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**Revised Energy
Statement:
Condition 23A**

London Square

The Hyde - Phase 1

Final v1

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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.

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Executive Summary

The energy strategy proposed for Phase 1 of the consented development site at The Hyde in the London Borough of Barnet, has been formulated following The London Plan Energy Hierarchy: **Be Lean, Be Clean** and **Be Green**. This document outlines the proposed change to the energy strategy for Phase 1 showing a significant improvement in CO₂ reductions over the original consented strategy. This report intends to discharge condition 23 Part A.

Existing consent has already been granted for Phase 1 of the development (Application number: 18/0352/FUL) following the energy strategy outlined in the Revised Energy Statement (Planning Issue 2) by Watkins Payne dated October 2018.

Phase 1 comprises of 1.02 hectares, 244 residential dwellings and 193 sqm of flexible commercial floorspace.

The consented energy statement (Watkins Payne, October 2018) described a strategy which used a heat network supplied by gas boilers. It also included PV panels to be installed on the rooftops of the development. This strategy enabled the development to achieve a 26.94% reduction in CO₂ emissions over the baseline Part L 2013 target (using SAP 2012 emission factors).

To allow further CO₂ savings to be made, a change to the heating strategy is proposed.

The new energy strategy is summarised as follows:

- > The retained heat network has changed from gas boiler to 100% heat demand supplied by air source heat pumps (ASHP);
- > Most up to date SAP 10.2 carbon factors will be used.

As can be seen in the table below this new strategy improves on the previous energy strategy significantly:

Summary Table – Phase 1	
	Regulated CO ₂ (kg/yr)
Residential & Non-Residential	
Baseline (TER)	263,221
Following <i>Be Lean</i> Measures	227,723
Following <i>Be Clean</i> Measures	59,309
Following <i>Be Green</i> Measures	59,309
% Improvement	77.46%

Further, the table highlights the Phase 1 performance only. The remaining Phase 2-3 has outline consent only and is not covered in this report. The energy strategy for these remaining phases will be addressed in a reserved matters application (RMA) at detailed application stage. If Phases 2-3 are required to go through future iterations of building regulations and planning policy, then the network would need to be future proofed to address these requirements.

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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 London Square (The ‘Developer’) for Phase 1 of The Hyde development site and henceforth referred to as ‘the site’, located in the London Borough of Barnet.
- 1.3** Detailed consent has already been granted for Phase 1 of the development at The Hyde (Application number: 18/0352/FUL) following the energy strategy outlined in the Revised Energy Statement (Planning Issue 2) by Watkins Payne dated October 2018. Phases 2 and 3 of the site are consented in outline. The updated energy strategy described below to discharge condition 23 Part A incorporates the changes proposed by The Developer and design team which will safeguard the long-term ambitions for the site and show further CO₂ improvements beyond the original energy strategy.
- 1.4** As set out in the 2018 Energy Statement, the strategy proposed for the site has been formulated in line with the following approach:
- > Initially implementing **Be Lean** measures to reduce energy consumption through improvements to building fabric performance and auxiliary systems; then
 - > Consideration, and implementation of, **Be Clean** options, including the use of decentralised energy generation;
 - > Following the heating hierarchy to enable the specification of appropriate heat generating technologies that enable significant CO₂ reductions and provide a robust, resilient & affordable supply of heat to residents. The selection of the heating source needs to be future-proofed so as to enable the delivery of future phases which may be subject to a differing set of standards;
 - > Reviewing the feasibility of **Be Green** measures, in order to generate renewable energy, and implementing them where appropriate.
- 1.5** All calculations will be undertaken against a Part L 2013 baseline, using SAP 10.2 emission factors.

2. DEVELOPMENT OVERVIEW

Site Location

- 2.1 Phase 1 of the development site at The Hyde in the London Borough of Barnet. Phase 1 fronts Edgware Road (A5), on the south a car dealership and garage, and Hyde Estate Road to the East, as shown in Figure 1 below.



Figure 1: Site Location from Google Maps © (2022)

Consented Development

- 2.2 Phase 1 of the consented development at The Hyde comprises of 1.02 hectares of the Site for 244 residential dwellings (Use Class C3); 193 sqm of flexible commercial floorspace (within Use Class A1, A2, A3, B1, D1, and D2); with associated road layout and means of access, car parking, amenity space, landscaping, and other associated works and improvements.
- 2.3 Figure 2 below illustrates the current Phase 1 site plan.

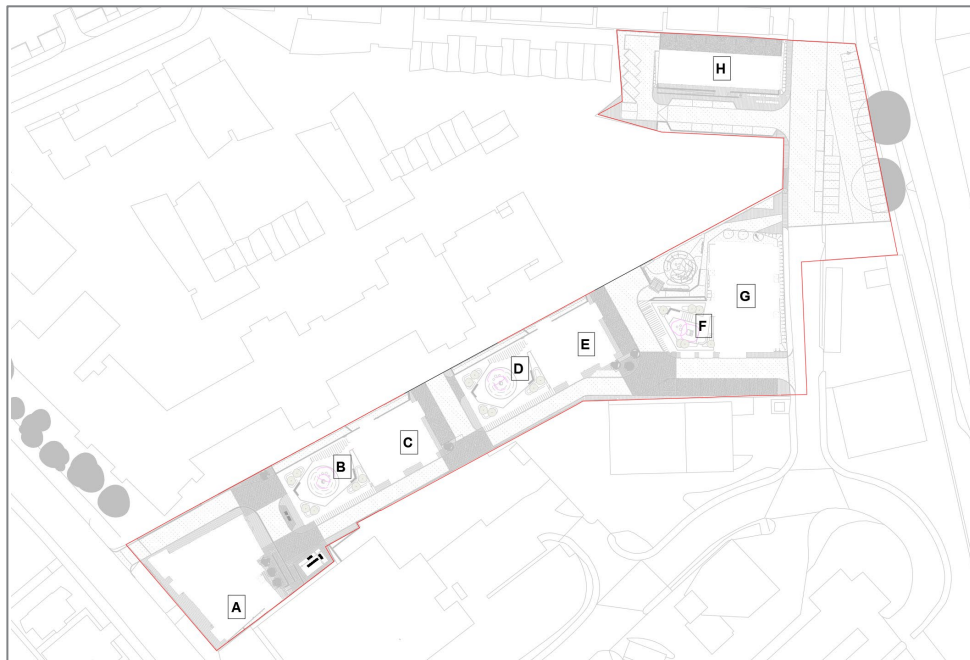


Figure 2: Proposed Site Layout – (CGCT Studios, 2022)

3. RELEVANT PLANNING CONTEXT

Existing consent

- 3.1 The site was granted hybrid planning permission in February 2018 (Application number: 18/0352/FUL). This Statement responds specifically to the following planning condition, in relation to the energy strategy (*Planning Issue 2*) produced by Watkins Payne dated October 2018 for the development:

Condition 23 Part A states – “Energy Provision for the detailed element of the scheme shall be in accordance with the Revised Energy Statement (*Planning Issue 2*)”.

This energy statement described a strategy which used a heat network supplied by gas boilers. It also included PV panels to be installed on the rooftops of the development.

Updated strategy

- 3.2 To allow further CO₂ savings to be made, a change to the heating strategy is proposed. The revised energy strategy will retain the single site heat network, however 100% of heat demand is now proposed to be supplied by air source heat pumps (ASHP), in line with the developer’s decision to move away from gas altogether. A heat network with no reliance on gas aligns with future proofing the site and an ASHP networks serves further to decarbonise the Phase 1 development.
- 3.3 PV panels will no longer be installed. Carbon reductions already good and improved over the original strategy. Even with additional PV further carbon reduction would not be significant.
- 3.4 Other parts of the strategy, such as the fabric, remain as the consented strategy.
- 3.5 This Statement therefore serves to act as an update to the energy strategy for Phase 1 which was prepared in 2018, outlining the proposed heating system to replace gas boilers.

4. BUILDING REGULATIONS BASELINE

- 4.1 This report first establishes a baseline assessment of the energy demands and associated CO₂ emissions based on Part L (2013) of the Building Regulations.
- 4.2 The estimated annual energy demand for the residential portion of the development has been calculated using Standard Assessment Procedure (SAP 2012) methodology. SAP calculates the Regulated energy demands associated with hot water, space heating and fixed electrical items. The Unregulated energy demands for appliances and cooking are taken from BRE methodology.
- 4.3 SAP calculations have been carried out for representative home types. These houses, mid floor, top floor and corner flats, at different orientations, and therefore represent a fair aggregation of the unit mix of the site. In order to provide energy demands across Phase 1, the accommodation schedule has been used to extrapolate the energy performance across Phase 1 of the development.
- 4.4 The estimated annual energy demand for the proposed non-residential aspects has been calculated using Simplified Building Energy Model methodology. The unregulated energy demands for appliances and cooking are taken from additional SBEM output documents.

SAP CO₂ Emission Factors

- 4.5 Sap 10.2 emission factors are the most up to date. The BRE SAP 10.2 manual states that these ‘emission factors and primary energy factors for electricity are a 5-year projection for 2020-2025’. The table below shows the SAP 10.2 CO₂ factors.

Table 1: SAP 10.2 CO₂ Emission factors

	SAP 10.2
Gas CO ₂ factor (kg CO ₂ /kWh)	0.210
Electricity CO ₂ factor (kg CO ₂ /kWh)	0.136

Baseline Emissions

- 4.6 A baseline calculation has been carried out to establish the Regulated CO₂ emissions by which this energy strategy will be compared against. As explained, SAP 10.2 emission factors have been utilised in this energy strategy. Calculations have been undertaken on the energy demands taken from SAP and SBEM outputs in order to convert the output Target Emission Rate (TER) and Dwelling/Building Emission Rate (DER/BER) figures in line with these SAP 10.2 factors.
- 4.7 The tables below show the Regulated and Total baseline CO₂ emissions rates for Phase 1.

Table 2: TER Baseline Case

Phase 1 – Baseline CO ₂ emissions (kg CO ₂ per annum)	
	Regulated
Residential	
Baseline (TER)	261,437
Non-Residential	
Baseline (TER)	1,784

5. BE LEAN: DEMAND REDUCTION

- 5.1 In line with the London Plan Energy Hierarchy, a number of **Be Lean** measures are proposed in order to reduce energy demands across the development.
- 5.2 Phase 1 of the development is already under construction and therefore will follow the measures set out in the consented 2018 Energy Statement (*Planning Issue 2*) produced by Watkins Payne, which will meet the Part L 2013 baseline.
- 5.3 The proposed servicing strategies for the shell non-domestic units will fall under the responsibility of future tenants. However, as the developer is responsible for the fabric elements, these will meet the requirements outlined within this section of the Energy Statement.

Residential

Fabric Performance

5.4 The target U-values remains as follows:

- > External wall u-value: 0.15 W/m².K;
- > Roof u-value: 0.12 W/m².K;
- > Ground and exposed floors u-value: 0.20 W/m².K;
- > Residential Glazing u-value: 1.3 W/m².K;
- > Residential Glazing g-value/Lt: 0.5/0.75;

Air Tightness & Ventilation

- 5.5 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 $10 \text{ m}^3/\text{h.m}^2$ to $3.0 \text{ m}^3/\text{h.m}^2$ or less for all dwellings will further reduce space heating requirements.
- 5.6 Phase 1 dwellings will utilise highly efficient mechanical ventilation with heat recovery (MVHR) units, with efficiencies of above 89%, and SFPs of 0.59 (for 2 wet rooms) targeted.
- 5.7 The Figure below demonstrates the principles of MVHR operation.

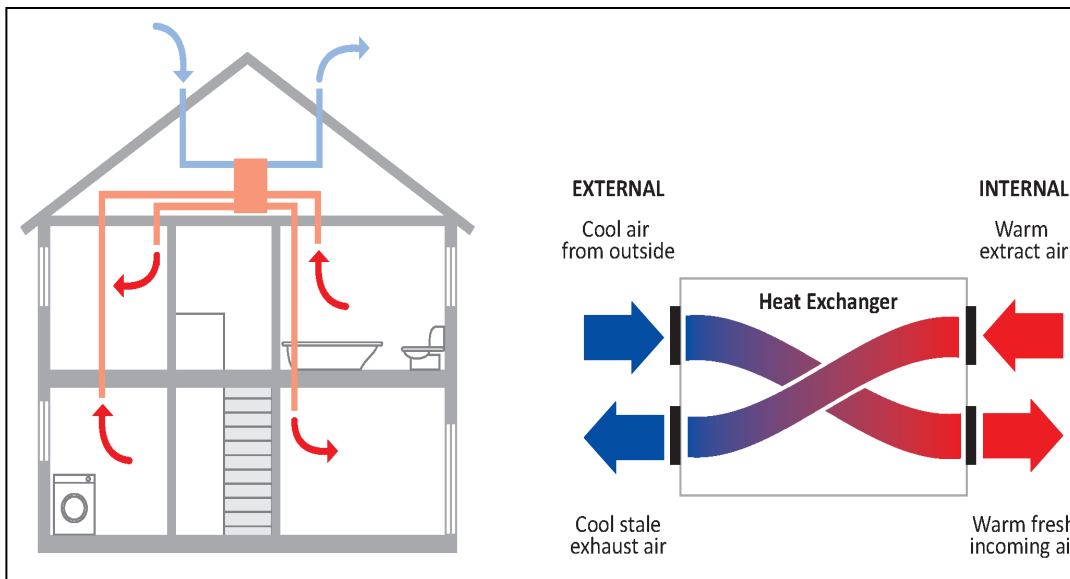


Figure 3: MVHR in Operation

- 5.8 Additionally, all homes are assumed to have openable windows and therefore the ability to naturally ventilate should the occupant desire. This will facilitate convective ventilation and night purging of heat, as illustrated in the Figure below.

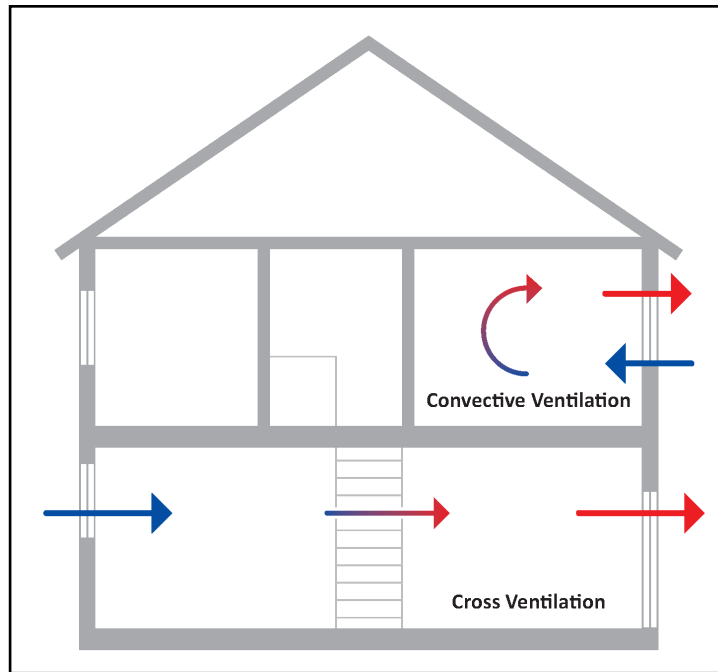


Figure 4: Natural Ventilation

Thermal Bridging

- 5.9** In well insulated buildings, as much as 30% of heat loss can occur through thermal bridges, which arise when elements are disrupted by changes in construction or penetrations through the insulation layer.
- 5.10** Part L1A now places increased importance on addressing heat losses through thermal bridging. As such, the developer is committed to develop a building fabric where these are minimised as far as practicable. Figure 5 illustrates the benefits of reducing thermal bridges.

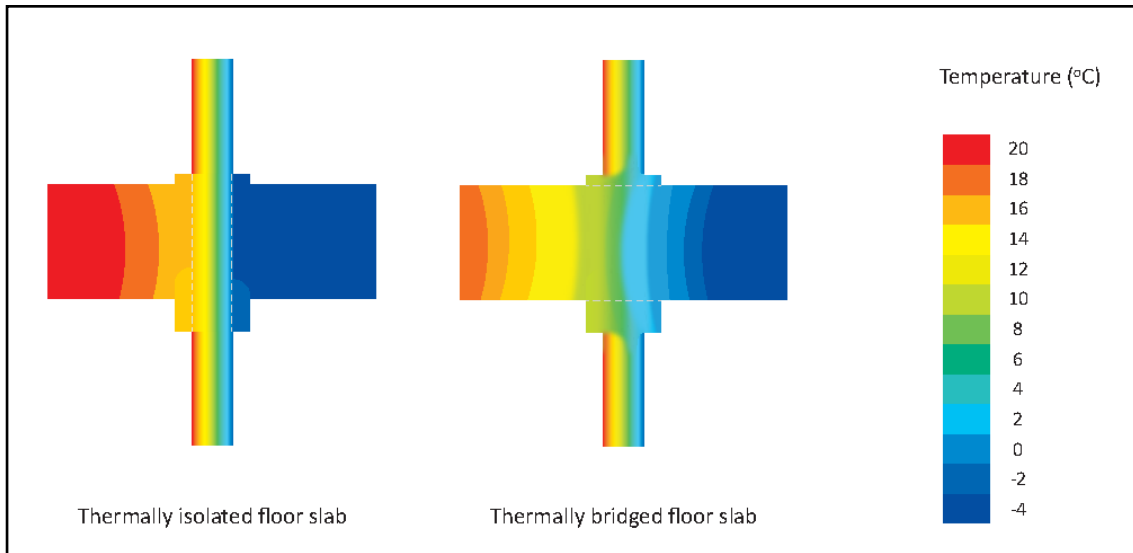


Figure 5: Thermal Bridging

5.11 It is anticipated that a mix of default, ACD and bespoke psi-values are targeted.

Space Heating & Hot Water

5.12 The site will include a communal heat network to which all dwellings will connect. at the **Be Lean** stage a community system with all heat originating from gas boilers (94.98% efficiency) has been assumed.

Lighting

5.13 Energy efficient lighting will be installed in 100% of internal fittings in the homes.

Unregulated Energy Demands

5.14 Unregulated energy demands are typically defined as the energy needed for cooking and powering appliances within the home. There is difficulty in reducing the energy associated with these uses as they are 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.

Mitigation Against Overheating

5.15 As per the energy strategy (*Planning Issue 2*) produced by Watkins Payne dated October 2018 no adverse overheating risk was identified.

- 5.16** The specification of passive measures includes the air tightness and U-values set out earlier in this section, as well as beneficial aspects such as balcony shading, openable windows, and solar control glazing reduces unwanted solar heat gains.

Non-Residential

- 5.17** The specification below applies to areas of the site that will be assessed against Part L2 of the Building Regulations. It is reiterated that the units will be constructed to shell & core stage by The Developer, with fit-out by future tenants. Illustrative servicing strategies are therefore outlined in this section.

Insulation Standards

- 5.18** For the non-residential areas U-values will be improved beyond the limiting U-values detailed in Part L2A. Example currently targeted values are:
- > External wall u-value: 0.15 W/m²K;
 - > Roof u-value: 0.12 W/m²K;
 - > Ground and exposed floors u-value: 0.20 W/m²K;
 - > Retail Glazing u-value: 1.4 W/m²K;
 - > Retail Glazing g-value/Lt: 0.35/0.65;

Air Tightness and Ventilation

- 5.19** 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 10m³/hm² to less than 3m³/hm² would further reduce space heating requirements.
- 5.20** Each non-residential area will likely have heat recovery ventilation units with speed control ventilation installed combined with local extract fans for other smaller areas. The selected units could typically have a low Specific Fan Power (SFP) of <1.30 W/l/s and heat exchange efficiency of 85% or more.

Space Heating and Hot Water

- 5.21** Space heating will be sourced from local air source heat pumps.

5.22 Hot water will be provided by a point of use instantaneous electric system.

Cooling and Limiting the Risk of Summer Overheating

5.23 The specification of passive measures such as low fabric U-values and ventilation systems capable of maintaining airflow reduces the demand on the mechanical cooling systems. Low g-values will also reduce unwanted solar heat gains.

5.24 For the non-residential units, air source heat pumps will supply the heating and cooling demand of the units.

5.25 To allow the occupant to efficiently use the systems a central time control with local temperature control should be installed. Sub-metering for the HVAC and lighting should also be considered.

Lighting

5.26 Demand reducing lighting controls such as photoelectric control for areas with extensive glazing and occupancy sensors would also be beneficial as they allow light output to be automatically adjusted to suit prevailing conditions. Specification of these by tenants would assist in achieving the energy performance requirements. LEDs are expected throughout, with minimum efficacy of 100lm/W.

5.27 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. Occupancy sensors will also be provided in suitable rooms.

CO₂ Emissions at *Be Lean* Stage

5.28 The tables below outline the CO₂ emissions following the inclusion of the above energy efficiency measures.

Table 3: Regulated emissions following *Be Lean* measures: Phase 1

Phase 1	
	Regulated CO ₂ (kg/yr)
Residential	
Baseline (TER)	261,437
Following <i>Be Lean</i> Measures	226,352
% Improvement	13.42%
Non-Residential	
Baseline (TER)	1,784
Following <i>Be Lean</i> Measures	1,371
% Improvement	23.15%

5.29 The dwellings also exceed the Target Fabric Energy Efficiency (TFEE) requirements of Building Regulations Part L 2013, as shown in the following table by the representative SAP example dwellings used to formulate this strategy. A focus on high standards of energy efficiency will assist in reducing resident energy bills.

