 (272)
Emissions per m2 for space and water heating			12.9088 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.1594 (272b)
Emissions per m2 for pumps and fans			0.4254 (272c)
Target Carbon Dioxide Emission Rate (TER) = (12.9088 * 1.55) + 2.1594 + 0.4254, rounded to 2 d.p.			22.5900 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



Property Reference	Type 5 - Option 5			Issued on Date	18/07/2023
Assessment Reference	St Ann's Type 5	Prop Type Ref	St Ann's Type 5		
Property	Type 5 - 1B - Mid				
SAP Rating	90 B	DER	5.57	TER	23.61
Environmental	97 A	% DER<TER	76.41		
CO ₂ Emissions (t/year)	0.19	DFEE	29.77	TFEE	36.61
General Requirements Compliance	Fail	% DFEE<TFEE	18.69		
Assessor Details	Miss Eleanor Ballinger, Eleanor Ballinger, Tel: 02036031625, Eleanor@hodkinsonconsultancy.com			Assessor ID	M976-0001
Client					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Mid-floor flat, total floor area 52 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating: Electricity (c)
Fuel factor: 1.55 (electricity)
Target Carbon Dioxide Emission Rate (TER) 23.61 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 5.57 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 36.6 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 29.8 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	0.83 (max. 2.00)	1.00 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals: 2.50 (design value)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Community heating scheme -
Secondary heating system: None

5 Cylinder insulation

Hot water storage: Nominal cylinder loss: 0.22 kWh/day
Permitted by DBSCG 0.35 OK
Primary pipework insulated: No primary pipework

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and at least two room statsOK
Hot water controls: No cylinder stat

7 Low energy lights

Percentage of fixed lights with low-energy fittings: 100%
Minimum 75% OK

8 Mechanical ventilation

Continuous supply and extract system
Specific fan power: 0.68
Maximum 1.5 OK
MVHR efficiency: 87%
Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): High Fail
Based on:
Overshading: Average
Windows facing East: 9.97 m², No overhang
Air change rate: 2.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Door U-value 1.00 W/m²K
Window U-value 0.80 W/m²K
Air permeability 2.5 m³/m²h
Photovoltaic array 0.78 kW

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	52.1600 (1b)	x 2.4000 (2b)	= 125.1840 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.1600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 125.1840 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					2.5000
Infiltration rate					0.1250 (18)
Number of sides sheltered					3 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.0969 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1235	0.1211	0.1187	0.1066	0.1041	0.0920	0.0920	0.0896	0.0969	0.1041	0.1090	0.1138 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												0.5000 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												73.9500 (23c)
Effective ac	0.2538	0.2513	0.2489	0.2368	0.2344	0.2223	0.2223	0.2199	0.2271	0.2344	0.2392	0.2441 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Window (Uw = 0.80)			9.9700	0.7752	7.7287		(27)
Door			2.0900	1.0000	2.0900		(26)
External Wall 1	23.0400	9.9700	13.0700	0.1800	2.3526		(29a)
Corridor Wall	19.4400	2.0900	17.3500	0.1786	3.0982		(29a)
Total net area of external elements Aum(A, m ²)			42.4800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	15.2695		(33)
Party Wall 1			32.6400	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.8716 (36)
Total fabric heat loss						(33) + (36) =	23.1411 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	10.4832	10.3832	10.2831	9.7829	9.6828	9.1826	9.1826	9.0825	9.3827	9.6828	9.8829	10.0830 (38)
Heat transfer coeff	33.6243	33.5243	33.4242	32.9240	32.8239	32.3237	32.3237	32.2236	32.5238	32.8239	33.0240	33.2241 (39)
Average = Sum(39)m / 12 =												32.8990 (39)
HLP	0.6446	0.6427	0.6408	0.6312	0.6293	0.6197	0.6197	0.6178	0.6235	0.6293	0.6331	0.6370 (40)
HLP (average)												0.6307 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7538 (42)
Average daily hot water use (litres/day)												75.8525 (43)
Daily hot water use	83.4378	80.4037	77.3696	74.3355	71.3014	68.2673	68.2673	71.3014	74.3355	77.3696	80.4037	83.4378 (44)
Energy conte	123.7358	108.2201	111.6735	97.3597	93.4189	80.6134	74.7002	85.7196	86.7433	101.0910	110.3487	119.8315 (45)
Energy content (annual)										Total = Sum(45)m =		1193.4558 (45)
Distribution loss (46)m = 0.15 x (45)m	18.5604	16.2330	16.7510	14.6039	14.0128	12.0920	11.2050	12.8579	13.0115	15.1636	16.5523	17.9747 (46)
Water storage loss:												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Store volume												3.0000 (47)
b) If manufacturer declared loss factor is not known :												
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0212 (51)
Volume factor from Table 2a												3.4200 (52)
Temperature factor from Table 2b												1.0000 (53)
Enter (49) or (54) in (55)												0.2173 (55)
Total storage loss												
6.7353 6.0835 6.7353 6.5180 6.7353 6.5180 6.7353 6.7353 6.5180 6.7353 6.5180 6.7353 (56)												
If cylinder contains dedicated solar storage												
6.7353 6.0835 6.7353 6.5180 6.7353 6.5180 6.7353 6.7353 6.5180 6.7353 6.5180 6.7353 (57)												
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month												
153.7335 135.3148 141.6712 126.3897 123.4166 109.6434 104.6979 115.7172 115.7733 131.0887 139.3787 149.8292 (62)												
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Solar input (sum of months) = Sum(63)m =												0.0000 (63)
Output from w/h												
153.7335 135.3148 141.6712 126.3897 123.4166 109.6434 104.6979 115.7172 115.7733 131.0887 139.3787 149.8292 (64)												
Heat gains from water heating, kWh/month												
65.1403 57.6590 61.1296 55.5961 55.0599 50.0280 48.8360 52.4999 52.0662 57.6109 59.9150 63.8421 (65)												

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
(66)m	87.6896	87.6896	87.6896	87.6896	87.6896	87.6896	87.6896	87.6896	87.6896	87.6896	87.6896	87.6896 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
13.7954 12.2530 9.9648 7.5440 5.6392 4.7609 5.1443 6.6867 8.9749 11.3957 13.3005 14.1788 (67)												
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
152.8409 154.4269 150.4302 141.9217 131.1813 121.0868 114.3430 112.7570 116.7537 125.2622 136.0026 146.0971 (68)												
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
31.7690 31.7690 31.7690 31.7690 31.7690 31.7690 31.7690 31.7690 31.7690 31.7690 31.7690 31.7690 (69)												
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)												
-70.1516 -70.1516 -70.1516 -70.1516 -70.1516 -70.1516 -70.1516 -70.1516 -70.1516 -70.1516 -70.1516 -70.1516 (71)												
Water heating gains (Table 5)												
87.5542 85.8020 82.1634 77.2168 74.0053 69.4833 65.6397 70.5644 72.3141 77.4340 83.2152 85.8093 (72)												
Total internal gains												
303.4974 301.7888 291.8653 275.9894 260.1327 244.6378 234.4339 239.3150 247.3496 263.3988 281.8252 295.3922 (73)												

6. Solar gains

[Jan]												
Area												
m2												
Solar flux												
Table 6a												
W/m2												
Specific data												
or Table 6b												
Specific data												
or Table 6c												
Access												
factor												
Table 6d												
Gains												
W												
East												
9.9700 19.6403 0.4200 0.8000 0.7700 45.5948 (76)												
Solar gains	45.5948	89.1930	146.8882	214.2277	262.5441	268.7606	255.8711	219.7895	170.8371	105.8350	56.8513	37.4949 (83)
Total gains	349.0921	390.9818	438.7535	490.2171	522.6768	513.3984	490.3050	459.1045	418.1867	369.2339	338.6765	332.8871 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
Jan												
tau	107.7262	108.0477	108.3711	110.0177	110.3531	112.0609	112.0609	112.4088	111.3715	110.3531	109.6844	109.0238
alpha	8.1817	8.2032	8.2247	8.3345	8.3569	8.4707	8.4707	8.4939	8.4248	8.3569	8.3123	8.2683
util living area												
0.9922 0.9794 0.9304 0.7811 0.5813 0.4028 0.2901 0.3229 0.5353 0.8549 0.9778 0.9943 (86)												
MIT	20.5733	20.6889	20.8483	20.9692	20.9972	20.9999	21.0000	21.0000	20.9989	20.9489	20.7458	20.5488 (87)
Th 2	20.3900	20.3917	20.3934	20.4020	20.4037	20.4123	20.4123	20.4140	20.4089	20.4037	20.4003	20.3968 (88)
util rest of house												
0.9900 0.9740 0.9151 0.7500 0.5450 0.3659 0.2513 0.2817 0.4900 0.8225 0.9711 0.9927 (89)												
MIT 2	19.8224	19.9892	20.2107	20.3699	20.4013	20.4122	20.4123	20.4140	20.4081	20.3510	20.0790	19.7928 (90)
Living area fraction												
MIT	20.1876	20.3295	20.5208	20.6614	20.6911	20.6981	20.6981	20.6990	20.6955	20.6418	20.4033	20.1605 (92)
Temperature adjustment												
adjusted MIT	20.1876	20.3295	20.5208	20.6614	20.6911	20.6981	20.6981	20.6990	20.6955	20.6418	20.4033	20.1605 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0.9891 0.9734 0.9186 0.7638 0.5626 0.3839 0.2702 0.3017 0.5120 0.8360 0.9711 0.9920 (94)												
Useful gains	345.2925	380.5823	403.0257	374.4184	294.0359	197.0753	132.4657	138.5266	214.1316	308.6754	328.8861	330.2135 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W												
534.2107 517.2637 468.6357 387.2327 295.1235 197.1118 132.4672 138.5302 214.5094 329.6107 439.3295 530.2739 (97)												
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh												
140.5551 91.8499 48.8138 9.2263 0.8092 0.0000 0.0000 0.0000 0.0000 15.5758 79.5192 148.8449 (98)												
Space heating												
Space heating per m2												
(98) / (4) =												10.2606 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000	(301)
Fraction of space heat from community system	1.0000	(302)
Fraction of heat from community Heat pump	0.9500	(303a)
Fraction of heat from community Boilers	0.0500	(303b)
Fraction of total space heat from community Heat pump	0.9500	(304a)
Fraction of total space heat from community Boilers	0.0500	(304b)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000	(305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000	(305a)
Distribution loss factor (Table 12c) for community heating system	1.0500	(306)
Space heating:		
Annual space heating requirement	535.1944	(98)
Space heat from Heat pump = (98) x 0.95 x 1.00 x 1.05	533.8564	(307a)
Space heat from Boilers = (98) x 0.05 x 1.00 x 1.05	28.0977	(307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000	(308)
Space heating fuel for secondary/supplementary system	0.0000	(309)
Water heating		
Annual water heating requirement	1546.6544	(64)
Water heat from Heat pump = (64) x 0.95 x 1.00 x 1.05	1542.7878	(310a)
Water heat from Boilers = (64) x 0.05 x 1.00 x 1.05	81.1994	(310b)
Electricity used for heat distribution	21.8594	(313)
Annual totals kWh/year		
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.8500)		
mechanical ventilation fans (SFP = 0.8500)	129.8158	(330a)
Total electricity for the above, kWh/year	129.8158	(331)
Electricity for lighting (calculated in Appendix L)	243.6316	(332)
Energy saving/generation technologies (Appendices M, N and Q)		
PV Unit 0 (0.80 * 0.78 * 951 * 1.00) =	-593.1844	-593.1844 (333)
Total delivered energy for all uses		1966.2042 (338)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Efficiency of heat source Heat pump			323.0000	(367a)
Space heating from Heat pump	642.9239	0.5190	333.6775	(367)
Efficiency of heat source Boilers			95.0000	(367b)
Space heating from Boilers	115.0495	0.5190	59.7107	(368)
Electrical energy for heat distribution	21.8594	0.5190	11.3450	(372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			404.7332	(373)
Space and water heating			404.7332	(376)
Pumps and fans	129.8158	0.5190	67.3744	(378)
Energy for lighting	243.6316	0.5190	126.4448	(379)
Energy saving/generation technologies				
PV Unit	-593.1844	0.5190	-307.8627	(380)
Total CO2, kg/year			290.6897	(383)
Dwelling Carbon Dioxide Emission Rate (DER)			5.5700	(384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		5.5700	ZC1
Total Floor Area	TFA	52.1600	
Assumed number of occupants	N	1.7538	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		17.3639	ZC2
CO2 emissions from cooking, equation (L16)		3.0884	ZC3
Total CO2 emissions		26.0223	ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000	ZC7
Net CO2 emissions		26.0223	ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	52.1600 (1b)	x 2.4000 (2b)	= 125.1840 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	52.1600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 125.1840 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour 20.0000 / (5) = 0.1598 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4098 (18)
Number of sides sheltered					3 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.7750 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3176 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4049	0.3970	0.3890	0.3493	0.3414	0.3017	0.3017	0.2938	0.3176	0.3414	0.3573	0.3731 (22b)
	0.5820	0.5788	0.5757	0.5610	0.5583	0.5455	0.5455	0.5431	0.5504	0.5583	0.5638	0.5696 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K						
TER Opaque door			2.0900	1.0000	2.0900			(26)					
TER Opening Type (Uw = 1.40)			9.9700	1.3258	13.2178			(27)					
External Wall 1	23.0400	9.9700	13.0700	0.1800	2.3526			(29a)					
Corridor Wall	19.4400	2.0900	17.3500	0.1800	3.1230			(29a)					
Total net area of external elements Aum(A, m2)			42.4800					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	20.7834			(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								4.0960 (36)					
Total fabric heat loss						(33) + (36) =		24.8794 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 24.0417	Feb 23.9102	Mar 23.7813	Apr 23.1759	May 23.0626	Jun 22.5353	Jul 22.5353	Aug 22.4377	Sep 22.7384	Oct 23.0626	Nov 23.2918	Dec 23.5313	(38)
Heat transfer coeff	48.9211	48.7896	48.6607	48.0553	47.9420	47.4147	47.4147	47.3171	47.6178	47.9420	48.1712	48.4107	(39)
Average = Sum(39)m / 12 =												48.0547	(39)
HLP	Jan 0.9379	Feb 0.9354	Mar 0.9329	Apr 0.9213	May 0.9191	Jun 0.9090	Jul 0.9090	Aug 0.9072	Sep 0.9129	Oct 0.9191	Nov 0.9235	Dec 0.9281	(40)
HLP (average)												0.9213	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7538 (42)
Average daily hot water use (litres/day)												75.8525 (43)
Daily hot water use	83.4378	80.4037	77.3696	74.3355	71.3014	68.2673	68.2673	71.3014	74.3355	77.3696	80.4037	83.4378 (44)
Energy conte	123.7358	108.2201	111.6735	97.3597	93.4189	80.6134	74.7002	85.7196	86.7433	101.0910	110.3487	119.8315 (45)
Energy content (annual)										Total = Sum(45)m =		1193.4558 (45)
Distribution loss (46)m = 0.15 x (45)m	18.5604	16.2330	16.7510	14.6039	14.0128	12.0920	11.2050	12.8579	13.0115	15.1636	16.5523	17.9747 (46)
Water storage loss:												
Store volume												3.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												0.2602 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.1405 (55)
Total storage loss												