5.30 This table shows the types used to represent the residential plots for Phase 1 at the Hyde development.

Table 4: TFEE/DFEE results for sample dwelling types

Residential - Example Unit Type	Unit Area (m ²)	No. Units	TFEE (kWh/m ² /yr)	DFEE (kWh/m ² /yr)
2 Bed End MF	72.82	96	45.93	40.73
2 Bed End MF	78.14	73	42.56	38.95
1 Bed End MF	70.38	40	63.6	59.4
2 Bed End TF	71.7	14	56.6	51.3
1 Bed End TF	55.86	3	25.9	23.0
Duplex House	70.58	18	41.1	39.7
			47.62	47.62
Reduction Achieved (Area Weighted)			10.71%	

6. BE CLEAN: HEATING INFRASTRUCTURE

- 6.1 The application of decentralised heating networks as a **Be Clean** measure has been evaluated. This is the next step in the Energy Hierarchy after **Be Lean**.

Existing heating strategy

- 6.2 The existing heating strategy, proposed in the energy statement (Planning Issue 2) by Watkins Payne dated October 2018, had an overriding strategy for Phase 1 to be served by communal gas fired boilers serving all Blocks except for the town houses in Block H which will have individual gas boilers.
- 6.3 The energy statement goes on to explain that *“Building H will be a standalone block due to it comprising town houses located such that a communal heating connection isn’t feasible due to land ownership issues. Additionally, the heating and hot water (DHW) demand from the townhouses at Building H do not represent a significant enough demand to justify the additional expense and legal issues associated with the land ownership. When compared with the demand from the elements of the development served by the energy centre (Buildings A-G) the demand of Building H very low.”*

Updated Strategy

- 6.4 It has therefore been concluded that a site heating network with ASHPs is the most suitable alternative to the consented gas boiler strategy with individual ASHPs to serve the Block H townhouses. The updated strategy allows further CO₂ and energy savings, aligns with the ambitions of the developer to provide a gas free site that operates with a future proofed technology that will enable decarbonisation of the site. If Phases 2-3 are required to go through future iterations of Building Regulations and planning policy, then the network would need to be future proofed to address these requirements. Further details of this strategy are set out below:

Network Parameters

- 6.5 The new strategy followed is as below:
- > A heat network change from gas boiler to 100% heat demand supplied ASHP;
 - > ASHP seasonal coefficient of performance (SCOP) of 300%.
- 6.6 Distribution heat loss factor of 1.05, matching those used in the consented strategy and in accordance with SAP 2012 defaults.

- 6.7 Highly insulated distribution pipework to minimise network distribution losses. Well insulated heat interface units (HIUs) will also mean losses will be kept low.
- 6.8 Heat pumps will be located on the roof of Block A. Appendix D shows roof plans with ASHP plant and Block A plant room. All ASHP network plant is in Block A.

CO₂ Emissions at *Be Clean* Stage

- 6.9 The tables below detail the Regulated CO₂ emissions for both the residential and non-residential elements for both at the *Be Clean* stage.
- 6.10 *Be Clean* calculations are shown in Appendix A and worksheets in Appendices E and F.

Table 5: *Be Clean* Emissions

Phase 1	
	Regulated CO ₂ (kg/yr)
Residential	
Baseline (TER)	261,437
Following <i>Be Lean</i> Measures	226,352
Following <i>Be Clean</i> Measures	58,527
% Improvement	77.58%
Non-Residential	
Baseline (TER)	1,784
Following <i>Be Lean</i> Measures	1,371
Following <i>Be Clean</i> Measures	782
% Improvement	56.16%

7. **BE GREEN: RENEWABLE ENERGY**

- 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 reduction in expected CO₂ emissions.
- 7.2 A site heat network has 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.

Wind Turbines

- 7.3 The development is situated in an urban location. It is known that such locations often experience highly turbulent and low speed wind conditions. Because of this, and due to space requirements, the installation of wind turbines would not be a cost effective or appropriate method for the generation of renewable energy on this development. Wind turbines will therefore not be installed on the site.

Solar Thermal Panels

- 7.4 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.

Photovoltaic (PV) Panels

- 7.5 PV panels generate electricity from solar radiation. The generating potential of PV panels is not dependent on development demand, but only on available roof space for installation and ensuring that they are not overshadowed.
- 7.6 PV panels will no longer be installed. With the change to 100% heat pumps and the use of updated SAP 10.2 carbon factors, PV would not have further significant carbon reductions.

CO₂ Emissions at *Be Green* Stage

7.7 The tables below outline the Regulated and Total CO₂ emissions following the aforementioned *Be Green* measures.

Table 6: *Be Green* Emissions

Phase 1	
	Regulated CO ₂ (kg/yr)
Residential	
Baseline (TER)	261,437
Following <i>Be Lean</i> Measures	226,352
Following <i>Be Clean</i> Measures	58,527
Following <i>Be Green</i> Measures	58,527
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Following <i>Be Lean</i> Measures	1,371
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Following <i>Be Green</i> Measures	782
% Improvement	56.16%

8. SUMMARY

- 8.1** The energy strategy proposed for Phase 1 of the consented development site at The Hyde in the London Borough of Barnet, has been formulated following The London Plan Energy Hierarchy: Be Lean, Be Clean and Be Green. This document outlines the proposed change to the energy strategy for Phase 1 showing a significant improvement in CO₂ reductions over the original consented strategy. This report intends to discharge condition 23 Part A.
- 8.2** Existing consent has already been granted for Phase 1 of the development (Application number: 18/0352/FUL) following the energy strategy outlined in the Revised Energy Statement (Planning Issue 2) by Watkins Payne dated October 2018.
- 8.3** Phase 1 comprises of 1.02 hectares, 244 residential dwellings and 193 sqm of flexible commercial floorspace.
- 8.4** The consented energy statement (Watkins Payne, October 2018) described a strategy which used a heat network supplied by gas boilers. It also included PV panels to be installed on the rooftops of the development. This strategy enabled the development to achieve a 26.94% reduction in CO₂ emissions over the baseline Part L 2013 target (using SAP 2012 emission factors).
- 8.5** To allow further CO₂ savings to be made, a change to the heating strategy is proposed.
- 8.6** The new energy strategy is summarised as follows:
- > The retained heat network has changed from gas boiler to 100% heat demand supplied by air source heat pumps (ASHP);
 - > Most up to date SAP 10.2 carbon factors will be used.
- 8.7** As can be seen in the table below this new strategy improves on the previous energy strategy significantly:

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8.8 Further, the table highlights the Phase 1 performance only. The remaining Phase 2-3 has outline consent only and is not covered in this report. The energy strategy for these remaining phases will be addressed in a reserved matters application (RMA) at detailed application stage. If Phases 2-3 are required to go through future iterations of building regulations and planning policy, then the network would need to be future proofed to address these requirements.

APPENDICES

Appendix A: Phase 1 Calculations - *Be Lean, Be Clean/Green*

Appendix B: DER Worksheets – *Be Lean*

Appendix C: BRUKL Worksheets – *Be Lean*

Appendix D: Roof Plans and Plant Room – Heat Pumps

Appendix E: DER Worksheets – *Be Clean/Green*

Appendix F: BRUKL Outputs – *Be Clean/Green*

Appendix A

Phase 1 Calculations - Be Lean, Be Clean/Green

Appendix A: Phase 1 Calculations - *Be Lean, Be Clean/Green* – Residential

Baseline and Be Lean

Baseline				Energy (kWh/year)					SAP 10.2 conversion - CO ₂ (kg/yr)		
Plot	Multiplier	DER	Area (m ²)	Space Heating	Hot Water	Pumps	Lighting	Electricity	SAP 10.2	Area*Multiplier	Area*Multiplier*SAP 10.2
A.02.05	96	16.8	72.82	2641.0408	2049.8915	75	331.5971	0	14.29	6990.72	99877.72691
F.02.01	73	15.77	78.14	2593.7778	2103.485	75	343.9454	0	13.35	5704.22	76168.32866
G.02.02	40	15.74	70.38	2163.0393	2035.654	75	312.0917	0	13.28	2815.2	37374.80257
C.07.03	14	24.07	71.7	5035.6353	2011.875	75	316.8732	0	21.38	1003.8	21465.80685
A.15.03	3	20.93	55.86	2750.3848	1843.1752	75	265.6477	0	18.10	167.58	3032.927062
B.00.02	18	21.13	70.58	3722.039	2247.1734	75	314.7231	0	18.51	1270.44	23517.66502
										17951.96	261437

Be Lean				Energy (kWh/year)					SAP 10.2 conversion - CO ₂ (kg/yr)		
Plot	Multiplier	DER	Area (m ²)	Space Heating	Hot Water	Pumps	Lighting	Electricity	SAP 10.2	Area*Multiplier	Area*Multiplier*SAP 10.2
A.02.05	96	15.3	72.82	1802.6695	1835.0871	188.0418	327.6741	36.3776	12.08	6990.72	84421.41243
F.02.01	73	14.79	78.14	1877.8528	1879.8268	201.7796	341.1994	37.5768	11.64	5704.22	66413.60876
G.02.02	40	14.65	70.38	1519.2087	1812.6123	181.741	312.0242	33.3182	11.49	2815.2	32333.84917
C.07.03	14	22.75	71.7	3876.3438	1824.9184	270.9507	316.8253	57.0126	18.80	1003.8	18875.29896
A.15.03	3	18.68	55.86	1921.2732	1658.4897	144.2463	262.3347	35.7976	15.25	167.58	2554.938381
B.00.02	18	19.9	70.58	2976.0571	2133.2934	266.6185	313.1014	0	17.12	1270.44	21753.27191
										17951.96	226352

Be Clean/Green

Be Clean/Green				Energy (kWh/year)					SAP 10.2 conversion - CO ₂ (kg/yr)		
Plot	Multiplier	DER	Area (m ²)	Space Heat	Hot Water	Pumps	Lighting	Electricity	SAP 10.2	Area*Multiplier	Area*Multiplier*SAP 10.2
A.02.05	96	12.6	72.82	1802.6695	1835.0871	188.0418	327.6741	36.3776	3.30	6990.72	23039.64946
F.02.01	73	12.18	78.14	1877.8528	1879.8268	201.7796	341.1994	37.5768	3.19	5704.22	18199.17234
G.02.02	40	12.08	70.38	1519.2087	1812.6123	181.741	312.0242	33.3182	3.16	2815.2	8909.035776
C.07.03	14	18.42	71.7	3876.3438	1824.9184	270.9507	316.8253	57.0126	4.83	1003.8	4846.078571
A.15.03	3	15.2	55.86	1921.2732	1658.4897	144.2463	262.3347	35.7976	3.98	167.58	667.3382232
B.00.02	18	18.4	70.58	1254.0876	743.7408	191.6185	313.1014	0	2.26	1270.44	2865.78229
										17951.96	58527

Appendix A: Phase 1 Calculations - *Be Lean, Be Clean/Green – Non-Domestic*

Non-Domestic	SAP 2012	SAP 10.2		
	BRUKL Value	Calculated Value	SAP 10.2	
Baseline	[kWh/m ² /year]	[kg CO ₂ /m ² /year]	[kWh/year]	[kg CO ₂ /year]
TER	22	9.25		
			Corrected Energy	Corrected CO ₂
Heating	23.74	4.76	4581.82	918.884001
Cooling	9.99	1.30	1928.07	250.4177316
Aux	2.7	0.35	521.1	67.680468
Lighting	18.51	2.40	3572.43	463.9872084
Hot water	3.34	0.43	644.62	83.7232456
			11248.04	1784.692655

Be lean	BRUKL Value	Calculated Value		
	[kWh/m ² /year]	[kg CO ₂ /m ² /year]	SAP 10.2	
BER	[kWh/year]	[kg CO ₂ /year]	[kWh/year]	[kg CO ₂ /year]
BER	17.1	7.11		
			Corrected Energy	Corrected CO ₂
Heating	17.08	3.59	3296.44	692.2524
Cooling	5.97	0.81	1152.21	156.70056
Aux	3.9	0.53	752.7	102.3672
Lighting	13.12	1.78	2532.16	344.37376
Hot water	2.89	0.39	557.77	75.85672
			8291.28	1371.55064

Be Clean/Green	BRUKL Value	Calculated Value		
	[kWh/m ² /year]	[kg CO ₂ /m ² /year]	SAP 10.2	
BER	[kWh/year]	[kg CO ₂ /year]	[kWh/year]	[kg CO ₂ /year]
BER	15.5	4.05		
			Corrected Energy	Corrected CO ₂
Heating	3.93	0.53	758.49	103.15464
Cooling	5.97	0.81	1152.21	156.70056
Aux	3.9	0.53	752.7	102.3672
Lighting	13.12	1.78	2532.16	344.37376
Hot water	2.89	0.39	557.77	75.85672
			5753.33	782.45288
			SAP 10.2	
			[kWh/year]	[kg CO ₂ /year]
Unregulated			Corrected Energy	Corrected CO ₂
Equipment	42.96	5.58	8291.28	1076.871446
			8291.28	1076.871446

Be Lean CO ₂ reduction over baseline	
	23.15%
Be Clean/Green CO ₂ reduction over baseline	
	56.16%

Appendix B

DER Worksheets – Be Lean

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



Property Reference	A.02.05_1		Issued on Date	13/07/2023
Assessment Reference	A.02.05	Prop Type Ref	2B4P	
Property				

SAP Rating	84 B	DER	15.30	TER	16.81
Environmental	89 B	% DER<TER	8.99		
CO ₂ Emissions (t/year)	0.90	DFEE	40.73	TFEE	45.93
General Requirements Compliance	Pass	% DFEE<TFEE	11.32		

Assessor Details	Mr. Simon Gowing, Simon Gowing, Tel: 02036031616, Simon@hodkinsonconsultancy.com	Assessor ID	T271-0001
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Client	
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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 73 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) 16.81 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 15.30 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)45.9 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)40.7 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.15 (max. 0.30)	0.15 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.26 (max. 2.00)	1.30 (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
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: 0.59
Maximum 1.5 OK
MVHR efficiency: 89%
Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): Slight OK
Based on:
Overshading: Average
Windows facing North East: 8.15 m², No overhang
Windows facing North West: 4.09 m², No overhang
Air change rate: 4.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Door U-value 1.00 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 (m2)	Storey height (m)	Volume (m3)
Ground floor	72.8200 (1b)	2.8700 (2b)	208.9934 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.8200		208.9934 (4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	208.9934 (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)

	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	0.1626	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:												
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.3511	0.3479	0.3447	0.3288	0.3256	0.3096	0.3096	0.3064	0.3160	0.3256	0.3319	0.3383 (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 = 1.30)			12.2400	1.2357	15.1255		(27)	
Main Entrance			2.0500	1.0000	2.0500		(26)	
External Wall 1	47.6100	12.2400	35.3700	0.1500	5.3055		(29a)	
Corridor Wall	14.7200	2.0500	12.6700	0.1415	1.7929		(29a)	
Total net area of external elements Aum(A, m2)				62.3300			(31)	
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	24.2739		(33)	
Party Wall 1			37.1700	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)								10.3718 (36)
Total fabric heat loss								(33) + (36) = 34.6457 (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	24.2120	23.9922	23.7723	22.6732	22.4533	21.3542	21.3542	21.1343	21.7938	22.4533	22.8930	23.3327 (38)
Average = Sum(39)m / 12 =	58.8577	58.6379	58.4180	57.3189	57.0990	55.9999	55.9999	55.7800	56.4395	57.0990	57.5387	57.9784 (39)
												57.2639 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.8083	0.8052	0.8022	0.7871	0.7841	0.7690	0.7690	0.7660	0.7751	0.7841	0.7901	0.7962 (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												
Average daily hot water use (litres/day)												
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	98.0366	94.4716	90.9066	87.3417	83.7767	80.2117	80.2117	83.7767	87.3417	90.9066	94.4716	98.0366 (44)
Energy content (annual)	145.3854	127.1550	131.2126	114.3943	109.7640	94.7180	87.7702	100.7176	101.9204	118.7784	129.6560	140.7980 (45)
Distribution loss (46)m = 0.15 x (45)m												
Water storage loss:	21.8078	19.0732	19.6819	17.1591	16.4646	14.2077	13.1655	15.1076	15.2881	17.8168	19.4484	21.1197 (46)
Total = Sum(45)m =												

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)												0.0191 (51)
Volume factor from Table 2a												3.4200 (52)
Temperature factor from Table 2b												1.0000 (53)
Enter (49) or (54) in (55)												0.1960 (55)
Total storage loss	6.0757	5.4877	6.0757	5.8797	6.0757	5.8797	6.0757	6.0757	5.8797	6.0757	5.8797	6.0757 (56)
If cylinder contains dedicated solar storage	6.0757	5.4877	6.0757	5.8797	6.0757	5.8797	6.0757	6.0757	5.8797	6.0757	5.8797	6.0757 (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	174.7235	153.6539	160.5506	142.7860	139.1021	123.1097	117.1082	130.0556	130.3121	148.1165	158.0477	170.1361 (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	174.7235	153.6539	160.5506	142.7860	139.1021	123.1097	117.1082	130.0556	130.3121	148.1165	158.0477	170.1361 (64)
Heat gains from water heating, kWh/month	71.8111	63.4782	67.0986	60.7494	59.9670	54.2071	52.6540	56.9590	56.6019	62.9643	65.8240	70.2858 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	115.6298	115.6298	115.6298	115.6298	115.6298	115.6298	115.6298	115.6298	115.6298	115.6298	115.6298	115.6298 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	18.5543	16.4797	13.4022	10.1463	7.5845	6.4032	6.9188	8.9934	12.0709	15.3268	17.8886	19.0699 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	203.7873	205.9019	200.5730	189.2284	174.9079	161.4486	152.4569	150.3423	155.6712	167.0158	181.3363	194.7956 (68)
Pumps, fans	34.5630	34.5630	34.5630	34.5630	34.5630	34.5630	34.5630	34.5630	34.5630	34.5630	34.5630	34.5630 (69)
Losses e.g. evaporation (negative values) (Table 5)	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)
Water heating gains (Table 5)	-92.5038	-92.5038	-92.5038	-92.5038	-92.5038	-92.5038	-92.5038	-92.5038	-92.5038	-92.5038	-92.5038	-92.5038 (71)
Total internal gains	96.5203	94.4615	90.1863	84.3742	80.6008	75.2876	70.7716	76.5579	78.6137	84.6294	91.4222	94.4701 (72)
	376.5508	374.5322	361.8505	341.4379	320.7821	300.8283	287.8363	293.5824	304.0447	324.6609	348.3360	366.0247 (73)

6. Solar gains

[Jan]		Area	Solar flux	g	FF	Access	Gains					
		m ²	Table 6a	Specific data	Specific data	factor	W					
			W/m ²	or Table 6b	or Table 6c	Table 6d						
Northeast		8.1500	11.2829	0.5000	0.7500	0.7700	23.8971 (75)					
Northwest		4.0900	11.2829	0.5000	0.7500	0.7700	11.9925 (81)					
Solar gains	35.8896	73.0543	131.6205	216.1587	290.5597	309.7674	289.7811	231.0168	160.3817	89.2781	45.1584	29.3092 (83)
Total gains	412.4403	447.5864	493.4711	557.5966	611.3419	610.5957	577.6174	524.5993	464.4264	413.9390	393.4944	395.3339 (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	85.9181	86.2402	86.5648	88.2248	88.5644	90.3028	90.3028	90.6587	89.5993	88.5644	87.8877	87.2212
alpha	6.7279	6.7493	6.7710	6.8817	6.9043	7.0202	7.0202	7.0439	6.9733	6.9043	6.8592	6.8147
util living area	0.9983	0.9966	0.9891	0.9468	0.8044	0.5811	0.4260	0.4875	0.7860	0.9734	0.9961	0.9987 (86)
MIT	20.2145	20.3147	20.5057	20.7713	20.9457	20.9951	20.9995	20.9988	20.9662	20.7362	20.4371	20.2015 (87)
Th 2	20.2462	20.2488	20.2514	20.2645	20.2671	20.2803	20.2803	20.2829	20.2750	20.2671	20.2619	20.2566 (88)
util rest of house	0.9978	0.9955	0.9854	0.9301	0.7587	0.5184	0.3566	0.4124	0.7223	0.9618	0.9946	0.9983 (89)
MIT 2	19.1846	19.3328	19.6120	19.9959	20.2159	20.2771	20.2801	20.2824	20.2485	19.9557	19.5221	19.1739 (90)
Living area fraction												fLA = Living area / (4) =
MIT	19.5647	19.6953	19.9419	20.2821	20.4853	20.5421	20.5456	20.5468	20.5134	20.2438	19.8599	19.5532 (92)
Temperature adjustment												0.0000
adjusted MIT	19.5647	19.6953	19.9419	20.2821	20.4853	20.5421	20.5456	20.5468	20.5134	20.2438	19.8599	19.5532 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9971	0.9944	0.9836	0.9305	0.7730	0.5414	0.3823	0.4402	0.7444	0.9613	0.9935	0.9978 (94)
Ext temp.	411.2527	445.0834	485.3577	518.8614	472.5691	330.6050	220.7946	230.9063	345.6966	397.9355	390.9429	394.4619 (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	898.4467	867.5621	785.2499	652.4102	501.6313	332.7568	220.9550	231.3110	361.9710	550.6533	734.1865	890.1545 (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 m ²	362.4723	283.9057	223.1198	96.1552	21.6223	0.0000	0.0000	0.0000	0.0000	113.6220	247.1354	368.7953 (98)
												(98) / (4) =
												23.5763 (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 (303b)
Fraction of total space heat from community Boilers	1.0000 (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	1716.8281 (98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05	1802.6695 (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	1747.7020 (64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05	1802.6695 (310b)
Electricity used for heat distribution	36.3776 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7375)	
mechanical ventilation fans (SFP = 0.7375)	188.0418 (330a)
Total electricity for the above, kWh/year	188.0418 (331)
Electricity for lighting (calculated in Appendix L)	327.6741 (332)
Total delivered energy for all uses	4153.4725 (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			94.9800 (367b)
Space heating from Boilers	3830.0238	0.2160	827.2851 (368)
Electrical energy for heat distribution	36.3776	0.5190	18.8800 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			846.1651 (373)
Space and water heating			846.1651 (376)
Pumps and fans	188.0418	0.5190	97.5937 (378)
Energy for lighting	327.6741	0.5190	170.0629 (379)
Total CO2, kg/year			1113.8217 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			15.3000 (384)

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

DER		15.3000 ZC1
Total Floor Area		TFA 72.8200
Assumed number of occupants		N 2.3126
CO2 emission factor in Table 12 for electricity displaced from grid		EF 0.5190
CO2 emissions from appliances, equation (L14)		16.5834 ZC2
CO2 emissions from cooking, equation (L16)		2.3964 ZC3
Total CO2 emissions		34.2797 ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000 ZC5
Additional allowable electricity generation, kWh/m ² /year		0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000 ZC7
Net CO2 emissions		34.2797 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	72.8200 (1b)	2.8700 (2b)	208.9934 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.8200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	208.9934 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ 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				3 * 10 =	30.0000 (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) =				30.0000 / (5) =	0.1435 (8)
Pressure test				Yes	
Measured/design AP50					5.0000
Infiltration rate					0.3935 (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) =		0.3345 (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	0.4265	0.4181	0.4098	0.3680	0.3596	0.3178	0.3178	0.3094	0.3345	0.3596	0.3763	0.3931 (22b)
Effective ac	0.5910	0.5874	0.5840	0.5677	0.5647	0.5505	0.5505	0.5479	0.5559	0.5647	0.5708	0.5772 (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			2.0500	1.0000	2.0500		(26)					
TER Opening Type (Uw = 1.40)			12.2400	1.3258	16.2273		(27)					
External Wall 1	47.6100	12.2400	35.3700	0.1800	6.3666		(29a)					
Corridor Wall	14.7200	2.0500	12.6700	0.1800	2.2806		(29a)					
Total net area of external elements Aum(A, m ²)			62.3300				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 26.9245		(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)							5.3075 (36)					
Total fabric heat loss						(33) + (36) =	32.2320 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	40.7567	40.5132	40.2744	39.1530	38.9431	37.9664	37.9664	37.7855	38.3426	38.9431	39.3676	39.8114 (38)
Heat transfer coeff	72.9887	72.7451	72.5064	71.3849	71.1751	70.1984	70.1984	70.0175	70.5746	71.1751	71.5996	72.0433 (39)
Average = Sum(39)m / 12 =												71.3839 (39)
HLP	1.0023	0.9990	0.9957	0.9803	0.9774	0.9640	0.9640	0.9615	0.9692	0.9774	0.9832	0.9893 (40)
HLP (average)												0.9803 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.3126 (42)
Average daily hot water use (litres/day)												89.1241 (43)
Daily hot water use	98.0366	94.4716	90.9066	87.3417	83.7767	80.2117	80.2117	83.7767	87.3417	90.9066	94.4716	98.0366 (44)
Energy conte	145.3854	127.1550	131.2126	114.3943	109.7640	94.7180	87.7702	100.7176	101.9204	118.7784	129.6560	140.7980 (45)
Energy content (annual)												Total = Sum(45)m = 1402.2699 (45)
Distribution loss (46)m = 0.15 x (45)m												
	21.8078	19.0732	19.6819	17.1591	16.4646	14.2077	13.1655	15.1076	15.2881	17.8168	19.4484	21.1197 (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	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	173.0031	152.1000	158.8302	141.1211	137.3817	121.4448	115.3878	128.3352	128.6472	146.3961	156.3827	168.4157 (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	173.0031	152.1000	158.8302	141.1211	137.3817	121.4448	115.3878	128.3352	128.6472	146.3961	156.3827	168.4157 (64)
Heat gains from water heating, kWh/month	70.4348	62.2350	65.7223	59.4175	58.5907	52.8752	51.2777	55.5827	55.2700	61.5880	64.4920	68.9095 (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	115.6298	115.6298	115.6298	115.6298	115.6298	115.6298	115.6298	115.6298	115.6298	115.6298	115.6298	115.6298 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.7764	16.6770	13.5627	10.2678	7.6753	6.4798	7.0017	9.1010	12.2154	15.5103	18.1028	19.2983 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	203.7873	205.9019	200.5730	189.2284	174.9079	161.4486	152.4569	150.3423	155.6712	167.0158	181.3363	194.7956 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5630	34.5630	34.5630	34.5630	34.5630	34.5630	34.5630	34.5630	34.5630	34.5630	34.5630	34.5630 (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)	-92.5038	-92.5038	-92.5038	-92.5038	-92.5038	-92.5038	-92.5038	-92.5038	-92.5038	-92.5038	-92.5038	-92.5038 (71)
Water heating gains (Table 5)	94.6704	92.6117	88.3364	82.5243	78.7509	73.4377	68.9217	74.7080	76.7638	82.7795	89.5723	92.6203 (72)
Total internal gains	377.9230	375.8796	363.1611	342.7095	322.0230	302.0551	289.0692	294.8402	305.3394	325.9945	349.7003	367.4031 (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 Specific data or Table 6c	Access factor Table 6d	Gains W					
Northeast	8.1500	11.2829	0.6300	0.7000	0.7700	28.1029 (75)						
Northwest	4.0900	11.2829	0.6300	0.7000	0.7700	14.1032 (81)						
Solar gains	42.2061	85.9118	154.7858	254.2027	341.6983	364.2865	340.7826	271.6758	188.6089	104.9910	53.1062	34.4677 (83)
Total gains	420.1291	461.7914	517.9468	596.9122	663.7213	666.3416	629.8518	566.5160	493.9482	430.9856	402.8065	401.8707 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (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)	69.2839	69.5159	69.7448	70.8405	71.0493	72.0379	72.0379	72.2240	71.6539	71.0493	70.6281	70.1931 (85)
tau	5.6189	5.6344	5.6497	5.7227	5.7366	5.8025	5.8025	5.8149	5.7769	5.7366	5.7085	5.6795
alpha	0.9983	0.9968	0.9906	0.9593	0.8504	0.6503	0.4864	0.5591	0.8463	0.9807	0.9966	0.9987 (86)
util living area	19.9404	20.0572	20.2857	20.6126	20.8702	20.9787	20.9966	20.9929	20.9081	20.5772	20.2102	19.9252 (87)
MIT	20.0814	20.0842	20.0869	20.0998	20.1022	20.1134	20.1134	20.1155	20.1091	20.1022	20.0973	20.0922 (88)
util rest of house	0.9978	0.9957	0.9873	0.9446	0.8038	0.5702	0.3905	0.4565	0.7805	0.9713	0.9952	0.9983 (89)
MIT 2	18.6592	18.8318	19.1661	19.6405	19.9763	20.0995	20.1122	20.1125	20.0337	19.5996	19.0654	18.6450 (90)
Living area fraction	19.1321	19.2841	19.5794	19.9993	20.3063	20.4241	20.4386	20.4375	20.3565	19.9604	19.4879	19.1176 (91)
MIT	19.1321	19.2841	19.5794	19.9993	20.3063	20.4241	20.4386	20.4375	20.3565	19.9604	19.4879	19.1176 (92)
Temperature adjustment												0.0000
adjusted MIT	19.1321	19.2841	19.5794	19.9993	20.3063	20.4241	20.4386	20.4375	20.3565	19.9604	19.4879	19.1176 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	418.8670	459.2094	510.0945	562.7004	541.1682	399.2101	268.3449	280.1867	395.5129	417.7745	400.3665	400.9267 (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	1082.5778	1046.3769	948.3389	792.3242	612.5535	408.8398	269.4664	282.6956	441.5487	666.2304	886.9718	1074.7105 (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	493.8008	394.5766	326.0538	165.3291	53.1107	0.0000	0.0000	0.0000	0.0000	184.8512	350.3558	501.2952 (98)
Space heating												2469.3731 (99)
Space heating per m ²												(98) / (4) = 33.9106 (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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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													2641.0408 (211)
Space heating requirement	493.8008	394.5766	326.0538	165.3291	53.1107	0.0000	0.0000	0.0000	0.0000	184.8512	350.3558	501.2952	(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)	528.1292	422.0070	348.7206	176.8226	56.8029	0.0000	0.0000	0.0000	0.0000	197.7018	374.7121	536.1446	(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	173.0031	152.1000	158.8302	141.1211	137.3817	121.4448	115.3878	128.3352	128.6472	146.3961	156.3827	168.4157	(64)
Efficiency of water heater (217)m	87.4575	87.2452	86.6924	85.2369	82.5202	79.8000	79.8000	79.8000	79.8000	85.4370	86.9040	87.5480	(217)
Fuel for water heating, kWh/month	197.8139	174.3362	183.2114	165.5633	166.4825	152.1865	144.5963	160.8211	161.2121	171.3497	179.9489	192.3696	(219)
Water heating fuel used													2049.8915 (219)
Annual totals kWh/year													
Space heating fuel - main system													2641.0408 (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)													331.5971 (232)
Total delivered energy for all uses													5097.5293 (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	2641.0408	0.2160	570.4648 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2049.8915	0.2160	442.7766 (264)
Space and water heating			1013.2414 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	331.5971	0.5190	172.0989 (268)
Total CO2, kg/m2/year			1224.2652 (272)
Emissions per m2 for space and water heating			13.9143 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.3633 (272b)
Emissions per m2 for pumps and fans			0.5345 (272c)
Target Carbon Dioxide Emission Rate (TER) = (13.9143 * 1.00) + 2.3633 + 0.5345, rounded to 2 d.p.			16.8100 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



Property Reference	F.02.01_1		Issued on Date	13/07/2023
Assessment Reference	F.02.01	Prop Type Ref	2B4P	
Property				

SAP Rating	84 B	DER	14.79	TER	15.77
Environmental	89 B	% DER<TER	6.20		
CO ₂ Emissions (t/year)	0.94	DFEE	38.95	TFEE	42.56
General Requirements Compliance	Pass	% DFEE<TFEE	8.47		

Assessor Details	Mr. Simon Gowing, Simon Gowing, Tel: 02036031616, Simon@hodkinsonconsultancy.com	Assessor ID	T271-0001
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 78 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) 15.77 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 14.79 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)42.6 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)38.9 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.15 (max. 0.30)	0.15 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.26 (max. 2.00)	1.30 (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: 0.20 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: 0.59
Maximum 1.5 OK
MVHR efficiency: 89%
Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): Slight OK
Based on:
Overshading: Average
Windows facing North: 2.47 m², No overhang
Windows facing South: 9.86 m², No overhang
Windows facing South West: 2.47 m², No overhang
Air change rate: 4.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Door U-value 1.00 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	78.1400 (1b)	2.8700 (2b)	224.2618 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.1400		224.2618 (4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 224.2618 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ 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					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)

	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	0.1769	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) =												
Effective ac	0.3654	0.3619	0.3585	0.3411	0.3377	0.3203	0.3203	0.3168	0.3273	0.3377	0.3446	0.3515 (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 = 1.30)			14.8000	1.2357	18.2890		(27)	
Main Entrance			2.4900	1.0000	2.4900		(26)	
External Wall 1	80.5300	14.8000	65.7300	0.1500	9.8595		(29a)	
Corridor Wall	6.7200	2.4900	4.2300	0.1415	0.5986		(29a)	
Total net area of external elements Aum(A, m ²)			87.2500				(31)	
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 31.2371		(33)	
Party Wall 1			33.5500	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)								13.2277 (36)
Total fabric heat loss								(33) + (36) = 44.4648 (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	27.0424	26.7857	26.5290	25.2454	24.9887	23.7052	23.7052	23.4485	24.2186	24.9887	25.5021	26.0156 (38)
Heat transfer coeff	71.5072	71.2504	70.9937	69.7102	69.4535	68.1699	68.1699	67.9132	68.6834	69.4535	69.9669	70.4803 (39)
Average = Sum(39)m / 12 =	69.6460 (39)											
HLP	0.9151	0.9118	0.9085	0.8921	0.8888	0.8724	0.8724	0.8691	0.8790	0.8888	0.8954	0.9020 (40)
HLP (average)	0.8913 (40)											
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												
Average daily hot water use (litres/day)	91.8323 (43)											
Daily hot water use	101.0155	97.3422	93.6689	89.9956	86.3223	82.6490	82.6490	86.3223	89.9956	93.6689	97.3422	101.0155 (44)
Energy conte	149.8030	131.0187	135.1996	117.8703	113.0993	97.5961	90.4371	103.7779	105.0174	122.3876	133.5957	145.0763 (45)
Energy content (annual)	Total = Sum(45)m = 1444.8790 (45)											
Distribution loss (46)m = 0.15 x (45)m	22.4705	19.6528	20.2799	17.6805	16.9649	14.6394	13.5656	15.5667	15.7526	18.3581	20.0394	21.7614 (46)
Water storage loss:												

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 (303b)
Fraction of total space heat from community Boilers	1.0000 (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	1788.4313 (98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05	1877.8528 (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	1790.3112 (64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05	1879.8268 (310b)
Electricity used for heat distribution	37.5768 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7375)	
mechanical ventilation fans (SFP = 0.7375)	201.7796 (330a)
Total electricity for the above, kWh/year	201.7796 (331)
Electricity for lighting (calculated in Appendix L)	341.1994 (332)
Total delivered energy for all uses	4300.6586 (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			94.9800 (367b)
Space heating from Boilers	3956.2851	0.2160	854.5576 (368)
Electrical energy for heat distribution	37.5768	0.5190	19.5024 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			874.0599 (373)
Space and water heating			874.0599 (376)
Pumps and fans	201.7796	0.5190	104.7236 (378)
Energy for lighting	341.1994	0.5190	177.0825 (379)
Total CO2, kg/year			1155.8660 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			14.7900 (384)

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

DER			14.7900 ZC1
Total Floor Area		TFA	78.1400
Assumed number of occupants		N	2.4266
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190
CO2 emissions from appliances, equation (L14)			16.3433 ZC2
CO2 emissions from cooking, equation (L16)			2.2682 ZC3
Total CO2 emissions			33.4015 ZC4
Residual CO2 emissions offset from biofuel CHP			0.0000 ZC5
Additional allowable electricity generation, kWh/m ² /year			0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation			0.0000 ZC7
Net CO2 emissions			33.4015 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	78.1400 (1b)	2.8700 (2b)	224.2618 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.1400		224.2618 (4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 224.2618 (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				3 * 10 =	30.0000 (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) =				30.0000 / (5) =	0.1338 (8)
Pressure test				Yes	
Measured/design AP50					5.0000
Infiltration rate					0.3838 (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) =	0.3550 (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	0.4526	0.4437	0.4349	0.3905	0.3816	0.3372	0.3372	0.3284	0.3550	0.3816	0.3994	0.4171 (22b)
Effective ac	0.6024	0.5985	0.5946	0.5762	0.5728	0.5569	0.5569	0.5539	0.5630	0.5728	0.5797	0.5870 (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			2.4900	1.0000	2.4900		(26)
TER Opening Type (Uw = 1.40)			14.8000	1.3258	19.6212		(27)
External Wall 1	80.5300	14.8000	65.7300	0.1800	11.8314		(29a)
Corridor Wall	6.7200	2.4900	4.2300	0.1800	0.7614		(29a)
Total net area of external elements Aum(A, m ²)			87.2500				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 34.7040		(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)							6.6618 (36)
Total fabric heat loss							(33) + (36) = 41.3658 (37)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	44.5836	44.2892	44.0007	42.6455	42.3919	41.2116	41.2116	40.9930	41.6662	42.3919	42.9049	43.4411 (38)
Heat transfer coeff	85.9494	85.6550	85.3665	84.0113	83.7577	82.5774	82.5774	82.3588	83.0321	83.7577	84.2707	84.8069 (39)
Average = Sum(39)m / 12 =												84.0101 (39)
HLP	1.0999	1.0962	1.0925	1.0751	1.0719	1.0568	1.0568	1.0540	1.0626	1.0719	1.0785	1.0853 (40)
HLP (average)												1.0751 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.4266 (42)
Average daily hot water use (litres/day)												91.8323 (43)
Daily hot water use	101.0155	97.3422	93.6689	89.9956	86.3223	82.6490	82.6490	86.3223	89.9956	93.6689	97.3422	101.0155 (44)
Energy content (annual)	149.8030	131.0187	135.1996	117.8703	113.0993	97.5961	90.4371	103.7779	105.0174	122.3876	133.5957	145.0763 (45)
Distribution loss (46)m = 0.15 x (45)m	22.4705	19.6528	20.2799	17.6805	16.9649	14.6394	13.5656	15.5667	15.7526	18.3581	20.0394	21.7614 (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)												
Total storage loss												

FULL SAP CALCULATION PRINTOUT

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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	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	177.4207	155.9637	162.8172	144.5970	140.7170	124.3229	118.0548	131.3956	131.7442	150.0053	160.3225	172.6939	(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	177.4207	155.9637	162.8172	144.5970	140.7170	124.3229	118.0548	131.3956	131.7442	150.0053	160.3225	172.6939	(64)
Heat gains from water heating, kWh/month	71.9037	63.5197	67.0480	60.5733	59.6997	53.8321	52.1645	56.6003	56.2997	62.7880	65.8020	70.3320	(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)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	121.3311	121.3311	121.3311	121.3311	121.3311	121.3311	121.3311	121.3311	121.3311	121.3311	121.3311	121.3311	(66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	19.4756	17.2981	14.0677	10.6502	7.9611	6.7211	7.2624	9.4400	12.6703	16.0878	18.7769	20.0169	(67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	215.5093	217.7456	212.1101	200.1130	184.9687	170.7352	161.2264	158.9901	164.6255	176.6227	191.7669	206.0004	(68)
Pumps, fans	35.1331	35.1331	35.1331	35.1331	35.1331	35.1331	35.1331	35.1331	35.1331	35.1331	35.1331	35.1331	(69)
Losses e.g. evaporation (negative values) (Table 5)	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)
Water heating gains (Table 5)	-97.0649	-97.0649	-97.0649	-97.0649	-97.0649	-97.0649	-97.0649	-97.0649	-97.0649	-97.0649	-97.0649	-97.0649	(71)
Total internal gains	96.6447	94.5234	90.1183	84.1296	80.2415	74.7668	70.1136	76.0757	78.1940	84.3925	91.3916	94.5322	(72)
	394.0289	391.9664	378.6955	357.2920	335.5706	314.6225	301.0017	306.9050	317.8891	339.5024	364.3348	382.9489	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	g Specific data or Table 6c	FF Specific data or Table 6c	Access factor Table 6d	Gains W	(74)					
North	2.4700	10.6334	0.6300	0.7000	0.7700	8.0268	(74)						
South	9.8600	46.7521	0.6300	0.7000	0.7700	140.8801	(78)						
Southwest	2.4700	36.7938	0.6300	0.7000	0.7700	27.7743	(79)						
Solar gains	176.6812	293.3748	384.7003	454.2479	492.3832	482.6839	467.8338	439.6069	408.4464	319.4062	210.1602	152.1939	(83)
Total gains	570.7101	685.3411	763.3957	811.5400	827.9539	797.3064	768.8355	746.5119	726.3355	658.9085	574.4950	535.1428	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	63.1347	63.3517	63.5658	64.5912	64.7867	65.7128	65.7128	65.8872	65.3529	64.7867	64.3924	63.9852	(85)
alpha	5.2090	5.2234	5.2377	5.3061	5.3191	5.3809	5.3809	5.3925	5.3569	5.3191	5.2928	5.2657	
util living area	0.9950	0.9868	0.9679	0.9195	0.8150	0.6365	0.4681	0.5010	0.7288	0.9334	0.9881	0.9964	(86)
MIT	19.9478	20.1470	20.3940	20.6706	20.8730	20.9743	20.9958	20.9940	20.9468	20.6878	20.2649	19.9157	(87)
Th 2	20.0009	20.0040	20.0070	20.0212	20.0239	20.0363	20.0363	20.0386	20.0315	20.0239	20.0185	20.0128	(88)
util rest of house	0.9934	0.9826	0.9578	0.8943	0.7616	0.5516	0.3680	0.3997	0.6483	0.9071	0.9837	0.9952	(89)
MIT 2	18.6107	18.9012	19.2565	19.6490	19.9049	20.0199	20.0348	20.0362	19.9928	19.6817	19.0847	18.5727	(90)
Living area fraction	19.0556	19.3157	19.6350	19.9889	20.2270	20.3375	20.3545	20.3549	20.3102	20.0164	19.4774	19.0196	(91)
MIT	19.0556	19.3157	19.6350	19.9889	20.2270	20.3375	20.3545	20.3549	20.3102	20.0164	19.4774	19.0196	(92)
Temperature adjustment	19.0556	19.3157	19.6350	19.9889	20.2270	20.3375	20.3545	20.3549	20.3102	20.0164	19.4774	19.0196	(93)
adjusted MIT													