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

If cylinder contains dedicated solar storage	4.3553	3.9338	4.3553	4.2148	4.3553	4.2148	4.3553	4.3553	4.2148	4.3553	4.2148	4.3553 (56)
Primary loss	4.3553	3.9338	4.3553	4.2148	4.3553	4.2148	4.3553	4.3553	4.2148	4.3553	4.2148	4.3553 (57)
Total heat required for water heating calculated for each month	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Solar input	151.3535	133.1651	139.2912	124.0864	121.0366	107.3402	102.3179	113.3372	113.4701	128.7086	137.0755	147.4492 (62)
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Heat gains from water heating, kWh/month	151.3535	133.1651	139.2912	124.0864	121.0366	107.3402	102.3179	113.3372	113.4701	128.7086	137.0755	147.4492 (64)
	63.2363	55.9392	59.2256	53.7535	53.1559	48.1854	46.9320	50.5959	50.2236	55.7069	58.0724	61.9381 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)
(66)m	87.6896	87.6896	87.6896	87.6896	87.6896	87.6896	87.6896	87.6896	87.6896	87.6896	87.6896	87.6896	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.7954	12.2530	9.9648	7.5440	5.6392	4.7609	5.1443	6.6867	8.9749	11.3957	13.3005	14.1788	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	152.8409	154.4269	150.4302	141.9217	131.1813	121.0868	114.3430	112.7570	116.7537	125.2622	136.0026	146.0971	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.7690	31.7690	31.7690	31.7690	31.7690	31.7690	31.7690	31.7690	31.7690	31.7690	31.7690	31.7690	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-70.1516	-70.1516	-70.1516	-70.1516	-70.1516	-70.1516	-70.1516	-70.1516	-70.1516	-70.1516	-70.1516	-70.1516	(71)
Water heating gains (Table 5)	84.9950	83.2429	79.6043	74.6577	71.4461	66.9241	63.0806	68.0052	69.7550	74.8748	80.6561	83.2502	(72)
Total internal gains	303.9382	302.2296	292.3061	276.4302	260.5735	245.0787	234.8748	239.7559	247.7905	263.8396	282.2661	295.8330	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d	Gains W	
East					9.9700	19.6403	0.6300	0.7000			0.7700	59.8431 (76)	
Solar gains	59.8431	117.0659	192.7908	281.1739	344.5891	352.7483	335.8308	288.4737	224.2237	138.9085	74.6173	49.2121	(83)
Total gains	363.7813	419.2954	485.0969	557.6041	605.1626	597.8270	570.7055	528.2295	472.0141	402.7481	356.8834	345.0451	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	74.0422	74.2417	74.4384	75.3761	75.5542	76.3944	76.3944	76.5521	76.0686	75.5542	75.1948	74.8227	
alpha	5.9361	5.9494	5.9626	6.0251	6.0369	6.0930	6.0930	6.1035	6.0712	6.0369	6.0130	5.9882	
util living area	0.9954	0.9887	0.9639	0.8750	0.7020	0.5035	0.3651	0.4110	0.6707	0.9318	0.9892	0.9966	(86)
MIT	20.1481	20.3049	20.5538	20.8242	20.9605	20.9954	20.9995	20.9989	20.9774	20.7683	20.4056	20.1192	(87)
Th 2	20.1354	20.1375	20.1396	20.1494	20.1513	20.1598	20.1598	20.1614	20.1565	20.1513	20.1475	20.1437	(88)
util rest of house	0.9940	0.9853	0.9532	0.8440	0.6486	0.4393	0.2956	0.3366	0.5987	0.9067	0.9853	0.9955	(89)
MIT 2	19.0023	19.2310	19.5869	19.9569	20.1165	20.1571	20.1596	20.1610	20.1405	19.8959	19.3860	18.9665	(90)
Living area fraction	19.5596	19.7534	20.0572	20.3787	20.5270	20.5648	20.5681	20.5686	20.5476	20.3202	19.8819	19.5271	(92)
MIT	19.5596	19.7534	20.0572	20.3787	20.5270	20.5648	20.5681	20.5686	20.5476	20.3202	19.8819	19.5271	(93)
Temperature adjustment													
adjusted MIT	19.5596	19.7534	20.0572	20.3787	20.5270	20.5648	20.5681	20.5686	20.5476	20.3202	19.8819	19.5271	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9928	0.9834	0.9520	0.8530	0.6729	0.4705	0.3294	0.3728	0.6329	0.9123	0.9838	0.9945	(94)
Ext temp.	361.1485	412.3251	461.8294	475.6251	407.2102	281.2552	188.0011	196.9410	298.7421	367.4397	351.1086	343.1526	(95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Month fracti	746.5148	724.6889	659.7018	551.6144	423.1847	282.8213	188.1472	197.2439	307.0196	466.0074	615.7190	741.9980	(97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating	286.7125	209.9084	147.2171	54.7123	11.8850	0.0000	0.0000	0.0000	0.0000	73.3344	190.5195	296.7410	(98)
Space heating per m2												1271.0302	(98)
												24.3679	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													1359.3905 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	286.7125	209.9084	147.2171	54.7123	11.8850	0.0000	0.0000	0.0000	0.0000	73.3344	190.5195	296.7410	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	306.6444	224.5010	157.4514	58.5159	12.7112	0.0000	0.0000	0.0000	0.0000	78.4325	203.7641	317.3700	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	151.3535	133.1651	139.2912	124.0864	121.0366	107.3402	102.3179	113.3372	113.4701	128.7086	137.0755	147.4492	(64)
Efficiency of water heater (217)m	86.4930	86.0229	84.9615	82.7955	80.6526	79.8000	79.8000	79.8000	79.8000	83.3781	85.6922	79.8000	(216)
Fuel for water heating, kWh/month	174.9892	154.8020	163.9462	149.8711	150.0715	134.5115	128.2179	142.0266	142.1931	154.3675	159.9626	170.1792	(219)
Water heating fuel used												1825.1383	(219)
Annual totals kWh/year													
Space heating fuel - main system												1359.3905	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												243.6316	(232)
Total delivered energy for all uses												3503.1604	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1359.3905	0.2160	293.6284 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1825.1383	0.2160	394.2299 (264)
Space and water heating			687.8582 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	243.6316	0.5190	126.4448 (268)
Total CO2, kg/m2/year			853.2280 (272)
Emissions per m2 for space and water heating			13.1875 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.4242 (272b)
Emissions per m2 for pumps and fans			0.7463 (272c)
Target Carbon Dioxide Emission Rate (TER) = (13.1875 * 1.55) + 2.4242 + 0.7463, rounded to 2 d.p.			23.6100 (273)

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Calculation Type: New Build (As Designed)



Property Reference	Type 6 - Option 5			Issued on Date	18/07/2023
Assessment Reference	St Ann's Type 6	Prop Type Ref	St Ann's Type 6		
Property	Type 6 - 4B - Mid Terrace				
SAP Rating	89 B	DER	10.93	TER	23.39
Environmental	90 B	% DER<TER	53.28		
CO ₂ Emissions (t/year)	1.07	DFEE	35.84	TFEE	52.02
General Requirements Compliance	Pass	% DFEE<TFEE	31.10		
Assessor Details	Miss Eleanor Ballinger, Eleanor Ballinger, Tel: 02036031625, Eleanor@hodkinsonconsultancy.com			Assessor ID	M976-0001
Client					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Mid-Terrace House, total floor area 116 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Electricity

Fuel factor:1.55 (electricity)

Target Carbon Dioxide Emission Rate (TER) 23.39 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 10.93 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)52.0 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)35.8 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.13 (max. 0.25)	0.13 (max. 0.70)	OK
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	OK
Openings	0.85 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals:	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system: Heat pump with radiators or underfloor - Electric

Daikin Altherma ERHQ006BV3 + EKHBH008B

Secondary heating system: None

5 Cylinder insulation

Hot water storage	Measured cylinder loss: 1.20 kWh/day	
Permitted by DBSCG 2.03	OK	
Primary pipework insulated:	Yes	OK

6 Controls

Space heating controls:	Time and temperature zone control	OK
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Hot water controls:

Cylinderstat	OK
Independent timer for DHW	OK

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%	
Minimum	75% OK

8 Mechanical ventilation

Continuous supply and extract system

Specific fan power:	0.83	
Maximum	1.5	OK
MVHR efficiency:	92%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley):	Medium	OK
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Based on:

Overshading:	Average
Windows facing East:	8.61 m ² , No overhang
Windows facing West:	14.61 m ² , No overhang
Air change rate:	2.00 ach
Blinds/curtains:	None

10 Key features

Party wall U-value	0.00 W/m ² K
Roof U-value	0.10 W/m ² K
Roof U-value	0.10 W/m ² K
Window U-value	0.80 W/m ² K
Window U-value	0.80 W/m ² K
Air permeability	3.0 m ³ /m ² h
Photovoltaic array	0.78 kW

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	44.9000 (1b)	x 2.4900 (2b)	= 111.8010 (1b) - (3b)
First floor	35.5300 (1c)	x 3.0700 (2c)	= 109.0771 (1c) - (3c)
Second floor	35.5300 (1d)	x 2.9200 (2d)	= 103.7476 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	115.9600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 324.6257 (5)