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(94)
Useful gains	0.9913	0.9789	0.9531	0.8933	0.7737	0.5790	0.4014	0.4335	0.6729	0.9069	0.9804	0.9936	(94)
Ext temp.	565.7733	670.8878	727.6160	724.9793	640.5509	461.6637	308.6404	323.6160	488.7292	597.5373	563.2463	531.6985	(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	1268.2354	1234.7808	1121.2886	931.5947	714.2041	473.7842	310.0407	325.7234	515.6483	788.6997	1043.0503	1256.8021	(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	522.6318	378.9361	292.8925	148.7631	54.7980	0.0000	0.0000	0.0000	0.0000	142.2248	345.4588	539.4771	(98)
Space heating per m2													(98) / (4) =

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													2593.7778	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	522.6318	378.9361	292.8925	148.7631	54.7980	0.0000	0.0000	0.0000	0.0000	142.2248	345.4588	539.4771	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)	558.9645	405.2792	313.2540	159.1050	58.6075	0.0000	0.0000	0.0000	0.0000	152.1121	369.4747	576.9808	(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	177.4207	155.9637	162.8172	144.5970	140.7170	124.3229	118.0548	131.3956	131.7442	150.0053	160.3225	172.6939	(64)	
Efficiency of water heater (217)m	87.5257	87.0949	86.3627	84.8896	82.5350	79.8000	79.8000	79.8000	79.8000	84.6722	86.8104	87.6501	(216)	
Fuel for water heating, kWh/month	202.7071	179.0732	188.5273	170.3354	170.4937	155.7931	147.9384	164.6562	165.0929	177.1600	184.6812	197.0264	(219)	
Water heating fuel used													2103.4850	(219)
Annual totals kWh/year													2593.7778	(211)
Space heating fuel - main system													0.0000	(215)
Space heating fuel - secondary													30.0000	(230c)
Electricity for pumps and fans:													45.0000	(230e)
central heating pump													75.0000	(231)
main heating flue fan													343.9454	(232)
Total electricity for the above, kWh/year													5116.2082	(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	2593.7778	0.2160	560.2560 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2103.4850	0.2160	454.3528 (264)
Space and water heating			1014.6088 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	343.9454	0.5190	178.5077 (268)
Total CO2, kg/m2/year			1232.0414 (272)
Emissions per m2 for space and water heating			12.9845 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.2845 (272b)
Emissions per m2 for pumps and fans			0.4981 (272c)
Target Carbon Dioxide Emission Rate (TER) = (12.9845 * 1.00) + 2.2845 + 0.4981, rounded to 2 d.p.			15.7700 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



Property Reference	G.02.02_1		Issued on Date	13/07/2023
Assessment Reference	G.02.02	Prop Type Ref	1B2P (D)	
Property				

SAP Rating	84 B	DER	14.65	TER	15.74
Environmental	89 B	% DER<TER	6.93		
CO ₂ Emissions (t/year)	0.85	DFEE	37.50	TFEE	40.86
General Requirements Compliance	Pass	% DFEE<TFEE	8.22		

Assessor Details	Mr. Simon Gowing, Simon Gowing, Tel: 02036031616, Simon@hodkinsonconsultancy.com	Assessor ID	T271-0001
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Client	
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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 70 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) 15.74 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 14.65 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 40.9 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 37.5 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.15 (max. 0.30)	0.15 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.27 (max. 2.00)	1.30 (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: 0.20 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: 0.59
Maximum 1.5 OK
MVHR efficiency: 89%
Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): Slight OK
Based on:
Overshading: Average
Windows facing East: 9.88 m², No overhang
Windows facing South: 7.40 m², No overhang
Air change rate: 4.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Door U-value 1.00 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	70.3800 (1b)	2.8700 (2b)	201.9906 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.3800		201.9906 (4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 201.9906 (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					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)

	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	0.1769	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) =												
Effective ac	0.3654	0.3619	0.3585	0.3411	0.3377	0.3203	0.3203	0.3168	0.3273	0.3377	0.3446	0.3515 (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 = 1.30)			17.2800	1.2357	21.3536		(27)	
Main Entrance			2.0500	1.0000	2.0500		(26)	
External Wall 1	47.2100	17.2800	29.9300	0.1500	4.4895		(29a)	
Corridor Wall	9.5000	2.0500	7.4500	0.1415	1.0542		(29a)	
Total net area of external elements Aum(A, m ²)				56.7100			(31)	
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	28.9474		(33)	
Party Wall 1			41.7300	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)								10.4132 (36)
Total fabric heat loss								(33) + (36) = 39.3606 (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	24.3568	24.1256	23.8944	22.7383	22.5071	21.3510	21.3510	21.1198	21.8135	22.5071	22.9696	23.4320 (38)
Average = Sum(39)m / 12 =	63.7174	63.4862	63.2550	62.0989	61.8677	60.7116	60.7116	60.4804	61.1740	61.8677	62.3301	62.7925 (39)
	62.0411 (39)											

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.9053	0.9020	0.8988	0.8823	0.8791	0.8626	0.8626	0.8593	0.8692	0.8791	0.8856	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												2.2553 (42)
Average daily hot water use (litres/day)												87.7637 (43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	96.5401	93.0296	89.5190	86.0085	82.4979	78.9874	78.9874	82.4979	86.0085	89.5190	93.0296	96.5401 (44)
Energy conte	143.1662	125.2141	129.2097	112.6481	108.0886	93.2722	86.4304	99.1802	100.3647	116.9654	127.6769	138.6488 (45)
Energy content (annual)												Total = Sum(45)m = 1380.8652 (45)
Distribution loss (46)m = 0.15 x (45)m												
Water storage loss:	21.4749	18.7821	19.3815	16.8972	16.2133	13.9908	12.9646	14.8770	15.0547	17.5448	19.1515	20.7973 (46)

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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 :															0.0191 (51)
Hot water storage loss factor from Table 2 (kWh/litre/day)															0.0191 (52)
Volume factor from Table 2a															1.0000 (53)
Temperature factor from Table 2b															0.1960 (55)
Enter (49) or (54) in (55)															
Total storage loss	6.0757	5.4877	6.0757	5.8797	6.0757	5.8797	6.0757	6.0757	5.8797	6.0757	5.8797	6.0757	5.8797	6.0757	(56)
If cylinder contains dedicated solar storage	6.0757	5.4877	6.0757	5.8797	6.0757	5.8797	6.0757	6.0757	5.8797	6.0757	5.8797	6.0757	5.8797	6.0757	(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	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month															
Solar input	172.5043	151.7130	158.5478	141.0398	137.4267	121.6639	115.7685	128.5183	128.7564	146.3035	156.0685	167.9869	167.9869	167.9869	(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	0.0000	0.0000	(63)
Solar input (sum of months) = Sum(63)m =															0.0000 (63)
Total per year (kWh/year) = Sum(64)m =															1726.2974 (64)
Heat gains from water heating, kWh/month	71.0732	62.8328	66.4327	60.1689	59.4099	53.7264	52.2086	56.4479	56.0846	62.3615	65.1659	69.5712	69.5712	69.5712	(65)

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

Metabolic gains (Table 5), Watts															
(66)m	112.7657	112.7657	112.7657	112.7657	112.7657	112.7657	112.7657	112.7657	112.7657	112.7657	112.7657	112.7657	112.7657	112.7657	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.6681	15.6926	12.7621	9.6617	7.2223	6.0973	6.5884	8.5638	11.4944	14.5947	17.0342	18.1592	18.1592	18.1592	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	198.1823	200.2388	195.0565	184.0239	170.0972	157.0081	148.2638	146.2073	151.3896	162.4222	176.3489	189.4380	189.4380	189.4380	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.2766	34.2766	34.2766	34.2766	34.2766	34.2766	34.2766	34.2766	34.2766	34.2766	34.2766	34.2766	34.2766	34.2766	(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	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-90.2126	-90.2126	-90.2126	-90.2126	-90.2126	-90.2126	-90.2126	-90.2126	-90.2126	-90.2126	-90.2126	-90.2126	-90.2126	-90.2126	(71)
Water heating gains (Table 5)	95.5285	93.5012	89.2912	83.5679	79.8520	74.6199	70.1728	75.8708	77.8953	83.8192	90.5082	93.5097	93.5097	93.5097	(72)
Total internal gains	368.2087	366.2624	353.9396	334.0832	314.0012	294.5551	281.8547	287.4716	297.6090	317.6658	340.7210	357.9365	357.9365	357.9365	(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			9.8800	19.6403		0.5000		0.7500		0.7700				50.4277	(76)
South			7.4000	46.7521		0.5000		0.7500		0.7700				89.9077	(78)
Solar gains	140.3354	245.8929	350.0228	448.9242	511.2786	509.8400	490.7075	444.8064	384.8789	275.8715	169.4487	119.1578	119.1578	(83)	
Total gains	508.5441	612.1553	703.9623	783.0074	825.2798	804.3951	772.5622	732.2781	682.4879	593.5373	510.1697	477.0943	477.0943	(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)															
tau	76.7059	76.9852	77.2667	78.7051	78.9993	80.5036	80.5036	80.8113	79.8950	78.9993	78.4131	77.8357	77.8357	77.8357	(86)
alpha	6.1137	6.1323	6.1511	6.2470	6.2666	6.3669	6.3669	6.3874	6.3263	6.2666	6.2275	6.1890	6.1890	6.1890	(86)
util living area	0.9942	0.9822	0.9462	0.8436	0.6734	0.4806	0.3455	0.3794	0.6068	0.8946	0.9845	0.9960	0.9960	0.9960	(86)
MIT	20.2200	20.4119	20.6489	20.8726	20.9725	20.9972	20.9997	20.9995	20.9888	20.8422	20.4895	20.1883	20.1883	(87)	
Th 2	20.1630	20.1658	20.1686	20.1825	20.1853	20.1994	20.1994	20.2022	20.1938	20.1853	20.1797	20.1741	20.1741	(88)	
util rest of house	0.9925	0.9771	0.9319	0.8098	0.6220	0.4216	0.2828	0.3139	0.5407	0.8620	0.9791	0.9947	0.9947	(89)	
MIT 2	19.1278	19.4063	19.7413	20.0458	20.1614	20.1977	20.1993	20.2020	20.1861	20.0180	19.5314	19.0903	19.0903	(90)	
Living area fraction										fLA = Living area / (4) =		0.4119	0.4119	(91)	
MIT	19.5777	19.8205	20.1151	20.3864	20.4955	20.5270	20.5290	20.5305	20.5167	20.3575	19.9260	19.5426	19.5426	(92)	
Temperature adjustment												0.0000	0.0000	(92)	
adjusted MIT	19.5777	19.8205	20.1151	20.3864	20.4955	20.5270	20.5290	20.5305	20.5167	20.3575	19.9260	19.5426	19.5426	(93)	

8. Space heating requirement

Utilisation	0.9909	0.9745	0.9308	0.8188	0.6420	0.4459	0.3086	0.3409	0.5676	0.8696	0.9770	0.9934	0.9934	(94)
Useful gains	503.9129	596.5742	655.2539	641.0917	529.8305	358.6502	238.4421	249.6427	387.4084	516.1260	498.4576	473.9641	473.9641	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	16.6000	16.6000	16.6000	14.1000	10.6000	7.1000	4.2000	4.2000	(96)
Heat loss rate W	973.4568	947.2470	861.2244	713.2910	544.1562	359.8397	238.5349	249.8138	392.5376	603.6735	799.4486	963.3995	963.3995	(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	1.0000	(97a)
Space heating kWh	349.3407	235.6521	153.2421	51.9835	10.6583	0.0000	0.0000	0.0000	0.0000	65.1353	216.7135	364.1400	364.1400	(98)
Space heating per m2												1446.8655	1446.8655	(98)
												(98) / (4) =	20.5579	(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 (303b)
Fraction of total space heat from community Boilers	1.0000 (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	1446.8655 (98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05	1519.2087 (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	1726.2974 (64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05	1812.6123 (310b)
Electricity used for heat distribution	33.3182 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7375)	
mechanical ventilation fans (SFP = 0.7375)	181.7410 (330a)
Total electricity for the above, kWh/year	181.7410 (331)
Electricity for lighting (calculated in Appendix L)	312.0242 (332)
Total delivered energy for all uses	3825.5862 (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			94.9800 (367b)
Space heating from Boilers	3507.9185	0.2160	757.7104 (368)
Electrical energy for heat distribution	33.3182	0.5190	17.2922 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			775.0026 (373)
Space and water heating			775.0026 (376)
Pumps and fans	181.7410	0.5190	94.3236 (378)
Energy for lighting	312.0242	0.5190	161.9405 (379)
Total CO2, kg/year			1031.2667 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			14.6500 (384)

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

DER			14.6500 ZC1
Total Floor Area		TFA	70.3800
Assumed number of occupants		N	2.2553
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190
CO2 emissions from appliances, equation (L14)			16.6864 ZC2
CO2 emissions from cooking, equation (L16)			2.4599 ZC3
Total CO2 emissions			33.7963 ZC4
Residual CO2 emissions offset from biofuel CHP			0.0000 ZC5
Additional allowable electricity generation, kWh/m ² /year			0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation			0.0000 ZC7
Net CO2 emissions			33.7963 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	70.3800 (1b)	2.8700 (2b)	201.9906 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.3800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	201.9906 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ 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				3 * 10 =	30.0000 (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) =				30.0000 / (5) =	0.1485 (8)
Pressure test				Yes	
Measured/design AP50				5.0000	
Infiltration rate				0.3985	(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) =		0.3686 (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	0.4700	0.4608	0.4516	0.4055	0.3963	0.3502	0.3502	0.3410	0.3686	0.3963	0.4147	0.4331 (22b)
Effective ac	0.6105	0.6062	0.6020	0.5822	0.5785	0.5613	0.5613	0.5581	0.5679	0.5785	0.5860	0.5938 (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			2.0500	1.0000	2.0500		(26)					
TER Opening Type (Uw = 1.40)			15.5500	1.3258	20.6155		(27)					
External Wall 1	47.2100	15.5500	31.6600	0.1800	5.6988		(29a)					
Corridor Wall	9.5000	2.0500	7.4500	0.1800	1.3410		(29a)					
Total net area of external elements Aum(A, m ²)			56.7100				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	29.7053	(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)							5.0149 (36)					
Total fabric heat loss						(33) + (36) =	34.7202 (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	40.6909	40.4050	40.1248	38.8085	38.5623	37.4159	37.4159	37.2036	37.8575	38.5623	39.0605	39.5813 (38)
Average = Sum(39)m / 12 =	75.4111	75.1252	74.8450	73.5288	73.2825	72.1361	72.1361	71.9238	72.5777	73.2825	73.7807	74.3015 (39)
HLP	1.0715	1.0674	1.0634	1.0447	1.0412	1.0250	1.0250	1.0219	1.0312	1.0412	1.0483	1.0557 (40)
HLP (average)												1.0447 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.2553 (42)
Average daily hot water use (litres/day)												87.7637 (43)
Daily hot water use	96.5401	93.0296	89.5190	86.0085	82.4979	78.9874	78.9874	82.4979	86.0085	89.5190	93.0296	96.5401 (44)
Energy conte	143.1662	125.2141	129.2097	112.6481	108.0886	93.2722	86.4304	99.1802	100.3647	116.9654	127.6769	138.6488 (45)
Energy content (annual)										Total = Sum(45)m =		1380.8652 (45)
Distribution loss (46)m = 0.15 x (45)m	21.4749	18.7821	19.3815	16.8972	16.2133	13.9908	12.9646	14.8770	15.0547	17.5448	19.1515	20.7973 (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	170.7839	150.1591	156.8274	139.3749	135.7062	119.9990	114.0481	126.7978	127.0915	144.5831	154.4036	166.2665 (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	170.7839	150.1591	156.8274	139.3749	135.7062	119.9990	114.0481	126.7978	127.0915	144.5831	154.4036	166.2665 (64)
Heat gains from water heating, kWh/month	69.6969	61.5897	65.0564	58.8369	58.0336	52.3944	50.8323	55.0715	54.7527	60.9851	63.8340	68.1949 (65)

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

Metabolic gains (Table 5), Watts (66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.6719	15.6960	12.7649	9.6638	7.2238	6.0987	6.5898	8.5657	11.4969	14.5979	17.0379	18.1631	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	198.1823	200.2388	195.0565	184.0239	170.0972	157.0081	148.2638	146.2073	151.3896	162.4222	176.3489	189.4380	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.2766	34.2766	34.2766	34.2766	34.2766	34.2766	34.2766	34.2766	34.2766	34.2766	34.2766	34.2766	(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)	-90.2126	-90.2126	-90.2126	-90.2126	-90.2126	-90.2126	-90.2126	-90.2126	-90.2126	-90.2126	-90.2126	-90.2126	(71)
Water heating gains (Table 5)	93.6786	91.6513	87.4413	81.7180	78.0021	72.7701	68.3229	74.0209	76.0454	81.9693	88.6583	91.6598	(72)
Total internal gains	369.3626	367.4159	355.0925	335.2354	315.1529	295.7066	283.0063	288.6236	298.7616	318.8191	341.8748	359.0906	(73)

6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains							
	m ²	Table 6a	Specific data	Specific data	factor	W							
		W/m ²	or Table 6b	or Table 6c	Table 6d								
East	8.8900	19.6403	0.6300	0.7000	0.7700	53.3606 (76)							
South	6.6600	46.7521	0.6300	0.7000	0.7700	95.1583 (78)							
Solar gains	148.5190	260.2295	370.4254	475.0849	541.0681	539.5439	519.2975	470.7253	407.3108	291.9545	179.3295	126.1067	(83)
Total gains	517.8816	627.6454	725.5179	810.3203	856.2210	835.2504	802.3037	759.3488	706.0724	610.7736	521.2043	485.1973	(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	64.8114	65.0580	65.3016	66.4706	66.6940	67.7539	67.7539	67.9539	67.3416	66.6940	66.2436	65.7793	
alpha	5.3208	5.3372	5.3534	5.4314	5.4463	5.5169	5.5169	5.5303	5.4894	5.4463	5.4162	5.3853	
util living area	0.9948	0.9853	0.9584	0.8811	0.7351	0.5431	0.3942	0.4332	0.6742	0.9217	0.9873	0.9962	(86)
MIT	19.9925	20.1992	20.4713	20.7609	20.9291	20.9891	20.9984	20.9974	20.9662	20.7289	20.3053	19.9615	(87)
Th 2	20.0242	20.0275	20.0308	20.0462	20.0491	20.0626	20.0626	20.0651	20.0574	20.0491	20.0433	20.0372	(88)
util rest of house	0.9931	0.9807	0.9459	0.8493	0.6776	0.4678	0.3110	0.3465	0.5956	0.8927	0.9825	0.9950	(89)
MIT 2	18.6928	18.9939	19.3826	19.7844	19.9860	20.0559	20.0620	20.0641	20.0337	19.7555	19.1614	18.6572	(90)
Living area fraction	fLA = Living area / (4) =												0.4119 (91)
MIT	19.2282	19.4903	19.8311	20.1866	20.3745	20.4403	20.4477	20.4485	20.4178	20.1564	19.6326	19.1944	(92)
Temperature adjustment													0.0000
adjusted MIT	19.2282	19.4903	19.8311	20.1866	20.3745	20.4403	20.4477	20.4485	20.4178	20.1564	19.6326	19.1944	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	513.3568	613.5502	684.0902	692.3459	597.7944	416.4551	277.0410	290.2891	442.5303	547.5139	510.7468	482.0669	(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	1125.7502	1096.1030	997.7640	829.8932	635.6879	421.2967	277.5613	291.1863	458.5342	700.3206	924.6610	1114.1085	(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	455.6207	324.2755	233.3734	99.0340	28.1928	0.0000	0.0000	0.0000	0.0000	113.6882	298.0182	470.2390	(98)
Space heating													2022.4417 (99)
Space heating per m2													(98) / (4) = 28.7360 (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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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													2163.0393 (211)
Space heating requirement	455.6207	324.2755	233.3734	99.0340	28.1928	0.0000	0.0000	0.0000	0.0000	113.6882	298.0182	470.2390	(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)	487.2949	346.8187	249.5972	105.9187	30.1527	0.0000	0.0000	0.0000	0.0000	121.5916	318.7361	502.9294	(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	170.7839	150.1591	156.8274	139.3749	135.7062	119.9990	114.0481	126.7978	127.0915	144.5831	154.4036	166.2665	(64)
Efficiency of water heater (217)m	87.3083	86.8157	85.8723	83.9216	81.4566	79.8000	79.8000	79.8000	79.8000	84.1812	86.5399	87.4375	(217)
Fuel for water heating, kWh/month	195.6102	172.9630	182.6286	166.0774	166.5994	150.3747	142.9174	158.8945	159.2625	171.7523	178.4191	190.1547	(219)
Water heating fuel used													2035.6540 (219)
Annual totals kWh/year													
Space heating fuel - main system													2163.0393 (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)													312.0917 (232)
Total delivered energy for all uses													4585.7849 (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	2163.0393	0.2160	467.2165 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2035.6540	0.2160	439.7013 (264)
Space and water heating			906.9177 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	312.0917	0.5190	161.9756 (268)
Total CO2, kg/m2/year			1107.8183 (272)
Emissions per m2 for space and water heating			12.8860 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.3014 (272b)
Emissions per m2 for pumps and fans			0.5531 (272c)
Target Carbon Dioxide Emission Rate (TER) = (12.8860 * 1.00) + 2.3014 + 0.5531, rounded to 2 d.p.			15.7400 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



Property Reference	C.07.03_1			Issued on Date	13/07/2023
Assessment Reference	C.07.03	Prop Type Ref	2B4P		
Property					
SAP Rating	79 C	DER	22.75	TER	24.07
Environmental	83 B	% DER<TER	5.47		
CO ₂ Emissions (t/year)	1.34	DFEE	72.37	TFEE	84.25
General Requirements Compliance	Pass	% DFEE<TFEE	14.10		
Assessor Details	Mr. Simon Gowing, Simon Gowing, Tel: 02036031616, Simon@hodkinsonconsultancy.com			Assessor ID	T271-0001
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 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) 24.07 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 22.75 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)84.2 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)72.4 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.15 (max. 0.30)	0.15 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.12 (max. 0.20)	0.12 (max. 0.35)	OK
Openings	1.27 (max. 2.00)	1.30 (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
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: 0.59
Maximum 1.5 OK
MVHR efficiency: 89%
Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): Not significant OK
Based on:
Overshading: Average
Windows facing North East: 9.88 m², No overhang
Windows facing North West: 7.40 m², No overhang
Air change rate: 4.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Roof U-value 0.12 W/m²K
Door U-value 1.00 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 (m2)	Storey height (m)	Volume (m3)
Ground floor	71.7000 (1b)	4.2000 (2b)	301.1400 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.7000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	301.1400 (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				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)

	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	0.1769	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:												0.5000 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												62.3000 (23c)
Effective ac	0.3654	0.3619	0.3585	0.3411	0.3377	0.3203	0.3203	0.3168	0.3273	0.3377	0.3446	0.3515 (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 = 1.30)			17.2800	1.2357	21.3536		(27)
Main Entrance			2.0500	1.0000	2.0500		(26)
External Wall 1	70.5600	17.2800	53.2800	0.1500	7.9920		(29a)
Corridor Wall	6.8900	2.0500	4.8400	0.1409	0.6820		(29a)
External Roof 1	71.7000		71.7000	0.1200	8.6040		(30)
Total net area of external elements Aum(A, m2)			149.1500				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	40.6816	(33)
Party Wall 1			67.2000	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)							19.7581 (36)
Total fabric heat loss						(33) + (36) =	60.4397 (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	36.3127	35.9680	35.6233	33.8997	33.5550	31.8314	31.8314	31.4867	32.5209	33.5550	34.2444	34.9338 (38)
Heat transfer coeff	96.7524	96.4077	96.0630	94.3394	93.9947	92.2712	92.2712	91.9265	92.9606	93.9947	94.6841	95.3736 (39)
Average = Sum(39)m / 12 =												94.2533 (39)
HLP	1.3494	1.3446	1.3398	1.3158	1.3109	1.2869	1.2869	1.2821	1.2965	1.3109	1.3206	1.3302 (40)
HLP (average)												1.3146 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												
Average daily hot water use (litres/day)												2.2867 (42)
Daily hot water use	97.3595	93.8191	90.2788	86.7385	83.1981	79.6578	79.6578	83.1981	86.7385	90.2788	93.8191	97.3595 (44)
Energy conte	144.3813	126.2768	130.3064	113.6042	109.0060	94.0639	87.1640	100.0220	101.2166	117.9581	128.7605	139.8256 (45)
Energy content (annual)										Total = Sum(45)m =		1392.5854 (45)
Distribution loss (46)m = 0.15 x (45)m	21.6572	18.9415	19.5460	17.0406	16.3509	14.1096	13.0746	15.0033	15.1825	17.6937	19.3141	20.9738 (46)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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)											0.0191 (51)
Volume factor from Table 2a											3.4200 (52)
Temperature factor from Table 2b											1.0000 (53)
Enter (49) or (54) in (55)											0.1960 (55)
Total storage loss											
6.0757	5.4877	6.0757	5.8797	6.0757	5.8797	6.0757	6.0757	5.8797	6.0757	5.8797	6.0757 (56)
If cylinder contains dedicated solar storage											
6.0757	5.4877	6.0757	5.8797	6.0757	5.8797	6.0757	6.0757	5.8797	6.0757	5.8797	6.0757 (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											
Solar input	173.7194	152.7757	159.6444	141.9959	138.3441	122.4556	116.5021	129.3600	129.6082	147.2962	157.1522 (62)
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											
173.7194	152.7757	159.6444	141.9959	138.3441	122.4556	116.5021	129.3600	129.6082	147.2962	157.1522	169.1637 (64)
Total per year (kWh/year) = Sum(64)m = 1738.0176 (64)											
Heat gains from water heating, kWh/month											
71.4772	63.1862	66.7973	60.4868	59.7149	53.9896	52.4525	56.7278	56.3679	62.6915	65.5262	69.9625 (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	114.3340	114.3340	114.3340	114.3340	114.3340	114.3340	114.3340	114.3340	114.3340	114.3340	114.3340 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5											
17.9400	15.9341	12.9585	9.8104	7.3334	6.1912	6.6898	8.6956	11.6712	14.8193	17.2963	18.4386 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5											
201.2318	203.3199	198.0578	186.8555	172.7145	159.4240	150.5451	148.4570	153.7191	164.9214	179.0624	192.3529 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5											
34.4334	34.4334	34.4334	34.4334	34.4334	34.4334	34.4334	34.4334	34.4334	34.4334	34.4334	34.4334 (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)											
-91.4672	-91.4672	-91.4672	-91.4672	-91.4672	-91.4672	-91.4672	-91.4672	-91.4672	-91.4672	-91.4672	-91.4672 (71)
Water heating gains (Table 5)											
96.0716	94.0270	89.7814	84.0094	80.2620	74.9855	70.5007	76.2470	78.2887	84.2628	91.0086	94.0356 (72)
Total internal gains											
372.5435	370.5813	358.0979	337.9755	317.6101	297.9009	285.0357	290.6998	300.9792	321.3037	344.6675	362.1272 (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			
Northeast		9.8800	11.2829	0.5000		0.7500	0.7700		28.9697 (75)			
Northwest		7.4000	11.2829	0.5000		0.7500	0.7700		21.6979 (81)			
Solar gains	50.6676	103.1354	185.8172	305.1653	410.2020	437.3187	409.1027	326.1414	226.4212	126.0397	63.7530	41.3777 (83)
Total gains	423.2111	473.7167	543.9151	643.1407	727.8121	735.2196	694.1385	616.8412	527.4004	447.3434	408.4205	403.5050 (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	51.4630	51.6470	51.8323	52.7793	52.9728	53.9623	53.9623	54.1647	53.5621	52.9728	52.5871	52.2070
alpha	4.4309	4.4431	4.4555	4.5186	4.5315	4.5975	4.5975	4.6110	4.5708	4.5315	4.5058	4.4805
util living area												
0.9980	0.9964	0.9907	0.9659	0.8854	0.7215	0.5632	0.6426	0.8906	0.9841	0.9965	0.9984 (86)	
MIT	19.4916	19.6336	19.9187	20.3385	20.7077	20.9233	20.9807	20.9661	20.7809	20.3162	19.8450	19.4789 (87)
Th 2	19.8023	19.8061	19.8098	19.8285	19.8323	19.8511	19.8511	19.8549	19.8436	19.8323	19.8248	19.8173 (88)
util rest of house												
0.9974	0.9951	0.9871	0.9518	0.8387	0.6224	0.4269	0.5029	0.8255	0.9753	0.9949	0.9979 (89)	
MIT 2	17.8071	18.0169	18.4345	19.0486	19.5453	19.8008	19.8443	19.8410	19.6594	19.0281	18.3391	17.7985 (90)
Living area fraction												
MIT	18.4226	18.6077	18.9768	19.5199	19.9700	20.2109	20.2596	20.2521	20.0692	19.4988	18.8894	18.4125 (91)
Temperature adjustment												
adjusted MIT	18.4226	18.6077	18.9768	19.5199	19.9700	20.2109	20.2596	20.2521	20.0692	19.4988	18.8894	18.4125 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9962	0.9933	0.9836	0.9471	0.8451	0.6559	0.4772	0.5543	0.8407	0.9718	0.9931	0.9969 (94)
Useful gains	421.5859	470.5200	535.0038	609.1199	615.0733	482.1998	331.2456	341.9007	443.3829	434.7404	405.6184	402.2601 (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												
1366.3999	1321.5265	1198.5619	1001.8758	777.3402	517.7277	337.6732	354.1137	554.9005	836.4376	1116.2661	1355.5004 (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	1.0000 (97a)
Space heating kWh												
702.9417	571.8764	493.6872	282.7843	120.7266	0.0000	0.0000	0.0000	0.0000	298.8627	511.6664	709.2107 (98)	
Space heating												
Space heating per m ²												
											(98) / (4) =	51.4889 (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 (303b)
Fraction of total space heat from community Boilers	1.0000 (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	3691.7560 (98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05	3876.3438 (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	1738.0176 (64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05	1824.9184 (310b)
Electricity used for heat distribution	57.0126 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7375)	
mechanical ventilation fans (SFP = 0.7375)	270.9507 (330a)
Total electricity for the above, kWh/year	270.9507 (331)
Electricity for lighting (calculated in Appendix L)	316.8253 (332)
Total delivered energy for all uses	6289.0382 (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			94.9800 (367b)
Space heating from Boilers	6002.5924	0.2160	1296.5600 (368)
Electrical energy for heat distribution	57.0126	0.5190	29.5896 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			1326.1495 (373)
Space and water heating			1326.1495 (376)
Pumps and fans	270.9507	0.5190	140.6234 (378)
Energy for lighting	316.8253	0.5190	164.4323 (379)
Total CO2, kg/year			1631.2052 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			22.7500 (384)

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

DER			22.7500 ZC1
Total Floor Area		TFA	71.7000
Assumed number of occupants		N	2.2867
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190
CO2 emissions from appliances, equation (L14)			16.6312 ZC2
CO2 emissions from cooking, equation (L16)			2.4251 ZC3
Total CO2 emissions			41.8063 ZC4
Residual CO2 emissions offset from biofuel CHP			0.0000 ZC5
Additional allowable electricity generation, kWh/m ² /year			0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation			0.0000 ZC7
Net CO2 emissions			41.8063 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	71.7000 (1b)	4.2000 (2b)	301.1400 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.7000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	301.1400 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ 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				3 * 10 =	30.0000 (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) =				30.0000 / (5) =	0.0996 (8)
Pressure test				Yes	
Measured/design AP50				5.0000	
Infiltration rate				0.3496	(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) =		0.3234 (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	0.4123	0.4042	0.3962	0.3557	0.3477	0.3072	0.3072	0.2991	0.3234	0.3477	0.3638	0.3800 (22b)
Effective ac	0.5850	0.5817	0.5785	0.5633	0.5604	0.5472	0.5472	0.5447	0.5523	0.5604	0.5662	0.5722 (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			2.0500	1.0000	2.0500		(26)
TER Opening Type (Uw = 1.40)			15.8800	1.3258	21.0530		(27)
External Wall 1	70.5600	15.8800	54.6800	0.1800	9.8424		(29a)
Corridor Wall	6.8900	2.0500	4.8400	0.1800	0.8712		(29a)
External Roof 1	71.7000		71.7000	0.1300	9.3210		(30)
Total net area of external elements Aum(A, m ²)			149.1500				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	43.1376	(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)							15.7260 (36)
Total fabric heat loss						(33) + (36) =	58.8636 (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	58.1361	57.8080	57.4865	55.9762	55.6936	54.3782	54.3782	54.1346	54.8849	55.6936	56.2652	56.8629 (38)
Average = Sum(39)m / 12 =	116.9997	116.6717	116.3501	114.8398	114.5572	113.2418	113.2418	112.9982	113.7485	114.5572	115.1289	115.7265 (39)
HLP	1.6318	1.6272	1.6227	1.6017	1.5977	1.5794	1.5794	1.5760	1.5865	1.5977	1.6057	1.6140 (40)
HLP (average)												1.6017 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.2867 (42)
Average daily hot water use (litres/day)												88.5086 (43)
Daily hot water use	97.3595	93.8191	90.2788	86.7385	83.1981	79.6578	79.6578	83.1981	86.7385	90.2788	93.8191	97.3595 (44)
Energy conte	144.3813	126.2768	130.3064	113.6042	109.0060	94.0639	87.1640	100.0220	101.2166	117.9581	128.7605	139.8256 (45)
Energy content (annual)												Total = Sum(45)m = 1392.5854 (45)
Distribution loss (46)m = 0.15 x (45)m	21.6572	18.9415	19.5460	17.0406	16.3509	14.1096	13.0746	15.0033	15.1825	17.6937	19.3141	20.9738 (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	171.9990	151.2218	157.9240	140.3310	136.6237	120.7907	114.7817	127.6396	127.9433	145.5758	155.4873	167.4433 (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	171.9990	151.2218	157.9240	140.3310	136.6237	120.7907	114.7817	127.6396	127.9433	145.5758	155.4873	167.4433 (64)
Heat gains from water heating, kWh/month	70.1009	61.9430	65.4210	59.1548	58.3386	52.6577	51.0762	55.3514	55.0359	61.3152	64.1943	68.5861 (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	114.3340	114.3340	114.3340	114.3340	114.3340	114.3340	114.3340	114.3340	114.3340	114.3340	114.3340	114.3340 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.9427	15.9365	12.9605	9.8119	7.3345	6.1921	6.6908	8.6969	11.6730	14.8216	17.2989	18.4414 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	201.2318	203.3199	198.0578	186.8555	172.7145	159.4240	150.5451	148.4570	153.7191	164.9214	179.0624	192.3529 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4334	34.4334	34.4334	34.4334	34.4334	34.4334	34.4334	34.4334	34.4334	34.4334	34.4334	34.4334 (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)	-91.4672	-91.4672	-91.4672	-91.4672	-91.4672	-91.4672	-91.4672	-91.4672	-91.4672	-91.4672	-91.4672	-91.4672 (71)
Water heating gains (Table 5)	94.2217	92.1771	87.9315	82.1595	78.4121	73.1356	68.6508	74.3971	76.4388	82.4129	89.1587	92.1857 (72)
Total internal gains	373.6963	371.7338	359.2499	339.1271	318.7613	299.0519	286.1869	291.8512	302.1310	322.4561	345.8203	363.2801 (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						
Northeast	9.0800	11.2829	0.6300	0.7000	0.7700	31.3098 (75)						
Northwest	6.8000	11.2829	0.6300	0.7000	0.7700	23.4479 (81)						
Solar gains	54.7576	111.4607	200.8168	329.7989	443.3144	472.6201	442.1264	352.4683	244.6984	136.2139	68.8993	44.7178 (83)
Total gains	428.4539	483.1945	560.0667	668.9259	762.0758	771.6720	728.3133	644.3195	546.8295	458.6699	414.7195	407.9980 (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	42.5571	42.6767	42.7947	43.3575	43.4644	43.9693	43.9693	44.0641	43.7735	43.4644	43.2486	43.0253
alpha	3.8371	3.8451	3.8530	3.8905	3.8976	3.9313	3.9313	3.9376	3.9182	3.8976	3.8832	3.8684
util living area	0.9977	0.9960	0.9904	0.9690	0.9043	0.7715	0.6267	0.7043	0.9114	0.9850	0.9961	0.9981 (86)
MIT	19.1619	19.3163	19.6343	20.1027	20.5444	20.8428	20.9492	20.9198	20.6524	20.1043	19.5641	19.1437 (87)
Th 2	19.5901	19.5934	19.5967	19.6121	19.6150	19.6285	19.6285	19.6310	19.6233	19.6150	19.6092	19.6031 (88)
util rest of house	0.9968	0.9945	0.9865	0.9551	0.8586	0.6625	0.4577	0.5387	0.8479	0.9760	0.9943	0.9974 (89)
MIT 2	17.1882	17.4158	17.8811	18.5640	19.1673	19.5250	19.6114	19.5990	19.3308	18.5772	17.7885	17.1697 (90)
Living area fraction	fLA = Living area / (4) = 0.3654 (91)											
MIT	17.9094	18.1102	18.5217	19.1262	19.6705	20.0065	20.1002	20.0816	19.8137	19.1352	18.4373	17.8910 (92)
Temperature adjustment	0.0000											
adjusted MIT	17.9094	18.1102	18.5217	19.1262	19.6705	20.0065	20.1002	20.0816	19.8137	19.1352	18.4373	17.8910 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9952	0.9920	0.9822	0.9485	0.8608	0.6964	0.5204	0.5995	0.8591	0.9715	0.9920	0.9961 (94)
Useful gains	426.4174	479.3456	550.0736	634.4978	656.0259	537.4171	378.9802	386.2568	469.8022	445.6079	411.4105	406.4033 (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	1592.3005	1541.2592	1398.7294	1174.3779	913.0771	612.2423	396.3707	416.0162	649.9264	977.7716	1305.2533	1584.4136 (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	867.4171	713.6060	631.3999	388.7136	191.2461	0.0000	0.0000	0.0000	0.0000	395.9299	643.5668	876.4397 (98)
Space heating	4708.3190 (98)											
Space heating per m2	(98) / (4) = 65.6669 (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													5035.6353 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	867.4171	713.6060	631.3999	388.7136	191.2461	0.0000	0.0000	0.0000	0.0000	395.9299	643.5668	876.4397	(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)	927.7188	763.2150	675.2940	415.7365	204.5413	0.0000	0.0000	0.0000	0.0000	423.4544	688.3067	937.3686	(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	171.9990	151.2218	157.9240	140.3310	136.6237	120.7907	114.7817	127.6396	127.9433	145.5758	155.4873	167.4433	(64)
Efficiency of water heater (217)m	88.5356	88.4268	88.1356	87.3918	85.7110	79.8000	79.8000	79.8000	79.8000	87.3513	88.1988	79.8000	(216)
Fuel for water heating, kWh/month	194.2710	171.0136	179.1831	160.5769	159.4003	151.3667	143.8367	159.9494	160.3300	166.6556	176.2919	188.9996	(219)
Water heating fuel used													2011.8750 (219)
Annual totals kWh/year													
Space heating fuel - main system													5035.6353 (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)													316.8732 (232)
Total delivered energy for all uses													7439.3836 (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	5035.6353	0.2160	1087.6972 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2011.8750	0.2160	434.5650 (264)
Space and water heating			1522.2622 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	316.8732	0.5190	164.4572 (268)
Total CO2, kg/m2/year			1725.6444 (272)
Emissions per m2 for space and water heating			21.2310 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.2937 (272b)
Emissions per m2 for pumps and fans			0.5429 (272c)
Target Carbon Dioxide Emission Rate (TER) = (21.2310 * 1.00) + 2.2937 + 0.5429, rounded to 2 d.p.			24.0700 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



Property Reference	A.15.03_1		Issued on Date	13/07/2023
Assessment Reference	A.15.03	Prop Type Ref	1B2P	
Property				

SAP Rating	82 B	DER	18.68	TER	20.93
Environmental	88 B	% DER<TER	10.74		
CO ₂ Emissions (t/year)	0.85	DFEE	50.74	TFEE	60.86
General Requirements Compliance	Pass	% DFEE<TFEE	16.63		

Assessor Details	Mr. Simon Gowing, Simon Gowing, Tel: 02036031616, Simon@hodkinsonconsultancy.com	Assessor ID	T271-0001
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Client	
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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 56 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) 20.93 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 18.68 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 60.9 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 50.7 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.14 (max. 0.30)	0.15 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.12 (max. 0.20)	0.12 (max. 0.35)	OK
Openings	1.24 (max. 2.00)	1.30 (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
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: 0.59
Maximum 1.5 OK
MVHR efficiency: 89%
Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): Slight OK
Based on:
Overshading: Average
Windows facing North East: 9.13 m², No overhang
Air change rate: 4.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Roof U-value 0.12 W/m²K
Door U-value 1.00 W/m²K
Air permeability 3.0 m³/m²h