2. Ventilation rate

	main		secondary		other		total	m3 per hour				
	heating		heating									
Number of chimneys	0	+	0	+	0	=	0 * 40 =	0.0000	(6a)			
Number of open flues	0	+	0	+	0	=	0 * 20 =	0.0000	(6b)			
Number of intermittent fans							0 * 10 =	0.0000	(7a)			
Number of passive vents							0 * 10 =	0.0000	(7b)			
Number of flueless gas fires							0 * 40 =	0.0000	(7c)			
							Air changes per hour					
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =						0.0000 / (5) =	0.0000	(8)			
Pressure test							Yes					
Measured/design AP50							3.0000					
Infiltration rate							0.1500		(18)			
Number of sides sheltered							2		(19)			
Shelter factor							(20) = 1 - [0.075 x (19)] =	0.8500	(20)			
Infiltration rate adjusted to include shelter factor							(21) = (18) x (20) =	0.1275	(21)			
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750
	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												0.5000
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												78.2000
Effective ac	0.2716	0.2684	0.2652	0.2493	0.2461	0.2301	0.2301	0.2269	0.2365	0.2461	0.2524	0.2588
												(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Window (East) (Uw = 0.80)			23.2200	0.7752	18.0000		(27)					
Door			2.2600	1.2000	2.7120		(26)					
Roof Window (Uw = 1.20)			1.4400	1.1450	1.6489		(27a)					
Heat Loss Floor 1			44.9000	0.1300	5.8370		(28a)					
External Wall 1	25.4000	10.8300	14.5700	0.1800	2.6226		(29a)					
External Wall 2 (FF)	31.3100	6.9700	24.3400	0.1800	4.3812		(29a)					
External Wall 3 (SF)	29.7800	7.6800	22.1000	0.1800	3.9780		(29a)					
External Roof 1	37.2000	1.4400	35.7600	0.1000	3.5760		(30)					
External Roof 2 (1st Floor)	11.0500		11.0500	0.1000	1.1050		(30)					
Total net area of external elements Aum(A, m2)			179.6400				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	43.8607		(33)					
Party Wall 1			129.3800	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								9.7206 (36)				
Total fabric heat loss								(33) + (36) = 53.5813 (37)				
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 29.0915	Feb 28.7501	Mar 28.4086	Apr 26.7013	May 26.3598	Jun 24.6525	Jul 24.6525	Aug 24.3110	Sep 25.3354	Oct 26.3598	Nov 27.0427	Dec 27.7257 (38)
Heat transfer coeff	82.6728	82.3313	81.9899	80.2825	79.9411	78.2337	78.2337	77.8923	78.9167	79.9411	80.6240	81.3069 (39)
Average = Sum(39)m / 12 =												80.1972 (39)
HLP	Jan 0.7129	Feb 0.7100	Mar 0.7071	Apr 0.6923	May 0.6894	Jun 0.6747	Jul 0.6747	Aug 0.6717	Sep 0.6806	Oct 0.6894	Nov 0.6953	Dec 0.7012 (40)
HLP (average)												0.6916 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy											
2.8463 (42)											
Average daily hot water use (litres/day)											
101.7986 (43)											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Daily hot water use												
	111.9784	107.9065	103.8345	99.7626	95.6906	91.6187	91.6187	95.6906	99.7626	103.8345	107.9065	111.9784 (44)
Energy conte	166.0607	145.2378	149.8724	130.6624	125.3737	108.1879	100.2520	115.0407	116.4146	135.6700	148.0944	160.8210 (45)
Energy content (annual)										Total = Sum (45)m =		1601.6876 (45)
Distribution loss (46)m = 0.15 x (45)m												
	24.9091	21.7857	22.4809	19.5994	18.8060	16.2282	15.0378	17.2561	17.4622	20.3505	22.2142	24.1231 (46)
Water storage loss:												
Store volume												170.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.2000 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.6480 (55)
Total storage loss												
	20.0880	18.1440	20.0880	19.4400	20.0880	19.4400	20.0880	20.0880	19.4400	20.0880	19.4400	20.0880 (56)
If cylinder contains dedicated solar storage												
	20.0880	18.1440	20.0880	19.4400	20.0880	19.4400	20.0880	20.0880	19.4400	20.0880	19.4400	20.0880 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month												
	209.4111	184.3930	193.2228	172.6144	168.7241	150.1399	143.6024	158.3911	158.3666	179.0204	190.0464	204.1714 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Solar input (sum of months) = Sum (63)m =												0.0000 (63)
Output from w/h	209.4111	184.3930	193.2228	172.6144	168.7241	150.1399	143.6024	158.3911	158.3666	179.0204	190.0464	204.1714 (64)
Total per year (kWh/year) = Sum (64)m =												2112.1036 (64)
Heat gains from water heating, kWh/month												
	89.8955	79.6157	84.5129	77.0068	76.3671	69.5341	68.0141	72.9313	72.2695	79.7906	82.8030	88.1533 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	142.3127	142.3127	142.3127	142.3127	142.3127	142.3127	142.3127	142.3127	142.3127	142.3127	142.3127	142.3127 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	24.9808	22.1877	18.0442	13.6607	10.2115	8.6210	9.3153	12.1083	16.2518	20.6354	24.0845	25.6751 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	279.8563	282.7603	275.4422	259.8629	240.1969	221.7135	209.3655	206.4615	213.7796	229.3589	249.0249	267.5083 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	37.2313	37.2313	37.2313	37.2313	37.2313	37.2313	37.2313	37.2313	37.2313	37.2313	37.2313	37.2313 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)												
	-113.8502	-113.8502	-113.8502	-113.8502	-113.8502	-113.8502	-113.8502	-113.8502	-113.8502	-113.8502	-113.8502	-113.8502 (71)
Water heating gains (Table 5)												
	120.8273	118.4758	113.5926	106.9539	102.6439	96.5751	91.4168	98.0260	100.3743	107.2454	115.0042	118.4856 (72)
Total internal gains												
	491.3581	489.1176	472.7729	446.1713	418.7461	392.6034	375.7914	382.2896	396.0994	422.9335	453.8074	477.3627 (73)

6. Solar gains

[Jan]	Area m ²	Solar flux Table 6a W/m ²	Specific data or Table 6b	g Specific data or Table 6c	FF Access factor Table 6d	Gains W
East	8.6100	19.6403	0.5000	0.8000	0.7700	46.8753 (76)
West	14.6100	19.6403	0.5000	0.8000	0.7700	79.5409 (80)
Horizontal	1.4400	26.0000	0.5000	0.8000	1.0000	13.4784 (82)
Solar gains						
	139.8946	275.2905	457.0292	671.7285	827.4635	848.8466
Total gains						
	631.2527	764.4081	929.8021	1117.8999	1246.2096	1241.4501

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												
Utilisation factor for gains for living area, nil,m (see Table 9a)												21.0000 (85)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	97.4054	97.8094	98.2168	100.3055	100.7339	102.9323	102.9323	103.3835	102.0415	100.7339	99.8807	99.0417
alpha	7.4937	7.5206	7.5478	7.6870	7.7156	7.8622	7.8622	7.8922	7.8028	7.7156	7.6587	7.6028
util living area	0.9985	0.9932	0.9612	0.8141	0.5920	0.4031	0.2909	0.3339	0.5821	0.9251	0.9947	0.9990 (86)
Tweekday	19.6041	19.7829	20.0395	20.2526	20.2953	20.3124	20.3125	20.3153	20.3052	20.1985	19.8624	19.5889
Tweekend	20.6564	20.7348	20.8506	20.9508	20.9747	20.9775	20.9776	20.9776	20.9759	20.9184	20.7649	20.6457
24 / 16	9	8	9	8	9	9	9	9	8	9	8	9
24 / 9	22	20	22	22	22	21	22	22	22	22	22	22
16 / 9	0	0	0	0	0	0	0	0	0	0	0	0
MIT	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000 (87)
Th 2	20.3294	20.3320	20.3346	20.3476	20.3502	20.3633	20.3633	20.3659	20.3580	20.3502	20.3450	20.3398 (88)
util rest of house												
	0.9980	0.9912	0.9508	0.7824	0.5522	0.3631	0.2488	0.2879	0.5296	0.9012	0.9928	0.9987 (89)
Tweekday	19.6041	19.7829	20.0395	20.2526	20.2953	20.3124	20.3125	20.3153	20.3052	20.1985	19.8624	19.5889
Tweekend	19.6041	19.7829	20.0395	20.2526	20.2953	20.3124	20.3125	20.3153	20.3052	20.1985	19.8624	19.5889
MIT 2	20.3294	20.3320	20.3346	20.3476	20.3502	20.3633	20.3633	20.3659	20.3580	20.3502	20.3450	20.3398 (90)
Living area fraction												0.1369 (91)
MIT	20.4212	20.4234	20.4257	20.4369	20.4391	20.4504	20.4504	20.4527	20.4459	20.4391	20.4347	20.4302 (92)
Temperature adjustment												0.0000
adjusted MIT	20.4212	20.4234	20.4257	20.4369	20.4391	20.4504	20.4504	20.4527	20.4459	20.4391	20.4347	20.4302 (93)

8. Space heating requirement

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

FULL SAP CALCULATION PRINTOUT

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Utilisation	0.9981	0.9915	0.9524	0.7870	0.5577	0.3686	0.2546	0.2942	0.5368	0.9049	0.9931	0.9988 (94)
Useful gains	630.0221	757.8901	885.5095	879.7380	695.0638	457.5863	301.2272	315.6572	498.9349	679.1829	624.2196	591.4686 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	1332.7837	1278.0645	1141.7638	926.2113	698.6167	457.6995	301.2320	315.6714	500.7974	786.5519	1075.0928	1319.6243 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	522.8546	349.5572	190.6532	33.4608	2.6434	0.0000	0.0000	0.0000	0.0000	79.8825	324.6287	541.7478 (98)
Space heating												2045.4282 (98)
Space heating per m2												17.6391 (99)

(98) / (4) = 17.6391 (99)

8c. Space cooling requirement

Not applicable

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												338.2485 (206)
Efficiency of secondary/supplementary heating system, %												100.0000 (208)
Space heating requirement												604.7117 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	522.8546	349.5572	190.6532	33.4608	2.6434	0.0000	0.0000	0.0000	0.0000	79.8825	324.6287	541.7478 (98)
Space heating efficiency (main heating system 1)	338.2485	338.2485	338.2485	338.2485	338.2485	0.0000	0.0000	0.0000	0.0000	338.2485	338.2485	338.2485 (210)
Space heating fuel (main heating system)	154.5771	103.3433	56.3648	9.8924	0.7815	0.0000	0.0000	0.0000	0.0000	23.6165	95.9734	160.1627 (211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	209.4111	184.3930	193.2228	172.6144	168.7241	150.1399	143.6024	158.3911	158.3666	179.0204	190.0464	204.1714 (64)
Efficiency of water heater	133.8550	133.8550	133.8550	133.8550	133.8550	133.8550	133.8550	133.8550	133.8550	133.8550	133.8550	133.8550 (216)
(217)m	133.8550	133.8550	133.8550	133.8550	133.8550	133.8550	133.8550	133.8550	133.8550	133.8550	133.8550	133.8550 (217)
Fuel for water heating, kWh/month	156.4463	137.7558	144.3523	128.9562	126.0499	112.1661	107.2821	118.3303	118.3121	133.7420	141.9793	152.5317 (219)
Water heating fuel used												1577.9041 (219)
Annual totals kWh/year												
Space heating fuel - main system												604.7117 (211)
Space heating fuel - secondary												0.0000 (215)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 1.0375)												
mechanical ventilation fans (SFP = 1.0375)												410.8950 (230a)
Total electricity for the above, kWh/year												410.8950 (231)
Electricity for lighting (calculated in Appendix L)												441.1680 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV Unit 0 (0.80 * 0.78 * 951 * 1.00) =										-593.1844		-593.1844 (233)
Total delivered energy for all uses												2441.4945 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	604.7117	0.5190	313.8454 (261)
Space heating - secondary	0.0000	0.5190	0.0000 (263)
Water heating (other fuel)	1577.9041	0.5190	818.9323 (264)
Space and water heating			1132.7776 (265)
Pumps and fans	410.8950	0.5190	213.2545 (267)
Energy for lighting	441.1680	0.5190	228.9662 (268)
Energy saving/generation technologies			
PV Unit	-593.1844	0.5190	-307.8627 (269)
Total CO2, kg/year			1267.1357 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			10.9300 (273)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		10.9300 ZC1
Total Floor Area		115.9600
Assumed number of occupants	TFA	2.8463
CO2 emission factor in Table 12 for electricity displaced from grid	N	0.5190
CO2 emissions from appliances, equation (L14)	EF	14.3012 ZC2
CO2 emissions from cooking, equation (L16)		1.6153 ZC3
Total CO2 emissions		26.8465 ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000 ZC7
Net CO2 emissions		26.8465 ZC8