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 CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	55.8600 (1b)	2.8700 (2b)	160.3182 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	55.8600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	160.3182 (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				3	(19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.7750 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.1163 (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	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1163	0.1250	0.1308	0.1366 (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) =												62.3000 (23c)
Effective ac	0.3367	0.3338	0.3309	0.3164	0.3135	0.2989	0.2989	0.2960	0.3048	0.3135	0.3193	0.3251 (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 = 1.30)			9.1300	1.2357	11.2823		(27)
Main Entrance			2.0500	1.0000	2.0500		(26)
External Wall 1	23.4200	9.1300	14.2900	0.1500	2.1435		(29a)
Corridor Wall	27.6700	2.0500	25.6200	0.1409	3.6101		(29a)
External Roof 1	55.8600		55.8600	0.1200	6.7032		(30)
Total net area of external elements Aum(A, m2)			106.9500				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	25.7892	(33)
Party Wall 1			40.6100	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)							11.6174 (36)
Total fabric heat loss						(33) + (36) =	37.4066 (37)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	17.8141	17.6604	17.5066	16.7378	16.5841	15.8153	15.8153	15.6615	16.1228	16.5841	16.8916	17.1991 (38)
Heat transfer coeff	55.2207	55.0669	54.9132	54.1444	53.9906	53.2219	53.2219	53.0681	53.5294	53.9906	54.2981	54.6057 (39)
Average = Sum(39)m / 12 =												54.1059 (39)
HLP	0.9886	0.9858	0.9830	0.9693	0.9665	0.9528	0.9528	0.9500	0.9583	0.9665	0.9720	0.9775 (40)
HLP (average)												0.9686 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												1.8625 (42)
Average daily hot water use (litres/day)												78.4346 (43)
Daily hot water use	86.2781	83.1407	80.0033	76.8659	73.7285	70.5911	70.5911	73.7285	76.8659	80.0033	83.1407	86.2781 (44)
Energy conte	127.9479	111.9040	115.4749	100.6739	96.5990	83.3576	77.2430	88.6375	89.6961	104.5322	114.1050	123.9107 (45)
Energy content (annual)										Total = Sum(45)m =		1234.0818 (45)
Distribution loss (46)m = 0.15 x (45)m	19.1922	16.7856	17.3212	15.1011	14.4898	12.5036	11.5865	13.2956	13.4544	15.6798	17.1158	18.5866 (46)

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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	(303b)
Fraction of total space heat from community Boilers	1.0000	(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	1829.7840	(98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05	1921.2732	(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	1579.5140	(64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05	1658.4897	(310b)
Electricity used for heat distribution	35.7976	(313)
Annual totals kWh/year		
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7375)		
mechanical ventilation fans (SFP = 0.7375)	144.2463	(330a)
Total electricity for the above, kWh/year	144.2463	(331)
Electricity for lighting (calculated in Appendix L)	262.3347	(332)
Total delivered energy for all uses	3986.3439	(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			94.9800 (367b)
Space heating from Boilers	3768.9649	0.2160	814.0964 (368)
Electrical energy for heat distribution	35.7976	0.5190	18.5790 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			832.6754 (373)
Space and water heating			832.6754 (376)
Pumps and fans	144.2463	0.5190	74.8638 (378)
Energy for lighting	262.3347	0.5190	136.1517 (379)
Total CO2, kg/year			1043.6910 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			18.6800 (384)

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

DER		18.6800	ZC1
Total Floor Area		55.8600	TFA
Assumed number of occupants		1.8625	N
CO2 emission factor in Table 12 for electricity displaced from grid		0.5190	EF
CO2 emissions from appliances, equation (L14)		17.2278	ZC2
CO2 emissions from cooking, equation (L16)		2.9305	ZC3
Total CO2 emissions		38.8383	ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000	ZC5
Additional allowable electricity generation, kWh/m ² /year		0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000	ZC7
Net CO2 emissions		38.8383	ZC8

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1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	55.8600 (1b)	2.8700 (2b)	160.3182 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	55.8600		160.3182 (4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 160.3182 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ 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				2 * 10 =	20.0000 (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) =				20.0000 / (5) =	0.1248 (8)
Pressure test				Yes	
Measured/design AP50				5.0000	
Infiltration rate				0.3748	(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) =	0.2904 (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	0.3703	0.3630	0.3558	0.3195	0.3122	0.2759	0.2759	0.2687	0.2904	0.3122	0.3267	0.3413 (22b)
Effective ac	0.5686	0.5659	0.5633	0.5510	0.5487	0.5381	0.5381	0.5361	0.5422	0.5487	0.5534	0.5582 (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			2.0500	1.0000	2.0500		(26)
TER Opening Type (Uw = 1.40)			9.1300	1.3258	12.1042		(27)
External Wall 1	23.4200	9.1300	14.2900	0.1800	2.5722		(29a)
Corridor Wall	27.6700	2.0500	25.6200	0.1800	4.6116		(29a)
External Roof 1	55.8600		55.8600	0.1300	7.2618		(30)
Total net area of external elements Aum(A, m ²)			106.9500				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	28.5998	(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)							10.2949 (36)
Total fabric heat loss							(33) + (36) = 38.8947 (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	30.0798	29.9389	29.8008	29.1524	29.0310	28.4663	28.4663	28.3617	28.6838	29.0310	29.2765	29.5331 (38)
Average = Sum(39)m / 12 =	68.9744	68.8336	68.6955	68.0470	67.9257	67.3609	67.3609	67.2563	67.5785	67.9257	68.1712	68.4278 (39)
												68.0465 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.2348	1.2323	1.2298	1.2182	1.2160	1.2059	1.2059	1.2040	1.2098	1.2160	1.2204	1.2250 (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	1.8625 (42)											
Average daily hot water use (litres/day)	78.4346 (43)											
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	86.2781	83.1407	80.0033	76.8659	73.7285	70.5911	70.5911	73.7285	76.8659	80.0033	83.1407	86.2781 (44)
Energy content (annual)	127.9479	111.9040	115.4749	100.6739	96.5990	83.3576	77.2430	88.6375	89.6961	104.5322	114.1050	123.9107 (45)
Distribution loss (46)m = 0.15 x (45)m	Total = Sum(45)m = 1234.0818 (45)											
Water storage loss:	19.1922	16.7856	17.3212	15.1011	14.4898	12.5036	11.5865	13.2956	13.4544	15.6798	17.1158	18.5866 (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)											

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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	155.5656	136.8490	143.0926	127.4006	124.2166	110.0843	104.8607	116.2552	116.4229	132.1499	140.8318	151.5284 (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	155.5656	136.8490	143.0926	127.4006	124.2166	110.0843	104.8607	116.2552	116.4229	132.1499	140.8318	151.5284 (64)
Heat gains from water heating, kWh/month	64.6368	57.1641	60.4896	54.8555	54.2133	49.0978	47.7774	51.5661	51.2054	56.8511	59.3214	63.2944 (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	93.1255	93.1255	93.1255	93.1255	93.1255	93.1255	93.1255	93.1255	93.1255	93.1255	93.1255	93.1255 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	15.0421	13.3602	10.8653	8.2257	6.1488	5.1911	5.6092	7.2910	9.7860	12.4255	14.5024	15.4601 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	162.3990	164.0842	159.8375	150.7970	139.3849	128.6591	121.4936	119.8084	124.0551	133.0956	144.5077	155.2335 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.3125	32.3125	32.3125	32.3125	32.3125	32.3125	32.3125	32.3125	32.3125	32.3125	32.3125	32.3125 (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)	-74.5004	-74.5004	-74.5004	-74.5004	-74.5004	-74.5004	-74.5004	-74.5004	-74.5004	-74.5004	-74.5004	-74.5004 (71)
Water heating gains (Table 5)	86.8774	85.0656	81.3032	76.1882	72.8673	68.1914	64.2170	69.3093	71.1186	76.4128	82.3908	85.0732 (72)
Total internal gains	318.2561	316.4477	305.9436	289.1485	272.3387	255.9792	245.2574	250.3463	258.8972	275.8716	295.3386	309.7045 (73)

6. Solar gains

[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
Northeast		9.1300	11.2829	0.6300	0.7000	0.7700	31.4822 (75)
Solar gains	31.4822	64.0829	115.4570	189.6136	254.8779	271.7268	254.1948
Total gains	349.7383	380.5306	421.4007	478.7621	527.2165	527.7060	499.4523

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, T _{hl} (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	56.2407	56.3557	56.4690	57.0071	57.1090	57.5878	57.5878	57.6774	57.4024	57.1090	56.9033	56.6900	
alpha	4.7494	4.7570	4.7646	4.8005	4.8073	4.8392	4.8392	4.8452	4.8268	4.8073	4.7936	4.7793	
util living area	0.9976	0.9959	0.9904	0.9676	0.8933	0.7358	0.5732	0.6447	0.8855	0.9816	0.9956	0.9980 (86)	
MIT	19.6705	19.7920	20.0409	20.4020	20.7330	20.9287	20.9831	20.9712	20.8130	20.4040	19.9806	19.6485 (87)	
Th 2	19.8923	19.8943	19.8962	19.9055	19.9072	19.9153	19.9153	19.9168	19.9122	19.9072	19.9037	19.9001 (88)	
util rest of house	0.9967	0.9945	0.9867	0.9545	0.8501	0.6412	0.4421	0.5112	0.8212	0.9719	0.9937	0.9974 (89)	
MIT 2	18.1296	18.3084	18.6718	19.1955	19.6412	19.8674	19.9091	19.9047	19.7547	19.2065	18.5908	18.1029 (90)	
Living area fraction									f _{LA} = Living area / (4) =			0.4400 (91)	
MIT	18.8076	18.9612	19.2743	19.7264	20.1216	20.3344	20.3817	20.3740	20.2204	19.7335	19.2024	18.7830 (92)	
Temperature adjustment												0.0000	
adjusted MIT	18.8076	18.9612	19.2743	19.7264	20.1216	20.3344	20.3817	20.3740	20.2204	19.7335	19.2024	18.7830 (93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	348.1905	377.7965	414.6547	455.6928	453.2741	358.9862	249.8434	258.3642	336.5872	343.5052	332.2936	334.1969 (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	1000.6560	967.8856	877.5350	736.7020	572.0450	386.2748	254.7401	267.2742	413.6061	620.3962	825.0319	997.8823 (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	485.4344	396.5399	344.3830	202.3266	88.3656	0.0000	0.0000	0.0000	0.0000	206.0069	354.7715	493.7819 (98)
Space heating												2571.6098 (98)
Space heating per m ²												46.0367 (99)

8c. Space cooling requirement

Not applicable

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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													2750.3848 (211)
Space heating requirement	485.4344	396.5399	344.3830	202.3266	88.3656	0.0000	0.0000	0.0000	0.0000	206.0069	354.7715	493.7819	(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)	519.1812	424.1068	368.3240	216.3921	94.5086	0.0000	0.0000	0.0000	0.0000	220.3282	379.4348	528.1090	(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	155.5656	136.8490	143.0926	127.4006	124.2166	110.0843	104.8607	116.2552	116.4229	132.1499	140.8318	151.5284	(64)
Efficiency of water heater (217)m	87.6478	87.4902	87.0729	86.0423	83.9246	79.8000	79.8000	79.8000	79.8000	85.9939	87.1783	87.7376	(217)
Fuel for water heating, kWh/month	177.4894	156.4164	164.3366	148.0674	148.0098	137.9503	131.4044	145.6832	145.8934	153.6735	161.5445	172.7064	(219)
Water heating fuel used													1843.1752 (219)
Annual totals kWh/year													
Space heating fuel - main system													2750.3848 (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)													265.6477 (232)
Total delivered energy for all uses													4934.2077 (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	2750.3848	0.2160	594.0831 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1843.1752	0.2160	398.1258 (264)
Space and water heating			992.2090 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	265.6477	0.5190	137.8712 (268)
Total CO2, kg/m2/year			1169.0051 (272)
Emissions per m2 for space and water heating			17.7624 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.4682 (272b)
Emissions per m2 for pumps and fans			0.6968 (272c)
Target Carbon Dioxide Emission Rate (TER) = (17.7624 * 1.00) + 2.4682 + 0.6968, rounded to 2 d.p.			20.9300 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



Property Reference	B.00.02_1		Issued on Date	13/07/2023
Assessment Reference	B.00.02	Prop Type Ref	2B4P - Duplex House	
Property				

SAP Rating	82 B	DER	19.90	TER	21.13
Environmental	85 B	% DER<TER	5.84		
CO ₂ Emissions (t/year)	1.16	DFEE	54.85	TFEE	63.99
General Requirements Compliance	Pass	% DFEE<TFEE	14.28		

Assessor Details	Mr. Simon Gowing, Simon Gowing, Tel: 02036031616, Simon@hodkinsonconsultancy.com	Assessor ID	T271-0001
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 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
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 21.13 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 19.90 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 64.0 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 54.8 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.15 (max. 0.30)	0.15 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.20 (max. 0.25)	0.20 (max. 0.70)	OK
Roof	0.12 (max. 0.20)	0.12 (max. 0.35)	OK
Openings	1.25 (max. 2.00)	1.30 (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: Boiler system with radiators or underfloor - Mains gas

Data from database

Ideal LOGIC COMBI C30IE

Combi boiler

Efficiency: 89.6% SEDBUK2009

Minimum: 88.0% OK

Secondary heating system:

None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Time and temperature zone control OK

Hot water controls:

No cylinder

Boiler interlock

Yes

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: 0.59

Maximum 1.5 OK

MVHR efficiency: 89% OK

Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): Not significant OK

Based on:

Overshading:

Average

Windows facing South East: 9.27 m², No overhang

Windows facing North West: 4.95 m², No overhang

Air change rate: 4.00 ach

Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K

Party wall U-value 0.00 W/m²K

Roof U-value 0.12 W/m²K

Roof U-value 0.12 W/m²K

Door U-value 1.00 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 (m2)	Storey height (m)	Volume (m3)
Ground floor	20.4000 (1b)	3.3800 (2b)	68.9520 (1b) - (3b)
First floor	50.1800 (1c)	2.8700 (2c)	144.0166 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.5800		
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 212.9686 (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)
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)

	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	0.1626	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) =												62.3000 (23c)
Effective ac	0.3511	0.3479	0.3447	0.3288	0.3256	0.3096	0.3096	0.3064	0.3160	0.3256	0.3319	0.3383 (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 = 1.30)			14.2200	1.2357	17.5722		(27)
Main Entrance			3.1400	1.0000	3.1400		(26)
Ground Floor			20.4000	0.2000	4.0800		(28a)
Exposed Floor 1F			36.2900	0.2000	7.2580		(28b)
External Wall GF	27.6800	7.4800	20.2000	0.1500	3.0300		(29a)
External Wall 1F	17.7900	9.8800	7.9100	0.1500	1.1865		(29a)
Exposed Roof GF	6.4600		6.4600	0.1200	0.7752		(30)
Roof	50.1800		50.1800	0.1200	6.0216		(30)
Total net area of external elements Aum(A, m2)			158.8000				(31)
Fabric heat loss, W/K = Sum (A x U)					(26) ... (30) + (32) =		43.0635 (33)
Party Wall GF			33.6200	0.0000	0.0000		(32)
Party Wall 1F			70.3700	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)							14.2134 (36)
Total fabric heat loss							(33) + (36) = 57.2769 (37)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	24.6725	24.4485	24.2245	23.1044	22.8804	21.7603	21.7603	21.5363	22.2084	22.8804	23.3284	23.7765 (38)
Heat transfer coeff	81.9495	81.7255	81.5015	80.3814	80.1574	79.0373	79.0373	78.8133	79.4853	80.1574	80.6054	81.0534 (39)
Average = Sum(39)m / 12 =												80.3254 (39)
HLP	1.1611	1.1579	1.1547	1.1389	1.1357	1.1198	1.1198	1.1167	1.1262	1.1357	1.1420	1.1484 (40)
HLP (average)												1.1381 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.2601 (42)
Average daily hot water use (litres/day)												87.8779 (43)
Daily hot water use												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Energy conte	96.6657	93.1506	89.6355	86.1204	82.6053	79.0901	79.0901	82.6053	86.1204	89.6355	93.1506	96.6657 (44)
Energy content (annual)	143.3525	125.3770	129.3778	112.7947	108.2292	93.3936	86.5429	99.3092	100.4953	117.1176	127.8430	138.8292 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 1382.6620 (45)
Water storage loss:	21.5029	18.8065	19.4067	16.9192	16.2344	14.0090	12.9814	14.8964	15.0743	17.5676	19.1764	20.8244 (46)
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	43.3599	39.1428	43.3034	41.8687	43.2369	41.8106	43.1845	43.2185	41.8423	43.2759	41.9236	43.3489 (61)
Total heat required for water heating calculated for each month	186.7123	164.5198	172.6812	154.6635	151.4662	135.2041	129.7274	142.5277	142.3376	160.3935	169.7666	182.1781 (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	186.7123	164.5198	172.6812	154.6635	151.4662	135.2041	129.7274	142.5277	142.3376	160.3935	169.7666	182.1781 (64)
Heat gains from water heating, kWh/month	58.5047	51.4736	53.8440	47.9714	46.7954	41.5060	39.5716	43.8249	43.8753	49.7606	52.9887	56.9979 (65)
												Solar input (sum of months) = Sum(63)m = 0.0000 (63)
												Total per year (kWh/year) = Sum(64)m = 1892.1780 (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	113.0062	113.0062	113.0062	113.0062	113.0062	113.0062	113.0062	113.0062	113.0062	113.0062	113.0062	113.0062 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.7291	15.7468	12.8062	9.6951	7.2472	6.1184	6.6111	8.5934	11.5341	14.6451	17.0930	18.2218 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	198.6469	200.7083	195.5138	184.4553	170.4960	157.3762	148.6114	146.5500	151.7445	162.8030	176.7623	189.8821 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.3006	34.3006	34.3006	34.3006	34.3006	34.3006	34.3006	34.3006	34.3006	34.3006	34.3006	34.3006 (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)	-90.4049	-90.4049	-90.4049	-90.4049	-90.4049	-90.4049	-90.4049	-90.4049	-90.4049	-90.4049	-90.4049	-90.4049 (71)
Water heating gains (Table 5)	78.6353	76.5975	72.3709	66.6270	62.8971	57.6472	53.1877	58.9045	60.9378	66.8825	73.5954	76.6101 (72)
Total internal gains	354.9132	352.9545	340.5927	320.6793	300.5422	281.0437	268.3121	273.9498	284.1183	304.2325	327.3526	344.6159 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	FF	Access factor Table 6d	Gains W					
Southeast	9.2700	36.7938	0.5000	0.7500	0.7700	88.6379 (77)						
Northwest	4.9500	11.2829	0.5000	0.7500	0.7700	14.5142 (81)						
Solar gains	103.1520	180.5271	259.8105	343.3818	404.2075	409.9021	391.6031	344.9069	288.5444	202.9736	124.4303	87.7085 (83)
Total gains	458.0652	533.4816	600.4032	664.0610	704.7497	690.9457	659.9151	618.8567	572.6627	507.2060	451.7829	432.3245 (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	59.8099	59.9738	60.1387	60.9767	61.1471	62.0136	62.0136	62.1899	61.6641	61.1471	60.8072	60.4711
alpha	4.9873	4.9983	5.0092	5.0651	5.0765	5.1342	5.1342	5.1460	5.1109	5.0765	5.0538	5.0314
util living area	0.9972	0.9934	0.9832	0.9491	0.8580	0.6857	0.5175	0.5697	0.8178	0.9670	0.9939	0.9979 (86)
MIT	20.0375	20.1626	20.3561	20.6040	20.8056	20.9149	20.9408	20.9372	20.8666	20.6031	20.2753	20.0174 (87)
Th 2	19.9513	19.9538	19.9564	19.9692	19.9718	19.9847	19.9847	19.9873	19.9795	19.9718	19.9666	19.9615 (88)
util rest of house	0.9962	0.9912	0.9773	0.9306	0.8089	0.5952	0.4030	0.4524	0.7414	0.9513	0.9915	0.9972 (89)
MIT 2	18.6662	18.8504	19.1323	19.4927	19.7573	19.8862	19.9050	19.9059	19.8389	19.4997	19.0255	18.6449 (90)
Living area fraction										fLA = Living area / (4) =		0.2744 (91)
MIT	19.0426	19.2106	19.4681	19.7977	20.0450	20.1685	20.1892	20.1890	20.1210	19.8025	19.3685	19.0216 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.8926	19.0606	19.3181	19.6477	19.8950	20.0185	20.0392	20.0390	19.9710	19.6525	19.2185	18.8716 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	455.6987	527.4294	583.8829	613.2322	567.1238	413.5124	270.1383	283.8332	424.1440	479.2456	446.8060	430.6280 (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	1195.8527	1157.2787	1044.6958	863.9121	656.8878	428.2657	271.8286	286.7997	466.6549	725.6252	976.8180	1189.1824 (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	550.6745	423.2588	342.8448	180.4896	66.7844	0.0000	0.0000	0.0000	0.0000	183.3064	381.6086	564.3645 (98)
Space heating												2693.3317 (98)
Space heating per m2												(98) / (4) = 38.1600 (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