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	44.9000 (1b)	x 2.4900 (2b)	= 111.8010 (1b) - (3b)
First floor	35.5300 (1c)	x 3.0700 (2c)	= 109.0771 (1c) - (3c)
Second floor	35.5300 (1d)	x 2.9200 (2d)	= 103.7476 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	115.9600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 324.6257 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					4 * 10 = 40.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				40.0000 / (5) = 0.1232 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3732 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3172 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4045	0.3965	0.3886	0.3490	0.3410	0.3014	0.3014	0.2934	0.3172	0.3410	0.3569	0.3728 (22b)
Effective ac	0.5818	0.5786	0.5755	0.5609	0.5582	0.5454	0.5454	0.5431	0.5503	0.5582	0.5637	0.5695 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.2600	1.0000	2.2600		(26)
TER Opening Type (Uw = 1.40)			23.2200	1.3258	30.7841		(27)
TER Room Window (Uw = 1.70)			1.4400	1.5918	2.2921		(27a)
Heat Loss Floor 1			44.9000	0.1300	5.8370		(28a)
External Wall 1	25.4000	10.8300	14.5700	0.1800	2.6226		(29a)
External Wall 2 (FF)	31.3100	6.9700	24.3400	0.1800	4.3812		(29a)
External Wall 3 (SF)	29.7800	7.6800	22.1000	0.1800	3.9780		(29a)
External Roof 1	37.2000	1.4400	35.7600	0.1300	4.6488		(30)
External Roof 2 (1st Floor)	11.0500		11.0500	0.1300	1.4365		(30)
Total net area of external elements Aum(A, m ²)			179.6400				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	58.2403		(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K	250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	13.7312 (36)
Total fabric heat loss	(33) + (36) = 71.9715 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	62.3262	61.9860	61.6524	60.0858	59.7927	58.4282	58.4282	58.1755	58.9538	59.7927	60.3856	61.0055 (38)
Average = Sum(39)m / 12 =	134.2978	133.9575	133.6239	132.0573	131.7642	130.3997	130.3997	130.1470	130.9253	131.7642	132.3572	132.9771 (39)
												132.0559 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1581	1.1552	1.1523	1.1388	1.1363	1.1245	1.1245	1.1223	1.1291	1.1363	1.1414	1.1467 (40)
Days in month												1.1388 (40)
	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.8463 (42)
Average daily hot water use (litres/day)												101.7986 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	111.9784	107.9065	103.8345	99.7626	95.6906	91.6187	91.6187	95.6906	99.7626	103.8345	107.9065	111.9784 (44)
Energy conte	166.0607	145.2378	149.8724	130.6624	125.3737	108.1879	100.2520	115.0407	116.4146	135.6700	148.0944	160.8210 (45)
Energy content (annual)											Total = Sum(45)m =	1601.6876 (45)
Distribution loss (46)m = 0.15 x (45)m												

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24.9091	21.7857	22.4809	19.5994	18.8060	16.2282	15.0378	17.2561	17.4622	20.3505	22.2142	24.1231 (46)
Water storage loss:											
Store volume											170.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):											1.5003 (48)
Temperature factor from Table 2b											0.5400 (49)
Enter (49) or (54) in (55)											0.8102 (55)
Total storage loss											
25.1153	22.6848	25.1153	24.3051	25.1153	24.3051	25.1153	25.1153	24.3051	25.1153	24.3051	25.1153 (56)
If cylinder contains dedicated solar storage											
25.1153	22.6848	25.1153	24.3051	25.1153	24.3051	25.1153	25.1153	24.3051	25.1153	24.3051	25.1153 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month											
214.4384	188.9338	198.2501	177.4795	173.7514	155.0051	148.6297	163.4184	163.2317	184.0477	194.9116	209.1987 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Solar input (sum of months) = Sum(63)m =											0.0000 (63)
Output from w/h											
214.4384	188.9338	198.2501	177.4795	173.7514	155.0051	148.6297	163.4184	163.2317	184.0477	194.9116	209.1987 (64)
Heat gains from water heating, kWh/month											
93.9174	83.2484	88.5347	80.8989	80.3889	73.4262	72.0360	76.9532	76.1616	83.8124	86.6951	92.1751 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	142.3127	142.3127	142.3127	142.3127	142.3127	142.3127	142.3127	142.3127	142.3127	142.3127	142.3127	142.3127 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	24.9808	22.1877	18.0442	13.6607	10.2115	8.6210	9.3153	12.1083	16.2518	20.6354	24.0845	25.6751 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	279.8563	282.7603	275.4422	259.8629	240.1969	221.7135	209.3655	206.4615	213.7796	229.3589	249.0249	267.5083 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.2313	37.2313	37.2313	37.2313	37.2313	37.2313	37.2313	37.2313	37.2313	37.2313	37.2313	37.2313 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-113.8502	-113.8502	-113.8502	-113.8502	-113.8502	-113.8502	-113.8502	-113.8502	-113.8502	-113.8502	-113.8502	-113.8502 (71)
Water heating gains (Table 5)	126.2330	123.8815	118.9983	112.3596	108.0496	101.9808	96.8225	103.4317	105.7800	112.6511	120.4099	123.8913 (72)
Total internal gains	499.7638	497.5233	481.1786	454.5770	427.1518	401.0091	384.1971	390.6953	404.5051	431.3392	462.2131	485.7684 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
East				8.6100	19.6403	0.6300	0.7000	0.7700	51.6800 (76)			
West				14.6100	19.6403	0.6300	0.7000	0.7700	87.6939 (80)			
Horizontal				1.4400	26.0000	0.6300	0.7000	1.0000	14.8599 (82)			
Solar gains	154.2338	303.5078	503.8747	740.5807	912.2785	935.8534	890.1658	761.5826	587.9406	361.2375	192.6435	126.6165 (83)
Total gains	653.9976	801.0311	985.0533	1195.1577	1339.4303	1336.8625	1274.3629	1152.2779	992.4458	792.5767	654.8567	612.3850 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	59.9621	60.1144	60.2645	60.9794	61.1151	61.7546	61.7546	61.8745	61.5067	61.1151	60.8413	60.5576
alpha	4.9975	5.0076	5.0176	5.0653	5.0743	5.1170	5.1170	5.1250	5.1004	5.0743	5.0561	5.0372
util living area												
	0.9985	0.9956	0.9832	0.9301	0.7961	0.6020	0.4460	0.5107	0.7944	0.9728	0.9965	0.9989 (86)
MIT	19.7144	19.9002	20.2155	20.6054	20.8708	20.9757	20.9956	20.9917	20.9065	20.5134	20.0370	19.6853 (87)
Th 2	19.9536	19.9560	19.9583	19.9693	19.9713	19.9809	19.9809	19.9826	19.9772	19.9713	19.9672	19.9628 (88)
util rest of house												
	0.9980	0.9941	0.9773	0.9067	0.7391	0.5155	0.3450	0.4023	0.7150	0.9595	0.9951	0.9986 (89)
MIT 2	18.2367	18.5095	18.9675	19.5199	19.8525	19.9659	19.9793	19.9794	19.9059	19.4073	18.7180	18.2007 (90)
Living area fraction										fLA = Living area / (4) =		0.1369 (91)
MIT	18.4389	18.6998	19.1383	19.6684	19.9919	20.1041	20.1184	20.1179	20.0428	19.5586	18.8985	18.4039 (92)
Temperature adjustment												0.0000
adjusted MIT	18.4389	18.6998	19.1383	19.6684	19.9919	20.1041	20.1184	20.1179	20.0428	19.5586	18.8985	18.4039 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9968	0.9913	0.9710	0.8985	0.7404	0.5263	0.3588	0.4171	0.7207	0.9522	0.9928	0.9977	(94)
Ext temp.	651.9105	794.0948	956.4854	1073.8179	991.6783	703.6327	457.2242	480.5746	715.2559	754.7085	650.1359	610.9616	(95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
1898.8238	1848.5890	1688.7801	1422.0474	1092.5766	717.7327	458.8032	483.8796	778.0632	1180.4276	1561.6164	1888.7958	1888.7958	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	927.7035	708.6201	544.8272	250.7253	75.0683	0.0000	0.0000	0.0000	0.0000	316.7350	656.2660	950.7087	(98)
Space heating												4430.6541	(98)
Space heating per m2												38.2085	(99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF TARGET EMISSIONS 09 Jan 2014

8c. Space cooling requirement

Not applicable

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													4738.6675 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	927.7035	708.6201	544.8272	250.7253	75.0683	0.0000	0.0000	0.0000	0.0000	316.7350	656.2660	950.7087	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	992.1963	757.8825	582.7029	268.1554	80.2870	0.0000	0.0000	0.0000	0.0000	338.7540	701.8887	1016.8007	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	214.4384	188.9338	198.2501	177.4795	173.7514	155.0051	148.6297	163.4184	163.2317	184.0477	194.9116	209.1987	(64)
Efficiency of water heater (217)m	88.2776	88.0158	87.3743	85.7353	82.7518	79.8000	79.8000	79.8000	79.8000	86.2497	87.8040	88.3631	(216)
Fuel for water heating, kWh/month	242.9137	214.6590	226.8974	207.0087	209.9669	194.2419	186.2528	204.7849	204.5511	213.3894	221.9847	236.7489	(219)
Water heating fuel used												2563.3994	(219)
Annual totals kWh/year													
Space heating fuel - main system												4738.6675	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												441.1680	(232)
Total delivered energy for all uses												7818.2350	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	4738.6675	0.2160	1023.5522 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2563.3994	0.2160	553.6943 (264)
Space and water heating			1577.2465 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	441.1680	0.5190	228.9662 (268)
Total CO2, kg/m2/year			1845.1377 (272)
Emissions per m2 for space and water heating			13.6016 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			1.9745 (272b)
Emissions per m2 for pumps and fans			0.3357 (272c)
Target Carbon Dioxide Emission Rate (TER) = (13.6016 * 1.55) + 1.9745 + 0.3357, rounded to 2 d.p.			23.3900 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



Property Reference	Type 7 - Option 5			Issued on Date	18/07/2023
Assessment Reference	St Ann's Type 7	Prop Type Ref	St Ann's Type 7		
Property	Type 7 - 4B - End Terrace				
SAP Rating	88 B	DER	12.23	TER	26.07
Environmental	89 B	% DER<TER	53.09		
CO ₂ Emissions (t/year)	1.19	DFEE	43.56	TFEE	61.27
General Requirements Compliance	Pass	% DFEE<TFEE	28.91		
Assessor Details	Miss Eleanor Ballinger, Eleanor Ballinger, Tel: 02036031625, Eleanor@hodkinsonconsultancy.com			Assessor ID	M976-0001
Client					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

End-Terrace House, total floor area 116 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Electricity

Fuel factor:1.55 (electricity)

Target Carbon Dioxide Emission Rate (TER) 26.07 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 12.23 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)61.3 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)43.6 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.13 (max. 0.25)	0.13 (max. 0.70)	OK
Roof	0.10 (max. 0.20)	0.10 (max. 0.35)	OK
Openings	0.85 (max. 2.00)	1.20 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals:	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system: Heat pump with radiators or underfloor - Electric

Daikin Altherma ERHQ006BV3 + EKHBH008B

Secondary heating system: None

5 Cylinder insulation

Hot water storage	Measured cylinder loss: 1.20 kWh/day	
Permitted by DBSCG 2.03	OK	
Primary pipework insulated:	Yes	OK

6 Controls

Space heating controls:	Time and temperature zone control	OK
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Hot water controls:

Cylinderstat	OK
Independent timer for DHW	OK

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%	
Minimum	75% OK

8 Mechanical ventilation

Continuous supply and extract system	
Specific fan power:	0.83
Maximum	1.5 OK
MVHR efficiency:	92%
Minimum:	70% OK

9 Summertime temperature

Overheating risk (Thames Valley):	Medium	OK
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Based on:

Overshading:	Average
Windows facing East:	8.61 m ² , No overhang
Windows facing South:	5.68 m ² , No overhang
Windows facing West:	14.61 m ² , No overhang
Air change rate:	2.00 ach
Blinds/curtains:	None

10 Key features

Party wall U-value	0.00 W/m ² K
Roof U-value	0.10 W/m ² K
Roof U-value	0.10 W/m ² K
Window U-value	0.80 W/m ² K
Window U-value	0.80 W/m ² K
Air permeability	3.0 m ³ /m ² h
Photovoltaic array	0.78 kW

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	45.0400 (1b)	x 2.4900 (2b)	= 112.1496 (1b) - (3b)
First floor	35.5000 (1c)	x 3.0700 (2c)	= 108.9850 (1c) - (3c)
Second floor	35.5000 (1d)	x 2.9200 (2d)	= 103.6600 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	116.0400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 324.7946 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour							
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)							
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)							
Number of intermittent fans					0 * 10 = 0.0000 (7a)							
Number of passive vents					0 * 10 = 0.0000 (7b)							
Number of flueless gas fires					0 * 40 = 0.0000 (7c)							
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					0.0000 / (5) = 0.0000 (8)							
Pressure test					Yes							
Measured/design AP50					3.0000							
Infiltration rate					0.1500 (18)							
Number of sides sheltered					1 (19)							
Shelter factor					(20) = 1 - [0.075 x (19)] = 0.9250 (20)							
Infiltration rate adjusted to include shelter factor					(21) = (18) x (20) = 0.1388 (21)							
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
	0.1769	0.1734	0.1700	0.1526	0.1492	0.1318	0.1318	0.1283	0.1388	0.1492	0.1561	0.1630 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
												0.5000 (23a)
												78.2000 (23c)
Effective ac	0.2859	0.2824	0.2790	0.2616	0.2582	0.2408	0.2408	0.2373	0.2478	0.2582	0.2651	0.2720 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Window (west) (Uw = 0.80)			5.6800	0.7752	4.4031		(27)					
Door			2.2600	1.2000	2.7120		(26)					
Window (east) (Uw = 0.80)			23.2200	0.7752	18.0000		(27)					
Roof Window (Uw = 1.20)			1.4400	1.1450	1.6489		(27a)					
Heat Loss Floor 1			45.0400	0.1300	5.8552		(28a)					
External Wall 1 GF	47.5600	13.9900	33.5700	0.1800	6.0426		(29a)					
External Wall 2 (FF)	53.4200	8.2300	45.1900	0.1800	8.1342		(29a)					
External Wall 3 (SF)	50.8100	8.9400	41.8700	0.1800	7.5366		(29a)					
External Roof 1	37.2000	1.4400	35.7600	0.1000	3.5760		(30)					
External Roof 2 (1st Floor)	11.0500		11.0500	0.1000	1.1050		(30)					
Total net area of external elements Aum(A, m2)			245.0800				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		59.0136		(33)					
Party Wall 1			65.2900	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							16.5714 (36)					
Total fabric heat loss							(33) + (36) = 75.5850 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 30.6441	Feb 30.2723	Mar 29.9005	Apr 28.0415	May 27.6698	Jun 25.8108	Jul 25.8108	Aug 25.4390	Sep 26.5544	Oct 27.6698	Nov 28.4133	Dec 29.1569 (38)
Heat transfer coeff	106.2290	105.8572	105.4854	103.6265	103.2547	101.3958	101.3958	101.0240	102.1394	103.2547	103.9983	104.7419 (39)
Average = Sum(39)m / 12 =												103.5336 (39)
HLP	Jan 0.9155	Feb 0.9122	Mar 0.9090	Apr 0.8930	May 0.8898	Jun 0.8738	Jul 0.8738	Aug 0.8706	Sep 0.8802	Oct 0.8898	Nov 0.8962	Dec 0.9026 (40)
HLP (average)												0.8922 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.8466 (42)
Average daily hot water use (litres/day)	101.8073 (43)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	111.9880	107.9157	103.8434	99.7711	95.6989	91.6266	91.6266	95.6989	99.7711	103.8434	107.9157	111.9880	(44)
Energy conte	166.0750	145.2503	149.8852	130.6736	125.3844	108.1972	100.2606	115.0505	116.4246	135.6817	148.1071	160.8348	(45)
Energy content (annual)										Total =	Sum (45)m =	1601.8251	(45)
Distribution loss (46)m = 0.15 x (45)m	24.9112	21.7875	22.4828	19.6010	18.8077	16.2296	15.0391	17.2576	17.4637	20.3522	22.2161	24.1252	(46)
Water storage loss:													
Store volume													170.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.2000 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.6480 (55)
Total storage loss													
20.0880	18.1440	20.0880	19.4400	20.0880	19.4400	20.0880	20.0880	19.4400	20.0880	19.4400	20.0880	20.0880	(56)
If cylinder contains dedicated solar storage													
20.0880	18.1440	20.0880	19.4400	20.0880	19.4400	20.0880	20.0880	19.4400	20.0880	19.4400	20.0880	20.0880	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month													
209.4254	184.4055	193.2356	172.6256	168.7348	150.1492	143.6110	158.4009	158.3766	179.0321	190.0591	204.1852	204.1852	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Output from w/h	209.4254	184.4055	193.2356	172.6256	168.7348	150.1492	143.6110	158.4009	158.3766	179.0321	190.0591	204.1852	(64)
Heat gains from water heating, kWh/month	89.9003	79.6199	84.5172	77.0106	76.3706	69.5372	68.0170	72.9346	72.2728	79.7945	82.8072	88.1579	(65)
										Total per year (kWh/year) =	Sum (64)m =	2112.2411	(64)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	142.3311	142.3311	142.3311	142.3311	142.3311	142.3311	142.3311	142.3311	142.3311	142.3311	142.3311	142.3311	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	24.9590	22.1684	18.0285	13.6488	10.2026	8.6135	9.3072	12.0978	16.2376	20.6174	24.0636	25.6527	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	279.9643	282.8695	275.5486	259.9633	240.2896	221.7991	209.4464	206.5412	213.8621	229.4474	249.1211	267.6115	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.2331	37.2331	37.2331	37.2331	37.2331	37.2331	37.2331	37.2331	37.2331	37.2331	37.2331	37.2331	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-113.8649	-113.8649	-113.8649	-113.8649	-113.8649	-113.8649	-113.8649	-113.8649	-113.8649	-113.8649	-113.8649	-113.8649	(71)
Water heating gains (Table 5)	120.8337	118.4819	113.5983	106.9591	102.6487	96.5794	91.4207	98.0304	100.3789	107.2506	115.0100	118.4918	(72)
Total internal gains	491.4563	489.2191	472.8748	446.2705	418.8403	392.6914	375.8735	382.3688	396.1780	423.0148	453.8940	477.4554	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c		Access factor Table 6d		Gains W	
South				5.6800	46.7521	0.4200	0.8000		0.7700		61.8332 (78)	
Horizontal				1.4400	26.0000	0.5000	0.8000		1.0000		13.4784 (82)	
East				8.6100	19.6403	0.5000	0.8000		0.7700		46.8753 (76)	
West				14.6100	19.6403	0.5000	0.8000		0.7700		79.5409 (80)	

Solar gains	201.7278	376.5573	586.0252	817.5220	979.3893	995.0545	950.2606	829.5089	668.0310	436.8788	248.0268	168.2745 (83)
Total gains	693.1841	865.7765	1058.9000	1263.7925	1398.2296	1387.7459	1326.1342	1211.8776	1064.2090	859.8936	701.9208	645.7299 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	75.8581	76.1245	76.3928	77.7632	78.0432	79.4741	79.4741	79.7665	78.8955	78.0432	77.4852	76.9352
alpha	6.0572	6.0750	6.0929	6.1842	6.2029	6.2983	6.2983	6.3178	6.2597	6.2029	6.1657	6.1290
util living area	0.9979	0.9919	0.9647	0.8574	0.6644	0.4655	0.3362	0.3829	0.6444	0.9371	0.9940	0.9986 (86)
Weekday	19.1665	19.3866	19.6942	19.9916	20.0946	20.1254	20.1265	20.1293	20.1122	19.9223	19.4879	19.1435
Weekend	20.5273	20.6242	20.7626	20.9014	20.9587	20.9709	20.9719	20.9719	20.9641	20.8612	20.6638	20.5132
24 / 16	9	8	9	8	9	9	9	9	8	9	8	9
24 / 9	22	20	22	22	22	21	22	22	22	22	22	22
16 / 9	0	0	0	0	0	0	0	0	0	0	0	0
MIT	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000 (87)
Th 2	20.1544	20.1571	20.1598	20.1734	20.1762	20.1898	20.1898	20.1926	20.1844	20.1762	20.1707	20.1653 (88)
util rest of house	0.9973	0.9894	0.9543	0.8248	0.6127	0.4076	0.2744	0.3160	0.5754	0.9136	0.9917	0.9982 (89)
Weekday	19.1665	19.3866	19.6942	19.9916	20.0946	20.1254	20.1265	20.1293	20.1122	19.9223	19.4879	19.1435
Weekend	19.1665	19.3866	19.6942	19.9916	20.0946	20.1254	20.1265	20.1293	20.1122	19.9223	19.4879	19.1435
MIT 2	20.1544	20.1571	20.1598	20.1734	20.1762	20.1898	20.1898	20.1926	20.1844	20.1762	20.1707	20.1653 (90)
Living area fraction									fLA = Living area / (4) =			0.1368 (91)
MIT	20.2700	20.2724	20.2747	20.2865	20.2888	20.3006	20.3006	20.3030	20.2959	20.2888	20.2841	20.2794 (92)
Temperature adjustment												0.0000
adjusted MIT	20.2700	20.2724	20.2747	20.2865	20.2888	20.3006	20.3006	20.3030	20.2959	20.2888	20.2841	20.2794 (93)

8. Space heating requirement

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9974	0.9898	0.9559	0.8296	0.6199	0.4155	0.2829	0.3252	0.5851	0.9173	0.9921	0.9983	(94)
Useful gains	691.3683	856.9098	1012.1695	1048.4244	866.8314	576.6612	375.1334	394.0749	622.7017	788.7437	696.3560	644.6110	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	1696.4812	1627.2775	1453.0330	1179.9409	886.8374	578.0197	375.2281	394.2959	632.8458	1000.4176	1371.1264	1684.1887	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	747.8040	517.6871	328.0024	94.6919	14.8845	0.0000	0.0000	0.0000	0.0000	157.4854	485.8347	773.4458	(98)
Space heating												3119.8358	(98)
Space heating per m2											(98) / (4) =	26.8859	(99)

8c. Space cooling requirement

Not applicable

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000	(201)
Fraction of space heat from main system(s)													1.0000	(202)
Efficiency of main space heating system 1 (in %)													347.9609	(206)
Efficiency of secondary/supplementary heating system, %													100.0000	(208)
Space heating requirement													896.6054	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	747.8040	517.6871	328.0024	94.6919	14.8845	0.0000	0.0000	0.0000	0.0000	157.4854	485.8347	773.4458	(98)	
Space heating efficiency (main heating system 1)	347.9609	347.9609	347.9609	347.9609	347.9609	0.0000	0.0000	0.0000	0.0000	347.9609	347.9609	347.9609	(210)	
Space heating fuel (main heating system)	214.9104	148.7774	94.2642	27.2134	4.2776	0.0000	0.0000	0.0000	0.0000	45.2595	139.6234	222.2795	(211)	
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)	
Water heating														
Water heating requirement	209.4254	184.4055	193.2356	172.6256	168.7348	150.1492	143.6110	158.4009	158.3766	179.0321	190.0591	204.1852	(64)	
Efficiency of water heater	133.8550	133.8550	133.8550	133.8550	133.8550	133.8550	133.8550	133.8550	133.8550	133.8550	133.8550	133.8550	(216)	
(217)m	133.8550	133.8550	133.8550	133.8550	133.8550	133.8550	133.8550	133.8550	133.8550	133.8550	133.8550	133.8550	(217)	
Fuel for water heating, kWh/month	156.4569	137.7651	144.3619	128.9646	126.0579	112.1730	107.2885	118.3377	118.3195	133.7507	141.9888	152.5421	(219)	
Water heating fuel used												1578.0069	(219)	
Annual totals kWh/year														
Space heating fuel - main system												896.6054	(211)	
Space heating fuel - secondary												0.0000	(215)	

Electricity for pumps and fans:

(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 1.0375)
mechanical ventilation fans (SFP = 1.0375)

Total electricity for the above, kWh/year	411.1088	(230a)
Electricity for lighting (calculated in Appendix L)	411.1088	(231)
	440.7841	(232)

Energy saving/generation technologies (Appendices M ,N and Q)

PV Unit 0 (0.80 * 0.78 * 951 * 1.00) =	-593.1844	-593.1844	(233)
Total delivered energy for all uses		2733.3208	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	896.6054	0.5190	465.3382	(261)
Space heating - secondary	0.0000	0.5190	0.0000	(263)
Water heating (other fuel)	1578.0069	0.5190	818.9856	(264)
Space and water heating			1284.3238	(265)
Pumps and fans	411.1088	0.5190	213.3654	(267)
Energy for lighting	440.7841	0.5190	228.7670	(268)
Energy saving/generation technologies				
PV Unit	-593.1844	0.5190	-307.8627	(269)
Total CO2, kg/year			1418.5935	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			12.2300	(273)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		12.2300	ZC1
Total Floor Area		116.0400	
Assumed number of occupants	TFA	2.8466	
CO2 emission factor in Table 12 for electricity displaced from grid	N	0.5190	
CO2 emissions from appliances, equation (L14)	EF	14.2969	ZC2
CO2 emissions from cooking, equation (L16)		1.6143	ZC3
Total CO2 emissions		28.1411	ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000	ZC7
Net CO2 emissions		28.1411	ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	45.0400 (1b)	x 2.4900 (2b)	= 112.1496 (1b) - (3b)
First floor	35.5000 (1c)	x 3.0700 (2c)	= 108.9850 (1c) - (3c)
Second floor	35.5000 (1d)	x 2.9200 (2d)	= 103.6600 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	116.0400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 324.7946 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					4 * 10 = 40.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					Air changes per hour 40.0000 / (5) = 0.1232 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3732 (18)
Number of sides sheltered					1 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.9250 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3452 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4401	0.4315	0.4228	0.3797	0.3711	0.3279	0.3279	0.3193	0.3452	0.3711	0.3883	0.4056 (22b)
Effective ac	0.5968	0.5931	0.5894	0.5721	0.5688	0.5538	0.5538	0.5510	0.5596	0.5688	0.5754	0.5822 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.2600	1.0000	2.2600		(26)
TER Opening Type (Uw = 1.40)			25.4700	1.3258	33.7670		(27)
TER Room Window (Uw = 1.70)			1.2700	1.5918	2.0215		(27a)
Heat Loss Floor 1			45.0400	0.1300	5.8552		(28a)
External Wall 1 GF	47.5600	12.5900	34.9700	0.1800	6.2946		(29a)
External Wall 2 (FF)	53.4200	7.2600	46.1600	0.1800	8.3088		(29a)
External Wall 3 (SF)	50.8100	7.8800	42.9300	0.1800	7.7274		(29a)
External Roof 1	37.2000	1.2700	35.9300	0.1300	4.6709		(30)
External Roof 2 (1st Floor)	11.0500		11.0500	0.1300	1.4365		(30)
Total net area of external elements Aum(A, m ²)			245.0800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	72.3420		(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K		250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)		21.0000 (36)
Total fabric heat loss	(33) + (36) =	93.3420 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)		
(38)m	Jan 63.9706	Feb 63.5675
Heat transfer coeff	Mar 63.1725	Apr 61.3168
Average = Sum(39)m / 12 =	May 60.9697	Jun 59.3535
	Jul 59.3535	Aug 59.0542
	Sep 59.9760	Oct 60.9697
	Nov 61.6720	Dec 62.4063 (38)
		155.7482 (39)
		154.6572 (39)
HLP	Jan 1.3557	Feb 1.3522
HLP (average)	Mar 1.3488	Apr 1.3328
Days in month	May 1.3298	Jun 1.3159
	Jul 1.3159	Aug 1.3133
	Sep 1.3213	Oct 1.3298
	Nov 1.3359	Dec 1.3422 (40)
		1.3328 (40)
		31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy		2.8466 (42)
Average daily hot water use (litres/day)		101.8073 (43)
Daily hot water use	Jan 111.9880	Feb 107.9157
Energy conte	Mar 103.8434	Apr 99.7711
Energy content (annual)	May 95.6989	Jun 91.6266
Distribution loss (46)m = 0.15 x (45)m	Jul 91.6266	Aug 95.6989
	Sep 99.7711	Oct 103.8434
	Nov 107.9157	Dec 111.9880 (44)
		135.6817
		148.1071
		160.8348 (45)
		1601.8251 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF TARGET EMISSIONS 09 Jan 2014