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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 %)													90.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													2976.0571 (211)
Space heating requirement	550.6745	423.2588	342.8448	180.4896	66.7844	0.0000	0.0000	0.0000	0.0000	183.3064	381.6086	564.3645	(98)
Space heating efficiency (main heating system 1)	90.5000	90.5000	90.5000	90.5000	90.5000	0.0000	0.0000	0.0000	0.0000	90.5000	90.5000	90.5000	(210)
Space heating fuel (main heating system)	608.4801	467.6892	378.8341	199.4360	73.7950	0.0000	0.0000	0.0000	0.0000	202.5485	421.6670	623.6072	(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	186.7123	164.5198	172.6812	154.6635	151.4662	135.2041	129.7274	142.5277	142.3376	160.3935	169.7666	182.1781	(64)
Efficiency of water heater (217)m	89.6678	89.5809	89.4023	88.9946	88.2549	87.3000	87.3000	87.3000	87.3000	88.9780	89.4900	87.3000	(216)
Fuel for water heating, kWh/month	208.2268	183.6550	193.1507	173.7897	171.6235	154.8730	148.5996	163.2620	163.0442	180.2620	189.7045	203.1024	(219)
Water heating fuel used													2133.2934 (219)
Annual totals kWh/year													
Space heating fuel - main system													2976.0571 (211)
Space heating fuel - secondary													0.0000 (215)
Electricity for pumps and fans: (BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7375)													
mechanical ventilation fans (SFP = 0.7375)													191.6185 (230a)
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													266.6185 (231)
Electricity for lighting (calculated in Appendix L)													313.1014 (232)
Total delivered energy for all uses													5689.0704 (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	2976.0571	0.2160	642.8283	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2133.2934	0.2160	460.7914	(264)
Space and water heating			1103.6197	(265)
Pumps and fans	266.6185	0.5190	138.3750	(267)
Energy for lighting	313.1014	0.5190	162.4996	(268)
Total CO2, kg/year			1404.4943	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			19.9000	(273)

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

DER			19.9000	ZC1
Total Floor Area		TFA	70.5800	
Assumed number of occupants		N	2.2601	
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190	
CO2 emissions from appliances, equation (L14)			16.6781	ZC2
CO2 emissions from cooking, equation (L16)			2.4546	ZC3
Total CO2 emissions			39.0327	ZC4
Residual CO2 emissions offset from biofuel CHP			0.0000	ZC5
Additional allowable electricity generation, kWh/m ² /year			0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation			0.0000	ZC7
Net CO2 emissions			39.0327	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 (m2)	Storey height (m)	Volume (m3)
Ground floor	20.4000 (1b)	3.3800 (2b)	68.9520 (1b) - (3b)
First floor	50.1800 (1c)	2.8700 (2c)	144.0166 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.5800		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 212.9686 (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				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) =	0.1409 (8)							
Pressure test				Yes								
Measured/design AP50				5.0000								
Infiltration rate					0.3909 (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) =		0.3322 (21)							
Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 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	0.4236	0.4153	0.4070	0.3655	0.3572	0.3156	0.3156	0.3073	0.3322	0.3572	0.3738	0.3904 (22b)
Effective ac	0.5897	0.5862	0.5828	0.5668	0.5638	0.5498	0.5498	0.5472	0.5552	0.5638	0.5699	0.5762 (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			3.1400	1.0000	3.1400		(26)					
TER Opening Type (Uw = 1.40)			14.2200	1.3258	18.8523		(27)					
Ground Floor			20.4000	0.1300	2.6520		(28a)					
Exposed Floor 1F			36.2900	0.1300	4.7177		(28b)					
External Wall GF	27.6800	7.4800	20.2000	0.1800	3.6360		(29a)					
External Wall 1F	17.7900	9.8800	7.9100	0.1800	1.4238		(29a)					
Exposed Roof GF	6.4600		6.4600	0.1300	0.8398		(30)					
Roof	50.1800		50.1800	0.1300	6.5234		(30)					
Total net area of external elements Aum(A, m2)			158.8000				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	41.7850	(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							16.3607 (36)					
Total fabric heat loss							(33) + (36) = 58.1457 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 41.4452	Feb 41.2004	Mar 40.9604	Apr 39.8331	May 39.6222	Jun 38.6404	Jul 38.6404	Aug 38.4586	Sep 39.0186	Oct 39.6222	Nov 40.0489	Dec 40.4949 (38)
Heat transfer coeff	99.5909	99.3461	99.1061	97.9788	97.7679	96.7861	96.7861	96.6043	97.1643	97.7679	98.1945	98.6406 (39)
Average = Sum(39)m / 12 =												97.9778 (39)
HLP	Jan 1.4110	Feb 1.4076	Mar 1.4042	Apr 1.3882	May 1.3852	Jun 1.3713	Jul 1.3713	Aug 1.3687	Sep 1.3767	Oct 1.3852	Nov 1.3913	Dec 1.3976 (40)
HLP (average)												1.3882 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.2601 (42)
Average daily hot water use (litres/day)												87.8779 (43)
Daily hot water use	96.6657	93.1506	89.6355	86.1204	82.6053	79.0901	79.0901	82.6053	86.1204	89.6355	93.1506	96.6657 (44)
Energy conte	143.3525	125.3770	129.3778	112.7947	108.2292	93.3936	86.5429	99.3092	100.4953	117.1176	127.8430	138.8292 (45)
Energy content (annual)												Total = Sum(45)m = 1382.6620 (45)
Distribution loss (46)m = 0.15 x (45)m												
	21.5029	18.8065	19.4067	16.9192	16.2344	14.0090	12.9814	14.8964	15.0743	17.5676	19.1764	20.8244 (46)
Water storage loss:												

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Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	49.2598	42.8748	45.6773	42.4703	42.0947	39.0034	40.3035	42.0947	42.4703	45.6773	45.9373	49.2598	49.2598	49.2598	(61)
Total heat required for water heating calculated for each month	192.6123	168.2518	175.0551	155.2650	150.3239	132.3969	126.8464	141.4040	142.9656	162.7948	173.7803	188.0890	188.0890	188.0890	(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	0.0000	0.0000	(63)
Output from w/h	192.6123	168.2518	175.0551	155.2650	150.3239	132.3969	126.8464	141.4040	142.9656	162.7948	173.7803	188.0890	188.0890	188.0890	(64)
Heat gains from water heating, kWh/month	59.9796	52.4065	54.4374	48.1218	46.5099	40.8042	38.8514	43.5440	44.0323	50.3609	53.9921	58.4757	58.4757	58.4757	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	113.0062	113.0062	113.0062	113.0062	113.0062	113.0062	113.0062	113.0062	113.0062	113.0062	113.0062	113.0062	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	17.8209	15.8284	12.8725	9.7453	7.2847	6.1501	6.6454	8.6379	11.5938	14.7210	17.1816	18.3162	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	198.6469	200.7083	195.5138	184.4553	170.4960	157.3762	148.6114	146.5500	151.7445	162.8030	176.7623	189.8821	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	34.3006	34.3006	34.3006	34.3006	34.3006	34.3006	34.3006	34.3006	34.3006	34.3006	34.3006	34.3006	(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)													
	-90.4049	-90.4049	-90.4049	-90.4049	-90.4049	-90.4049	-90.4049	-90.4049	-90.4049	-90.4049	-90.4049	-90.4049	(71)
Water heating gains (Table 5)													
	80.6178	77.9859	73.1686	66.8359	62.5133	56.6725	52.2196	58.5269	61.1559	67.6894	74.9890	78.5963	(72)
Total internal gains	356.9875	354.4244	341.4567	320.9384	300.1959	280.1006	267.3782	273.6167	284.3961	305.1152	328.8348	346.6965	(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	
Southeast		9.2700	36.7938	0.6300	0.7000	0.7700	104.2381
Northwest		4.9500	11.2829	0.6300	0.7000	0.7700	17.0687
Solar gains	121.3068	212.2998	305.5372	403.8170	475.3480	482.0448	460.5252
Total gains	478.2943	566.7243	646.9939	724.7553	775.5439	762.1455	727.9034

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	49.2152	49.3365	49.4560	50.0250	50.1329	50.6415	50.6415	50.7368	50.4444	50.1329	49.9151	49.6894	21.0000
alpha	4.2810	4.2891	4.2971	4.3350	4.3422	4.3761	4.3761	4.3825	4.3630	4.3422	4.3277	4.3126	
util living area	0.9966	0.9924	0.9819	0.9504	0.8712	0.7213	0.5604	0.6150	0.8417	0.9682	0.9932	0.9974	(86)
MIT	19.4928	19.6819	19.9804	20.3665	20.7020	20.9109	20.9771	20.9659	20.8141	20.3744	19.8618	19.4613	(87)
Th 2	19.7549	19.7575	19.7601	19.7724	19.7747	19.7854	19.7854	19.7874	19.7813	19.7747	19.7700	19.7652	(88)
util rest of house	0.9954	0.9898	0.9753	0.9310	0.8200	0.6181	0.4178	0.4714	0.7608	0.9519	0.9903	0.9964	(89)
MIT 2	17.7771	18.0540	18.4876	19.0429	19.4878	19.7277	19.7776	19.7742	19.6362	19.0657	18.3259	17.7379	(90)
Living area fraction										fLA = Living area / (4) =		0.2744	(91)
MIT	18.2479	18.5008	18.8973	19.4061	19.8210	20.0524	20.1068	20.1012	19.9595	19.4249	18.7474	18.2109	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.2479	18.5008	18.8973	19.4061	19.8210	20.0524	20.1068	20.1012	19.9595	19.4249	18.7474	18.2109	(93)

8. Space heating requirement

Utilisation	0.9931	0.9859	0.9689	0.9236	0.8222	0.6429	0.4573	0.5109	0.7746	0.9456	0.9868	0.9947	(94)
Useful gains	475.0157	558.7227	626.8533	669.3775	637.6743	489.9969	332.8710	347.0496	483.1643	514.2023	468.9013	447.4378	(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	1389.0876	1351.1829	1228.6457	1029.3796	793.9728	527.7184	339.4060	357.5555	569.3308	862.7901	1143.7143	1382.0425	(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	680.0695	532.5333	447.7336	259.2015	116.2860	0.0000	0.0000	0.0000	0.0000	259.3493	485.8654	695.3459	(98)
Space heating												3476.3845	(98)
Space heating per m2												49.2545	(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 %)													93.4000	(206)
Efficiency of secondary/supplementary heating system, %													0.0000	(208)
Space heating requirement													3722.0390	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	680.0695	532.5333	447.7336	259.2015	116.2860	0.0000	0.0000	0.0000	0.0000	259.3493	485.8654	695.3459	(98)	
Space heating efficiency (main heating system 1)	93.4000	93.4000	93.4000	93.4000	93.4000	0.0000	0.0000	0.0000	0.0000	93.4000	93.4000	93.4000	(210)	
Space heating fuel (main heating system)	728.1258	570.1641	479.3722	277.5177	124.5033	0.0000	0.0000	0.0000	0.0000	277.6759	520.1985	744.4817	(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	192.6123	168.2518	175.0551	155.2650	150.3239	132.3969	126.8464	141.4040	142.9656	162.7948	173.7803	188.0890	(64)	
Efficiency of water heater (217)m	87.9582	87.7501	87.3131	86.3322	84.4135	80.3000	80.3000	80.3000	80.3000	86.2180	87.5006	88.0423	(217)	
Fuel for water heating, kWh/month	218.9816	191.7397	200.4911	179.8461	178.0804	164.8779	157.9656	176.0946	178.0394	188.8177	198.6046	213.6348	(219)	
Water heating fuel used													2247.1734	(219)
Annual totals kWh/year													3722.0390	(211)
Space heating fuel - main system													0.0000	(215)
Space heating fuel - secondary													30.0000	(230c)
Electricity for pumps and fans:													45.0000	(230e)
central heating pump													75.0000	(231)
main heating flue fan													314.7231	(232)
Total electricity for the above, kWh/year													6358.9356	(238)
Electricity for lighting (calculated in Appendix L)														
Total delivered energy for all uses														

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	3722.0390	0.2160	803.9604 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2247.1734	0.2160	485.3895 (264)
Space and water heating			1289.3499 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	314.7231	0.5190	163.3413 (268)
Total CO2, kg/m2/year			1491.6162 (272)
Emissions per m2 for space and water heating			18.2679 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.3143 (272b)
Emissions per m2 for pumps and fans			0.5515 (272c)
Target Carbon Dioxide Emission Rate (TER) = (18.2679 * 1.00) + 2.3143 + 0.5515, rounded to 2 d.p.			21.1300 (273)

Appendix C

BRUKL Worksheets – *Be Lean*

Project name

Shell and Core

The Hyde - Commercial Unit Be Lean

As designed

Date: Thu Jul 13 10:39:03 2023

Administrative information

Building Details

Address: The Hyde - Commercial Unit, Colindale, London, NW9

Certification tool

Calculation engine: SBEM

Calculation engine version: v5.6.b.0

Interface to calculation engine: DesignBuilder SBEM

Interface to calculation engine version: v6.1.8

BRUKL compliance check version: v5.6.b.0

Certifier details

Name: Nimco Ali

Telephone number: 020 3603 1600

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

Criterion 1: The calculated CO₂ emission rate for the building must not exceed the target

CO ₂ emission rate from the notional building, kgCO ₂ /m ² .annum	22
Target CO ₂ emission rate (TER), kgCO ₂ /m ² .annum	22
Building CO ₂ emission rate (BER), kgCO ₂ /m ² .annum	17.1
Are emissions from the building less than or equal to the target?	BER =< TER
Are as built details the same as used in the BER calculations?	Separate submission

Criterion 2: The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Values which do not achieve the standards in the Non-Domestic Building Services Compliance Guide and Part L are displayed in red.

Building fabric

Element	U _a -Limit	U _a -Calc	U _i -Calc	Surface where the maximum value occurs*
Wall**	0.35	0.15	0.15	"00 Level - Commercial_P_5"
Floor	0.25	0.2	0.2	"00 Level - Commercial_S_2"
Roof	0.25	0.12	0.12	"00 Level - Commercial_R_4"
Windows***, roof windows, and rooflights	2.2	1.4	1.4	"00 Level - Commercial_G_11"
Personnel doors	2.2	-	-	"No external personnel doors"
Vehicle access & similar large doors	1.5	-	-	"No external vehicle access doors"
High usage entrance doors	3.5	-	-	"No external high usage entrance doors"
U _a -Limit = Limiting area-weighted average U-values [W/(m ² K)]		U _a -Calc = Calculated area-weighted average U-values [W/(m ² K)]		U _i -Calc = Calculated maximum individual element U-values [W/(m ² K)]
* There might be more than one surface where the maximum U-value occurs.				
** 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.				
N.B.: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.				

Air Permeability	Worst acceptable standard	This building
m ³ /(h.m ²) at 50 Pa	10	3

Building services

The standard values listed below are minimum values for efficiencies and maximum values for SFPs. Refer to the Non-Domestic Building Services Compliance Guide for details.

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	NO
Whole building electric power factor achieved by power factor correction	<0.9

1- Project HVAC

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.92	3.7	-	-	-
Standard value	0.91*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO
* Standard shown is for gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.					

1- Project DHW

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

Local mechanical ventilation, exhaust, and terminal units

ID	System type in Non-domestic Building Services Compliance Guide
A	Local supply or extract ventilation units serving a single area
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 supply and extract ventilation units serving a single room or zone with heating and heat recovery
E	Local supply and extract ventilation system serving a single area with heating and heat recovery
F	Other local ventilation units
G	Fan-assisted terminal VAV unit
H	Fan coil units
I	Zonal extract system where the fan is remote from the zone with grease filter

Zone name	SFP [W/(l/s)]										HR efficiency	
	A	B	C	D	E	F	G	H	I	Zone	Standard	
ID of system type												
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1			
00 Level - Commercial	-	-	-	1.3	-	-	-	-	-		0.85	0.5

Shell and core configuration

Zone	Assumed shell?
00 Level - Commercial	NO

General lighting and display lighting

Zone name	Luminous efficacy [lm/W]			General lighting [W]
	Luminaire	Lamp	Display lamp	
Standard value	60	60	22	
00 Level - Commercial	100	-	-	1182

Criterion 3: The spaces in the building should have appropriate passive control measures to limit solar gains

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
00 Level - Commercial	NO (-50.8%)	NO

Criterion 4: The performance of the building, as built, should be consistent with the calculated BER

Separate submission

Criterion 5: The necessary provisions for enabling energy-efficient operation of the building should be in place

Separate submission

EPBD (Recast): Consideration of 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
Area [m ²]	197.5	197.5
External area [m ²]	473.8	473.8
Weather	LON	LON
Infiltration [m ³ /hm ² @ 50Pa]	3	5
Average conductance [W/K]	164.11	210.22
Average U-value [W/m ² K]	0.35	0.44
Alpha value* [%]	18.51	17.53

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

Building Use

% Area Building Type

	A1/A2 Retail/Financial and Professional services
	A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways
100	B1 Offices and Workshop businesses
	B2 to B7 General Industrial and Special Industrial Groups
	B8 Storage or Distribution
	C1 Hotels
	C2 Residential Institutions: Hospitals and Care Homes
	C2 Residential Institutions: Residential schools
	C2 Residential Institutions: Universities and colleges
	C2A Secure Residential Institutions
	Residential spaces
	D1 Non-residential Institutions: Community/Day Centre
	D1 Non-residential Institutions: Libraries, Museums, and Galleries
	D1 Non-residential Institutions: Education
	D1 Non-residential Institutions: Primary Health Care Building
	D1 Non-residential Institutions: Crown and County Courts
	D2 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	17.08	23.74
Cooling	5.97	9.99
Auxiliary	3.9	2.7
Lighting	13.12	18.51
Hot water	2.89	3.34
Equipment*	42.19	42.19
TOTAL**	42.96	58.28

* 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

Energy & CO₂ Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m ²]	151.91	199.45
Primary energy* [kWh/m ²]	100.28	126.02
Total emissions [kg/m ²]	17.1	22

* Primary energy is net of any electrical energy displaced by CHP generators, if applicable.

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] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity									
Actual	52.7	99.2	17.1	6	3.9	0.86	4.62	0.92	6.5
Notional	70	129.4	23.7	10	2.7	0.82	3.6	----	----

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

Key Features

The Building Control Body is advised to give particular attention to items whose specifications are better than typically expected.

Building fabric

Element	U _{i-Typ}	U _{i-Min}	Surface where the minimum value occurs*
Wall	0.23	0.15	"00 Level - Commercial_P_5"
Floor	0.2	0.2	"00 Level - Commercial_S_2"
Roof	0.15	0.12	"00 Level - Commercial_R_4"
Windows, roof windows, and rooflights	1.5	1.4	"00 Level - Commercial_G_11"
Personnel doors	1.5	-	"No external personnel doors"
Vehicle access & similar large doors	1.5	-	"No external vehicle access doors"
High usage entrance doors	1.5	-	"No external high usage entrance doors"
U _{i-Typ} = Typical individual element U-values [W/(m ² K)]		U _{i-Min} = Minimum individual element U-values [W/(m ² K)]	
* There might be more than one surface where the minimum U-value occurs.			