	24.9112	21.7875	22.4828	19.6010	18.8077	16.2296	15.0391	17.2576	17.4637	20.3522	22.2161	24.1252 (46)
Water storage loss:												
Store volume												170.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5003 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8102 (55)
Total storage loss												
	25.1153	22.6848	25.1153	24.3051	25.1153	24.3051	25.1153	25.1153	24.3051	25.1153	24.3051	25.1153 (56)
If cylinder contains dedicated solar storage												
	25.1153	22.6848	25.1153	24.3051	25.1153	24.3051	25.1153	25.1153	24.3051	25.1153	24.3051	25.1153 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month												
	214.4527	188.9462	198.2629	177.4907	173.7621	155.0144	148.6383	163.4282	163.2417	184.0594	194.9243	209.2125 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
								Solar input (sum of months) = Sum(63)m =				0.0000 (63)
Output from w/h												
	214.4527	188.9462	198.2629	177.4907	173.7621	155.0144	148.6383	163.4282	163.2417	184.0594	194.9243	209.2125 (64)
								Total per year (kWh/year) = Sum(64)m =				2171.4335 (64)
Heat gains from water heating, kWh/month												
	93.9221	83.2525	88.5390	80.9027	80.3925	73.4293	72.0388	76.9565	76.1649	83.8163	86.6993	92.1797 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	142.3311	142.3311	142.3311	142.3311	142.3311	142.3311	142.3311	142.3311	142.3311	142.3311	142.3311	142.3311 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	24.9590	22.1684	18.0285	13.6488	10.2026	8.6135	9.3072	12.0978	16.2376	20.6174	24.0636	25.6527 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	279.9643	282.8695	275.5486	259.9633	240.2896	221.7991	209.4464	206.5412	213.8621	229.4474	249.1211	267.6115 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.2331	37.2331	37.2331	37.2331	37.2331	37.2331	37.2331	37.2331	37.2331	37.2331	37.2331	37.2331 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-113.8649	-113.8649	-113.8649	-113.8649	-113.8649	-113.8649	-113.8649	-113.8649	-113.8649	-113.8649	-113.8649	-113.8649 (71)
Water heating gains (Table 5)	126.2394	123.8876	119.0040	112.3648	108.0544	101.9851	96.8264	103.4361	105.7846	112.6563	120.4157	123.8975 (72)
Total internal gains	499.8620	497.6248	481.2805	454.6762	427.2460	401.0971	384.2792	390.7745	404.5837	431.4205	462.2997	485.8611 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
East				7.5800	19.6403		0.6300		0.7000		0.7700		45.4976 (76)
South				5.0000	46.7521		0.6300		0.7000		0.7700		71.4402 (78)
West				12.8900	19.6403		0.6300		0.7000		0.7700		77.3699 (80)
Horizontal				1.2700	26.0000		0.6300		0.7000		1.0000		13.1056 (82)
Solar gains	207.4133	384.5749	593.2583	821.3496	979.8070	993.9853	949.8312	831.7060	674.0220	444.6656	254.5164		173.3565 (83)
Total gains	707.2754	882.1997	1074.5388	1276.0258	1407.0530	1395.0824	1334.1105	1222.4804	1078.6057	876.0861	716.8161		659.2175 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	51.2250	51.3566	51.4862	52.1039	52.2212	52.7739	52.7739	52.8775	52.5596	52.2212	51.9846	51.7395
alpha	4.4150	4.4238	4.4324	4.4736	4.4814	4.5183	4.5183	4.5252	4.5040	4.4814	4.4656	4.4493
util living area	0.9978	0.9938	0.9805	0.9346	0.8255	0.6516	0.4921	0.5527	0.8103	0.9687	0.9951	0.9984 (86)
MIT	19.5011	19.7124	20.0503	20.4683	20.7856	20.9465	20.9879	20.9801	20.8557	20.4074	19.8716	19.4686 (87)
Th 2	19.7975	19.8002	19.8028	19.8152	19.8176	19.8284	19.8284	19.8304	19.8242	19.8176	19.8128	19.8079 (88)
util rest of house	0.9970	0.9916	0.9735	0.9110	0.7671	0.5517	0.3669	0.4224	0.7254	0.9529	0.9930	0.9978 (89)
MIT 2	17.8176	18.1273	18.6176	19.2121	19.6187	19.7953	19.8244	19.8230	19.7148	19.1432	18.3695	17.7771 (90)
Living area fraction									fLA = Living area / (4) =			0.1368 (91)
MIT	18.0478	18.3441	18.8135	19.3839	19.7783	19.9528	19.9835	19.9812	19.8708	19.3161	18.5749	18.0085 (92)
Temperature adjustment												0.0000
adjusted MIT	18.0478	18.3441	18.8135	19.3839	19.7783	19.9528	19.9835	19.9812	19.8708	19.3161	18.5749	18.0085 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9951	0.9876	0.9653	0.9001	0.7649	0.5630	0.3840	0.4399	0.7293	0.9436	0.9896	0.9964 (94)
Useful gains	703.8435	871.2528	1037.2927	1148.6071	1076.2379	785.4455	512.2727	537.8162	786.6359	826.6398	709.3724	656.8415 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W												
	2162.7051	2109.5070	1927.2481	1621.4289	1246.5711	817.3430	516.6509	545.7662	884.7690	1344.9925	1778.7698	2150.6449 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh												
	1085.3930	832.1068	662.1268	340.4317	126.7279	0.0000	0.0000	0.0000	0.0000	385.6544	769.9661	1111.3898 (98)
Space heating												5313.7965 (98)
Space heating per m2										(98) / (4) =		45.7928 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF TARGET EMISSIONS 09 Jan 2014

8c. Space cooling requirement

Not applicable

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													5683.2049 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	1085.3930	832.1068	662.1268	340.4317	126.7279	0.0000	0.0000	0.0000	0.0000	385.6544	769.9661	1111.3898	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	1160.8482	889.9538	708.1570	364.0980	135.5379	0.0000	0.0000	0.0000	0.0000	412.4646	823.4932	1188.6522	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	214.4527	188.9462	198.2629	177.4907	173.7621	155.0144	148.6383	163.4282	163.2417	184.0594	194.9243	209.2125	(64)
Efficiency of water heater (217)m	88.5413	88.3088	87.7876	86.5242	83.9879	79.8000	79.8000	79.8000	79.8000	86.7424	88.1132	79.8000	(216)
Fuel for water heating, kWh/month	242.2064	213.9607	225.8440	205.1343	206.8895	194.2536	186.2636	204.7973	204.5636	212.1908	221.2202	236.0846	(219)
Water heating fuel used												2553.4086	(219)
Annual totals kWh/year													
Space heating fuel - main system												5683.2049	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												440.7841	(232)
Total delivered energy for all uses												8752.3976	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	5683.2049	0.2160	1227.5722	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2553.4086	0.2160	551.5363	(264)
Space and water heating			1779.1085	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	440.7841	0.5190	228.7670	(268)
Total CO2, kg/m2/year			2046.8005	(272)
Emissions per m2 for space and water heating			15.3319	(272a)
Fuel factor (electricity)			1.5500	
Emissions per m2 for lighting			1.9714	(272b)
Emissions per m2 for pumps and fans			0.3354	(272c)
Target Carbon Dioxide Emission Rate (TER) = (15.3319 * 1.55) + 1.9714 + 0.3354, rounded to 2 d.p.			26.0700	(273)

Project name

Shell and Core

Retail

As designed

Date: Tue Jul 18 13:41:44 2023

Administrative information

Building Details

Address: Retail, London, N15,

Certifier details

Name: Nimco Ali

Telephone number: 02036031613

Address: Trinity Court Batchworth Island Church Street,
Rickmansworth, WD3 1RT

Certification tool

Calculation engine: SBEM

Calculation engine version: v6.1.d.0

Interface to calculation engine: DesignBuilder SBEM

Interface to calculation engine version: v7.1.3

BRUKL compliance module version: v6.1.d.0

Foundation area [m²]: 127.63The CO₂ emission and primary energy rates of the building must not exceed the targets

Target CO ₂ emission rate (TER), kgCO ₂ /m ² .annum	4.57
Building CO ₂ emission rate (BER), kgCO ₂ /m ² .annum	2.44
Target primary energy rate (TPER), kWh/m ² .annum	49.52
Building primary energy rate (BPER), kWh/m ² .annum	25.64
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	0.19	0.25	00 Ground Floor - Retail_W_7
Floors	0.18	0.09	0.09	00 Ground Floor - Retail_S_2
Pitched roofs	0.16	-	-	No heat loss pitched roofs
Flat roofs	0.18	0.14	0.14	00 Ground Floor - Retail_R_3
Windows** and roof windows	1.6	1	1	00 Ground Floor - Retail_G_6
Rooflights***	2.2	-	-	No external rooflights
Personnel doors [^]	1.6	-	-	No external personnel doors
Vehicle access & similar large doors	1.3	-	-	No external vehicle access doors
High usage entrance doors	3	-	-	No external high usage entrance doors

U_{a-Limit} = Limiting area-weighted average U-values [W/(m²K)]U_{a-Calc} = Calculated area-weighted average U-values [W/(m²K)]U_{i-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
m ³ /(h.m ²) at 50 Pa	8	3

Building services

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

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

1- VRF

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4.3	6.7	-	-	-
Standard value	2.5*	5	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					

1- Project DHW

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	1	-
Standard value	1	N/A

1- CHP 1

	CHPQA quality index	CHP electrical efficiency
This building	110	0.36
Standard value	N/A	N/A

Zone-level mechanical ventilation, exhaust, and terminal units

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

Zone name	SFP [W/(l/s)]										HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		Zone	Standard
Standard value	0.3	1.1	0.5	2.3	2	0.5	0.5	0.4	1			
00 Ground Floor - Retail	-	-	-	-	1.2	-	-	-	-		0.85	N/A

Shell and core configuration

Zone	Assumed shell?
00 Ground Floor - Retail	NO

General lighting and display lighting	General luminaire	Display light source	
Zone name	Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m²]
Standard value	95	80	0.3
00 Ground Floor - Retail	110	110	1.364

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

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
00 Ground Floor - Retail	NO (-29.2%)	NO

Regulation 25A: Consideration of high efficiency alternative energy systems

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

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m ²]	127.6	127.6
External area [m ²]	396	396
Weather	LON	LON
Infiltration [m ³ /hm ² @ 50Pa]	3	3
Average conductance [W/K]	87.28	102.96
Average U-value [W/m ² K]	0.22	0.26
Alpha value* [%]	21.39	15.93

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

Building Use

% Area Building Type

100	Retail/Financial and Professional Services
	Restaurants and Cafes/Drinking Establishments/Takeaways
	Offices and Workshop Businesses
	General Industrial and Special Industrial Groups
	Storage or Distribution
	Hotels
	Residential Institutions: Hospitals and Care Homes
	Residential Institutions: Residential Schools
	Residential Institutions: Universities and Colleges
	Secure Residential Institutions
	Residential Spaces
	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	3.62	6.84
Cooling	4.94	6.06
Auxiliary	4.59	3.44
Lighting	11.44	15.41
Hot water	1.7	1.7
Equipment*	20.26	20.26
TOTAL **	26.28	33.46

* 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	9.03	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
<i>Displaced electricity</i>	<i>9.03</i>	<i>0</i>

Energy & CO₂ Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m ²]	143.89	161.09
Primary energy [kWh/m ²]	25.64	49.52
Total emissions [kg/m ²]	2.44	4.57

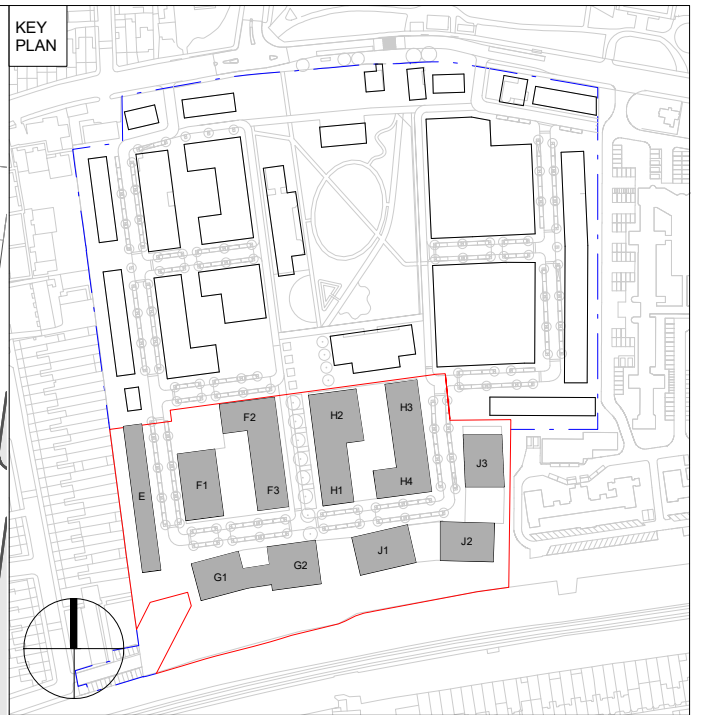
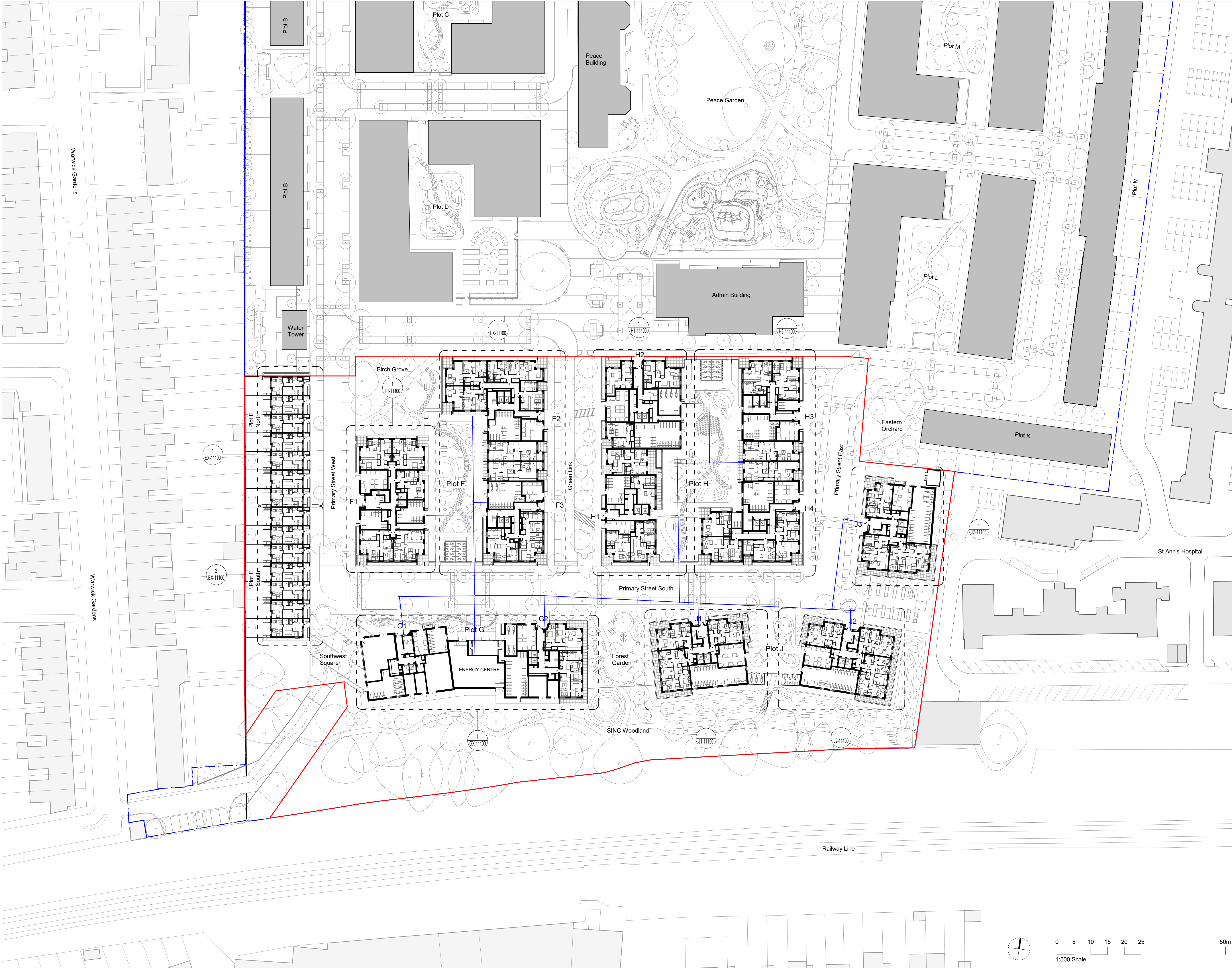
HVAC Systems Performance										
System Type	Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEFF	Cool SSEER	Heat gen SEFF	Cool gen SEER	
[ST] Split or multi-split system, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	54.9	89	3.6	4.9	4.6	4.22	5.01	4.3	6.7
	Notional	65	96.1	6.8	6.1	3.4	2.64	4.4	----	----

Key to terms

Heat dem [MJ/m2]	= Heating energy demand
Cool dem [MJ/m2]	= Cooling energy demand
Heat con [kWh/m2]	= Heating energy consumption
Cool con [kWh/m2]	= Cooling energy consumption
Aux con [kWh/m2]	= Auxiliary energy consumption
Heat SSEFF	= Heating system seasonal efficiency (for notional building, value depends on activity glazing class)
Cool SSEER	= Cooling system seasonal energy efficiency ratio
Heat gen SSEFF	= Heating generator seasonal efficiency
Cool gen SSEER	= Cooling generator seasonal energy efficiency ratio
ST	= System type
HS	= Heat source
HFT	= Heating fuel type
CFT	= Cooling fuel type

Appendix F

Indicative Primary Pipe Route



DO NOT SCALE FROM THIS DRAWING.
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Please read in conjunction with landscape architects drawings and information.

— SITE BOUNDARY OF PHASE 1B & 2 APPLICATION
- - - SITE BOUNDARY OF HYBRID PLANNING APPLICATION

DRAFT

P02 S2 Planning Design Freeze	23/06/23
P01 S2 Stage 2 Design Freeze	27/04/23
Rev	Status Reason for Issue Date

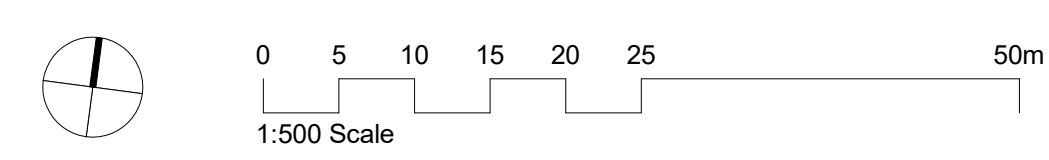
Karakusevic Carson Architects
Studio 501
37 Greiner St
Hackney
London E2 8HD
mail@karakusevic-carson.com | 0207 566 6300

PROJECT
St. Ann's New Neighbourhood Phase 1B & 2

TITLE
Ground Floor Plan, Proposed

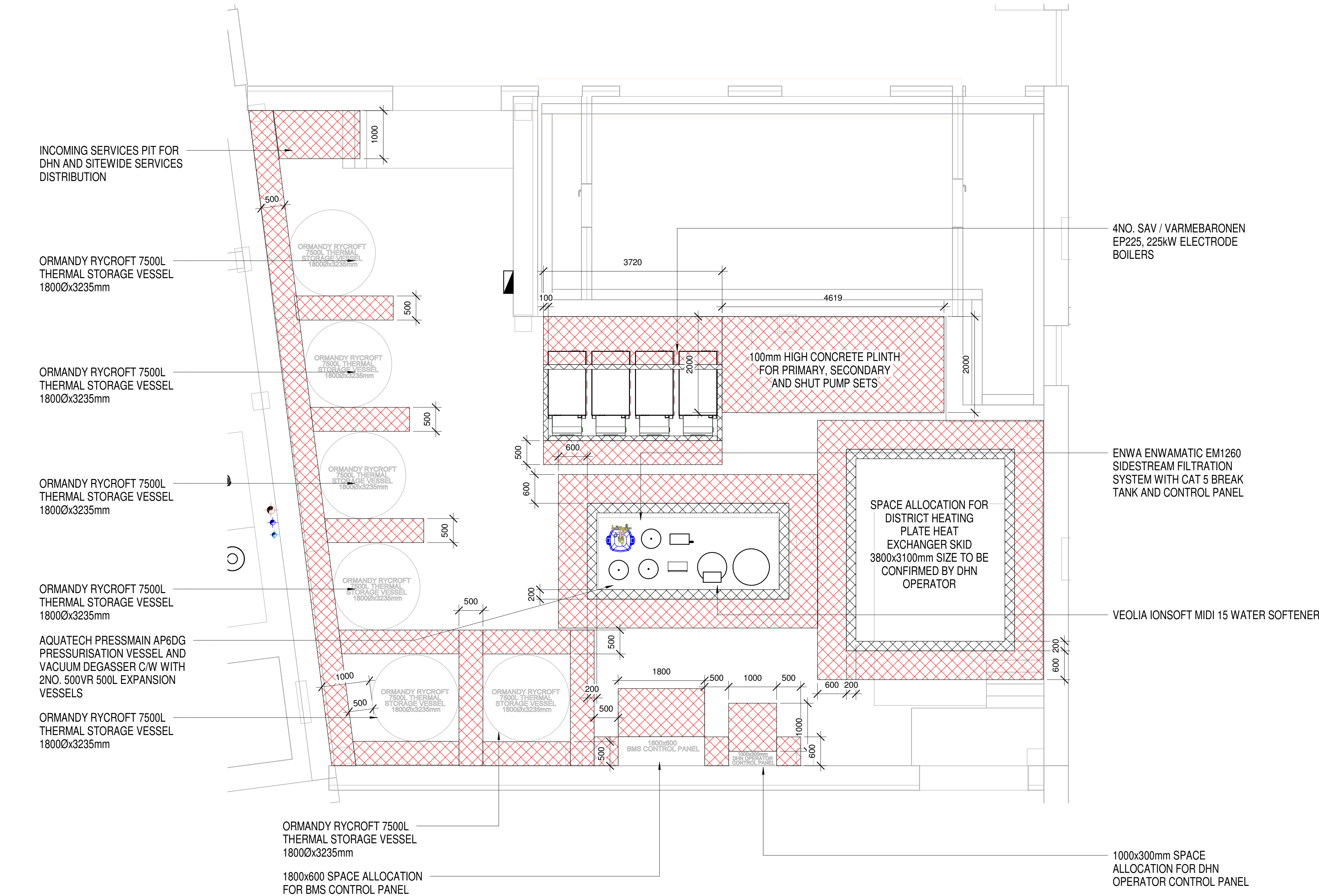
DRAWING NUMBER							REVISION
N15302-KCA-ZZ-00-DR-A-10000							P02
Project N°	Originator	Zone	Level	Type	Role	Drawing Number	

STATUS	REVISION DATE	DRAWN BY	SCALE
S2 - Suitable for information	23/06/23	NK	1 : 500 @ A1
	27/04/23	MB / SP	KCA PROJECT NUMBER 633



Appendix G

Block G Roof Plan & Energy Centre Layout



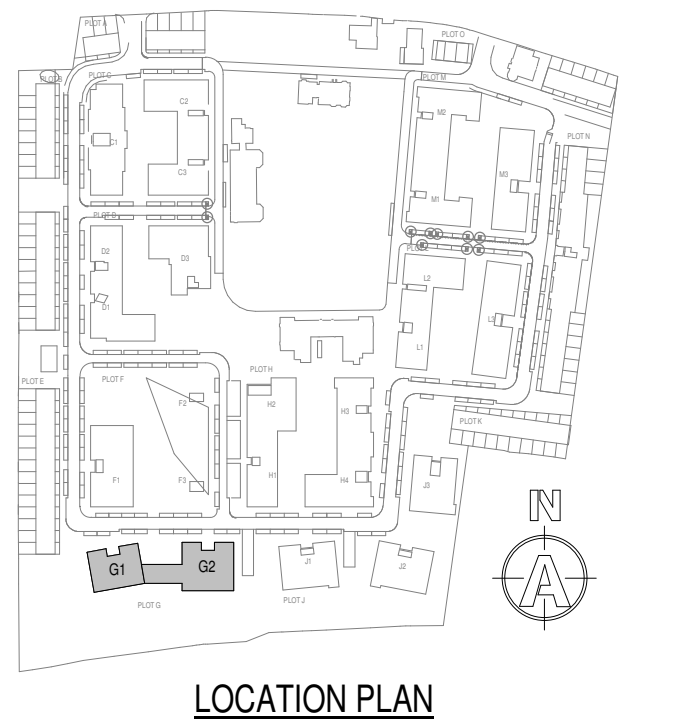
1 Plan
1 : 50

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Model: N15302-KCA-G2-ZZ-M3-A-01000.lfc Rev: P02 Dated: 03/07/23



Drawing Status:			
PRELIMINARY			
P01	PRELIMINARY ISSUE	Jul. 23	DH
Rev	Description	Date	By

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Tollgate West
Colchester, C03 8AQ
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E: info@awaconsultants.co.uk
W: www.awaconsultants.co.uk

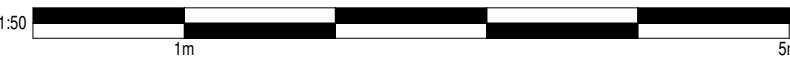
Contract Title
**ST ANN'S HOSPITAL,
ST ANN'S ROAD, LONDON
N15 3TH**

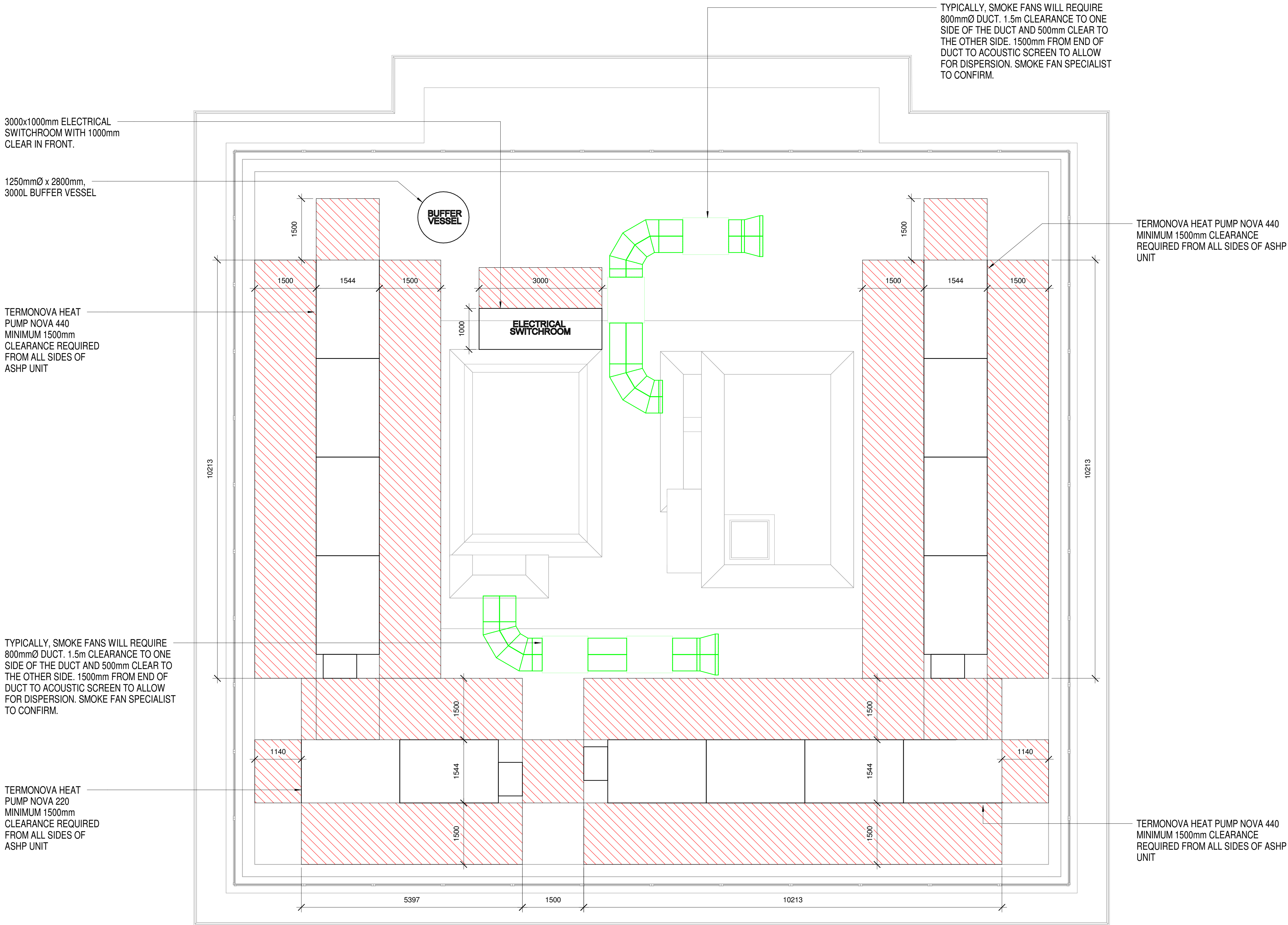
Drawing Title
**BLOCK G2
ENERGY CENTRE LAYOUT**

Drawn	Checked	Scale	Date
SC	KL	1 : 50 @ A1	July '23

MECHANICAL SERVICES

Model Name		N15302-AWA-ZZ-ZZ-M3-ME-00001.rvt		Project No.		22082	
Drawing Number				Status		Revision	
N15302-AWA-G2-00-DR-M-51002				S1		P01	





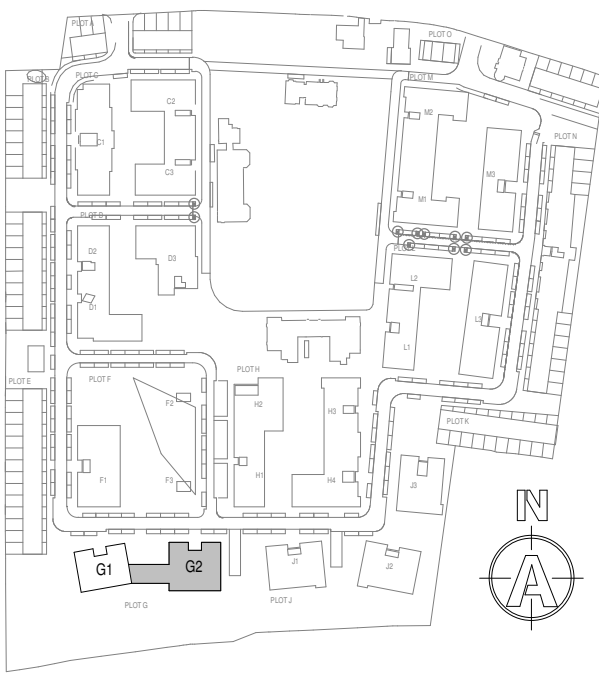
1 PLAN
1 : 50

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Model: N15302-KCA-G2-ZZ-M3-A-01000.lfc Rev: P02 Dated: 03/07/23



LOCATION PLAN

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**BLOCK G2
ROOF PLANT LAYOUT**

Drawn	Checked	Scale	Date
SC	KL	1 : 50 @ A1	Jul. 23

MECHANICAL SERVICES

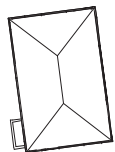
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		S1	P01



Appendix H

Phase 1B & 2 Roofplan – PV Areas

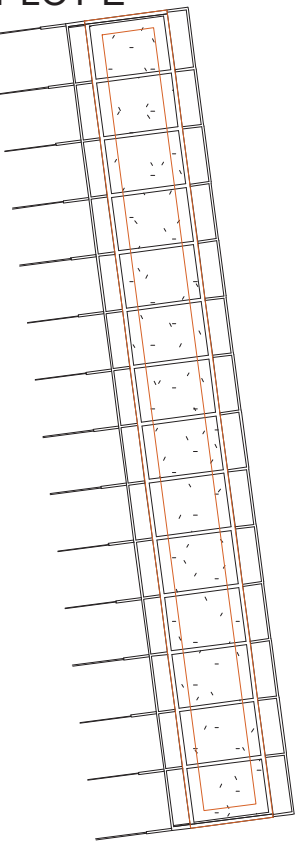
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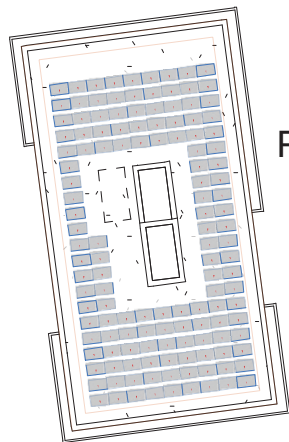
WATER
TOWER

D1

PLOT E

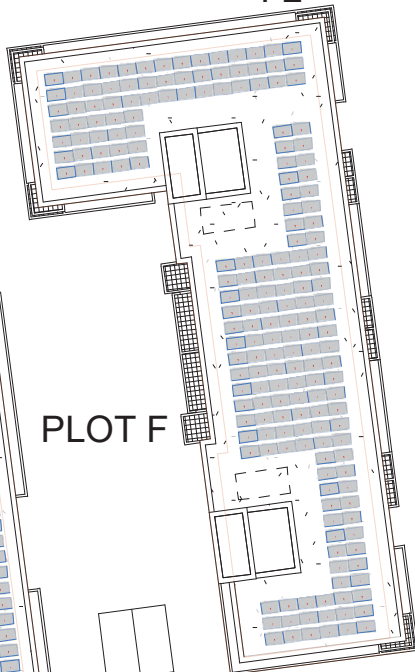


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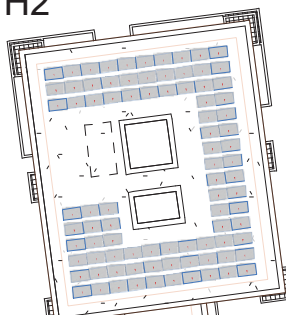
PLOT F

F2

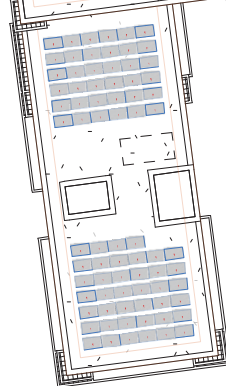


F3

H2



H1

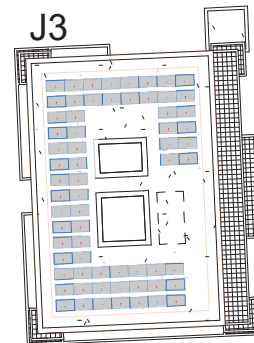


PLOT H

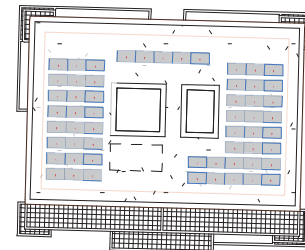
H4



J3

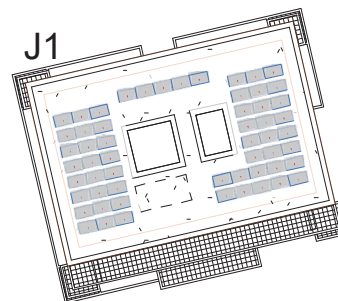


J2

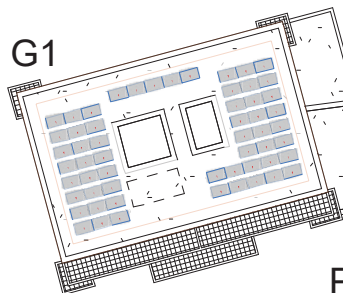


PLOT J

J1

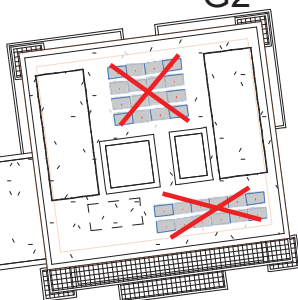


G1



PLOT G

G2



No PV on Block G
- Heat Pump
Location