Air Permeability	Typical value	This building
m ³ /(h.m ²) at 50 Pa	5	3

Appendix D

Roof Plans and Plant Room – Heat Pumps

ASHP Roof Plant Notes

For Mechanical Notes & Legends refer to drawing drgs:

- 6432-M-Z-M-000-50-900
- 6432-M-Z-M-000-50-901

For Energy Centre schematic, refer to drg:

- 6432-M-Z-M-900-56-700

For Energy Centre Layout, refer to drg:

- 6432-M-A-01-100-56-100

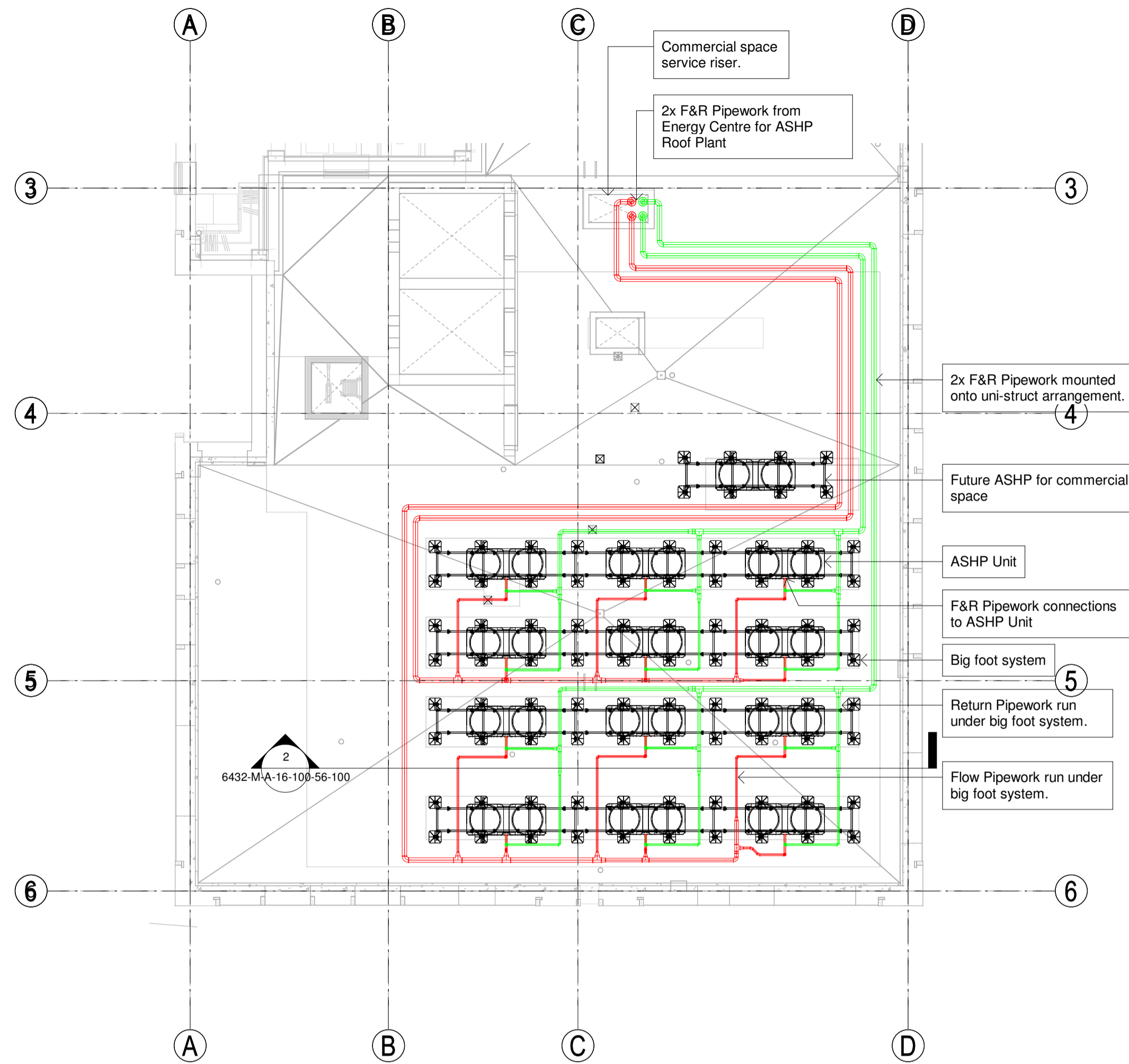
For District Heating Riser Schematics refer to drgs:

- 6432-M-A-M-700-56-700
- 6432-M-A-M-700-56-701
- 6432-M-BC-M-700-56-702
- 6432-M-DE-M-700-56-703
- 6432-M-FG-M-700-56-704

For District Heating Plant & Equipment refer to schedule:

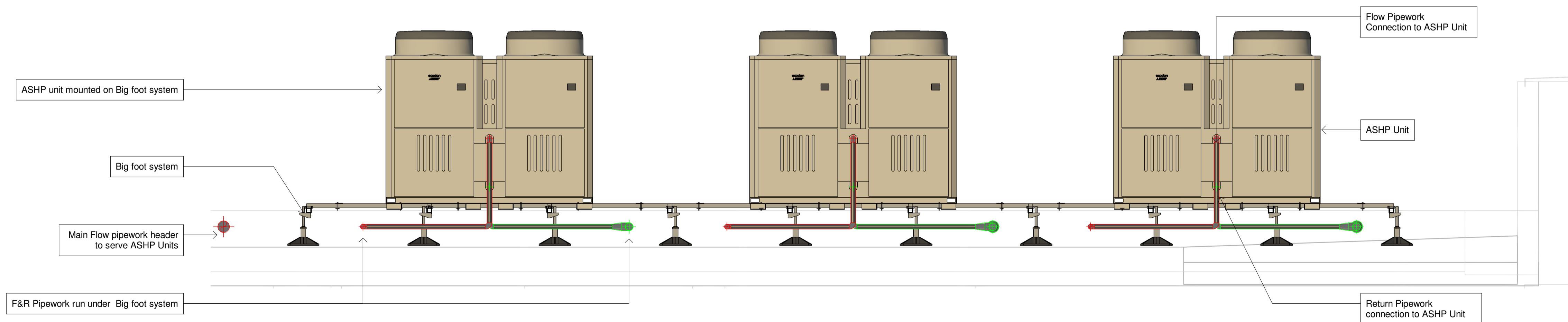
- 6432-M-A-ZZ-600-07-130

For service pipeline sizes, fittings & accessories refer to the energy centre system schematic.



1 L16 - ASHP Roof Plant

1 : 100



2 ASHP Section 1

1 : 25

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Safety, Health and environmental information unusual significant hazards

It is assumed that all works will be carried out by a competent contractor working, where appropriate, to an approved method statement, in addition to the hazards/risks normally associated with the type of work detailed on this drawing note the following:

Construction

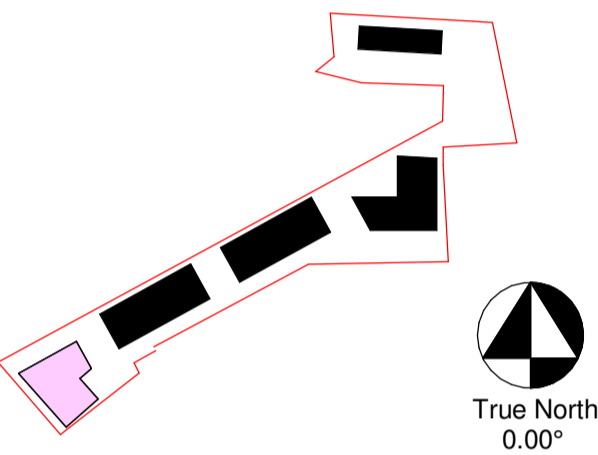
1. Working at high height to install all new high level services shall be managed safely, using the correct equipment.
2. During the creation of new builderswork holes for cables to pass through workers should be using the correct PPE equipment.
3. The use of portable tools should be done through 110V supplies only

Maintenance/cleaning

1. The installation of MEPH equipment has been coordinated during the design stage to ease maintenance and avoid unnecessary risks.

Operation

1. There are no unusual operation risk identified.



Block A - Key Plan

REVISION	DRAWN BY	CHECKED BY	DATE	DESCRIPTION
T2	JE	AE	20/09/22	Updated to latest ER's received & comments from design team
T1	SJL	AE	15/06/22	T1 Issue

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 Tel: 0118 9 773 011
 E-mail: admin@designbrook.co.uk



PROJECT TITLE

The Hyde, Colindale, Phase 1

DRAWING ISSUE

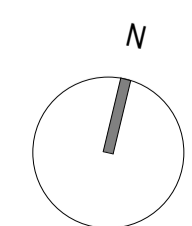
Construction Issue

DRAWING TITLE

Block A - Sixteenth Floor, District Heating ASHP Roof Plant

SCALE	DRAWN
1:50@A1	SJL
DATE	CHECKED
14/06/2022	AF
DBR Project No.	
J6432	

Identification	Sheet Number
Drawing Number	Rev.
6432-M-A-16-100-56-100	C1



Energy Centre Notes

For Mechanical Notes & Legends refer to drawing drgs:

- 6432-M-Z-M-000-50-900
- 6432-M-Z-M-000-50-901

For Energy Centre schematic, refer to drg:

- 6432-M-Z-M-900-56-700

For District Heating Plantroom Layout - ASHP - Block A Roof refer to drg:

- 6432-M-A-16-100-56-100

For District Heating Riser Schematics refer to drgs:

- 6432-M-A-M-700-56-700
- 6432-M-A-M-700-56-701
- 6432-M-BC-M-700-56-702
- 6432-M-DE-M-700-56-703
- 6432-M-FG-M-700-56-704

For District Heating Plant & Equipment refer to schedule:

- 6432-M-A-ZZ-600-07-130

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Safety, Health and environmental information unusual significant hazards

It is assumed that all works will be carried out by a competent contractor working, where appropriate, to an approved method statement, in addition to the hazards/risks normally associated with the type of work detailed on this drawing note the following:

Construction

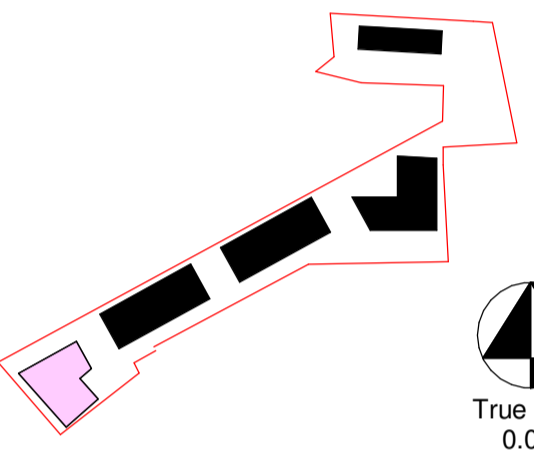
- Working at high height to install all new high level services shall be managed safely, using the correct equipment.
- During the creation of new builderswork holes for cables to pass through workers should be using the correct PPE equipment.
- The use of portable tools should be done through 110V supplies only

Maintenance/cleaning

- The installation of MEPH equipment has been coordinated during the design stage to ease maintenance and avoid unnecessary risks.

Operation

- There are no unusual operation risk identified.



Block A - Key Plan

REVISION	DRAWN BY	CHECKED BY	DATE	DESCRIPTION
C1	SJL	AE	13/04/23	Construction Issue
T3	JE	AE	28/09/22	Updated to latest ERI's received & comments from design team
T2	SJL	AE	10/08/22	Updated to suit split ASHP circuit
T1	SJL	AE	15/06/22	T1 Issue

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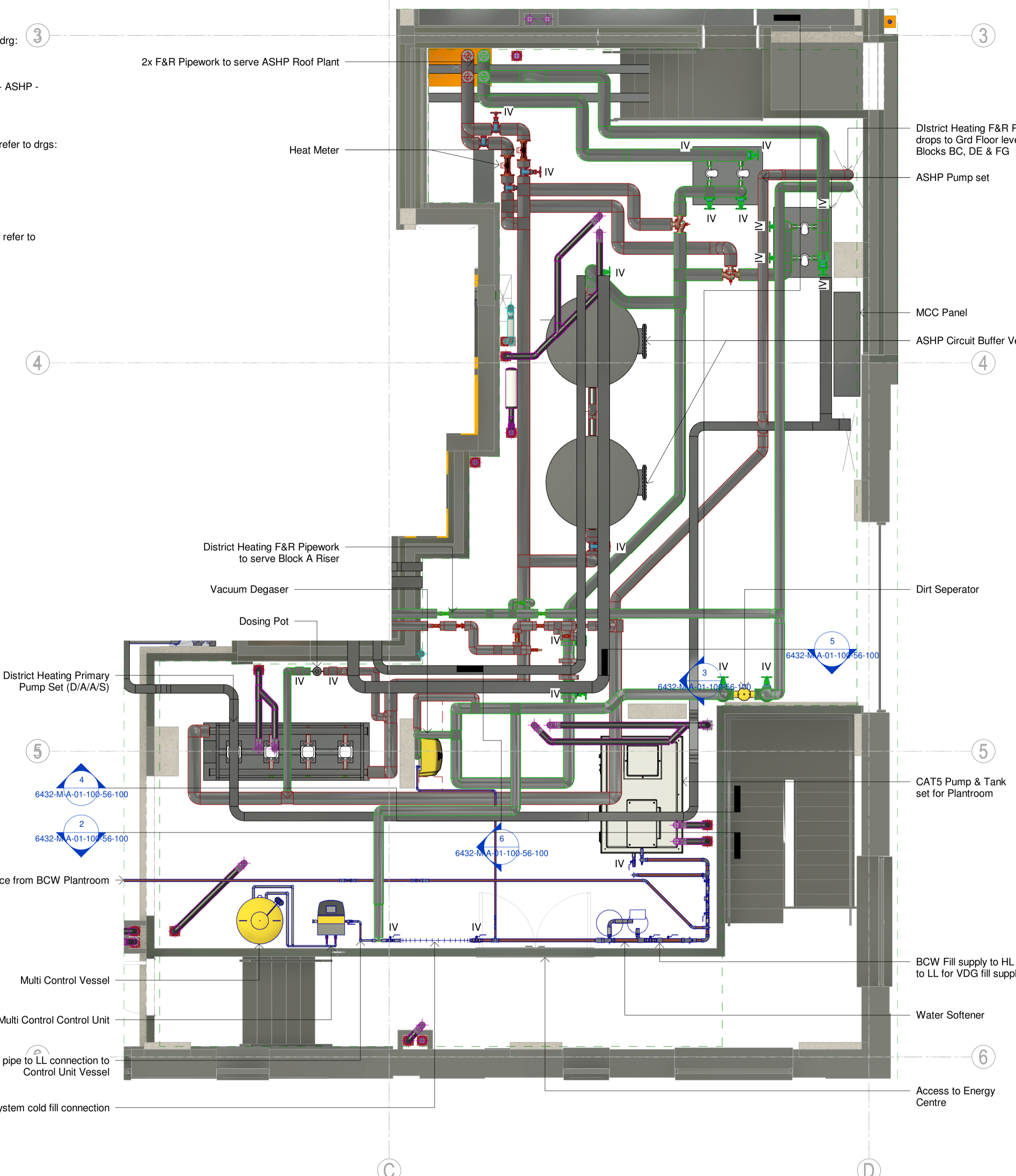
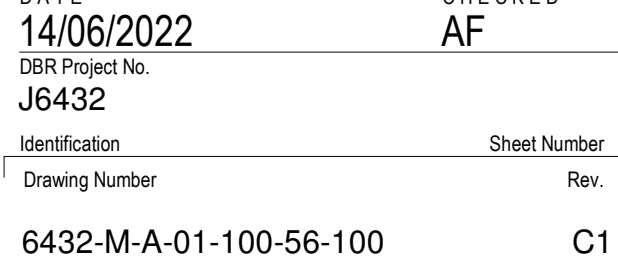
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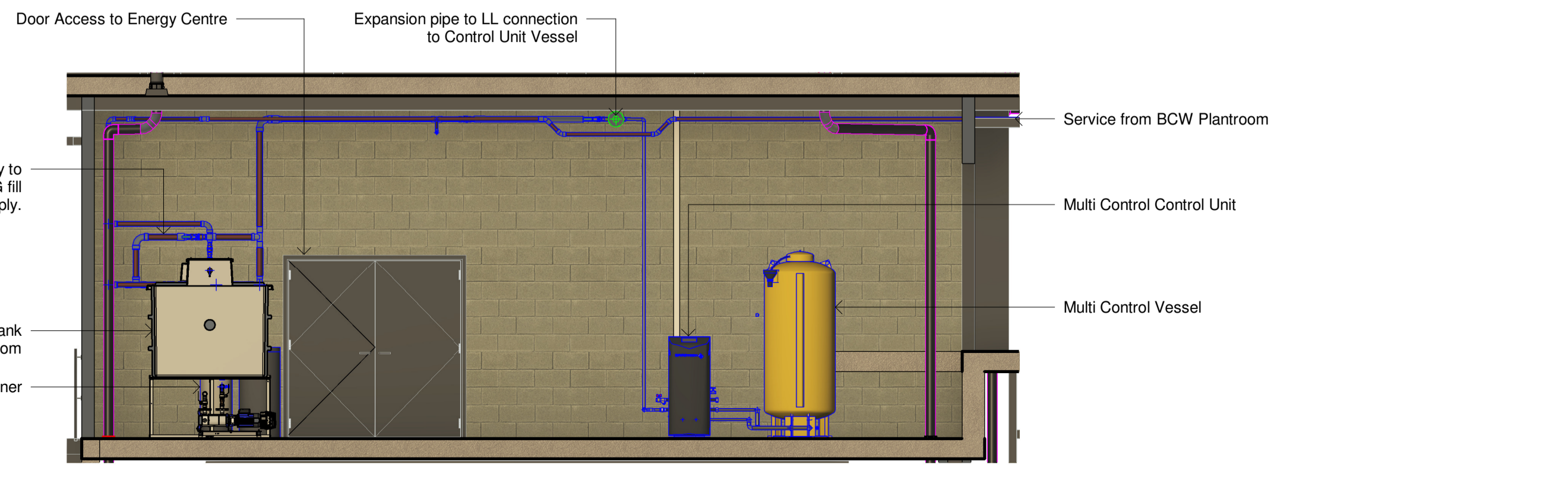
PROJECT TITLE
 The Hyde, Colindale, Phase 1
DRAWING ISSUE
 Construction Issue
DRAWING TITLE
 Communal Heating Energy Centre Layout

SCALE	1:50@A1	DRAWN	SJL
DATE	14/06/2022	CHECKED	AF
DBR Project No.	J6432		

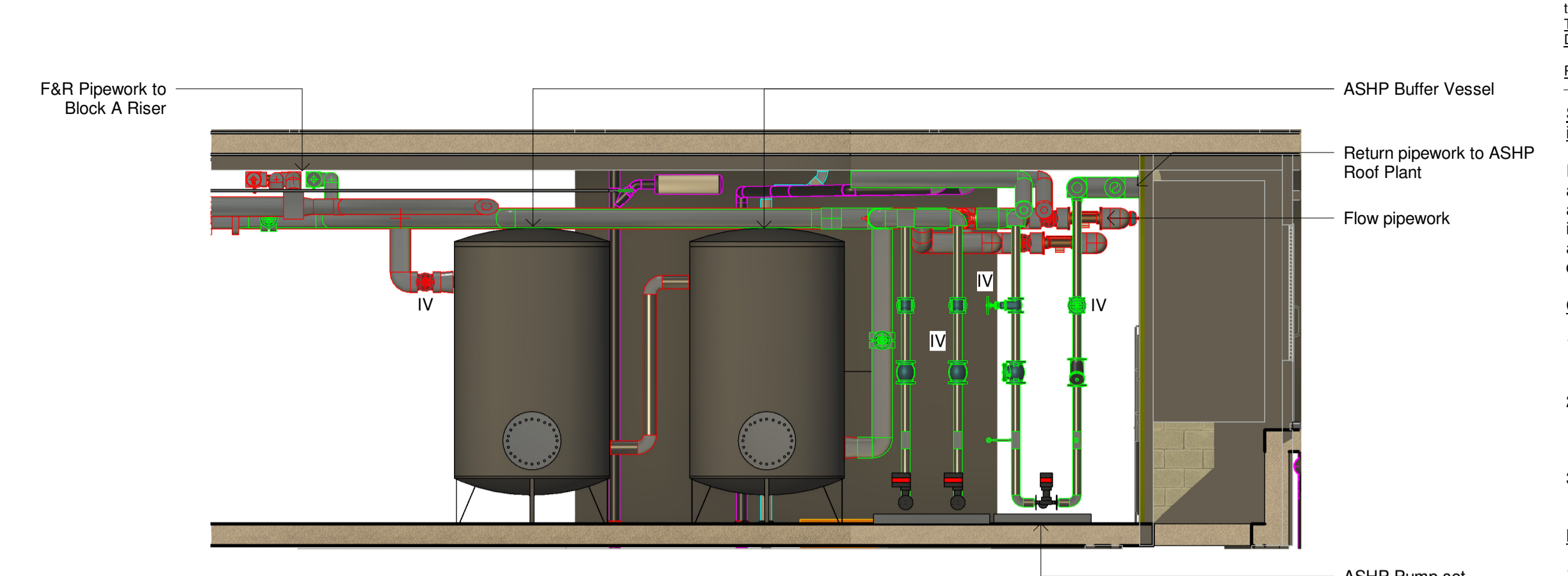
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Drawing Number	Rev.
6432-M-A-01-100-56-100	C1



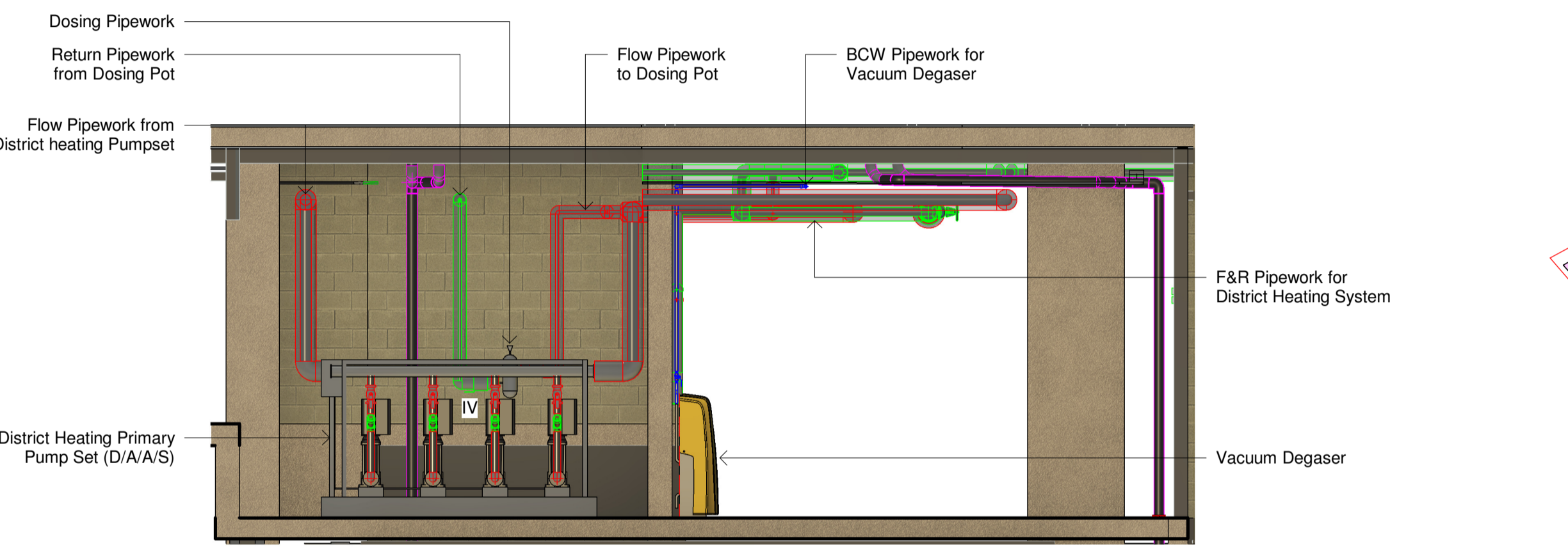
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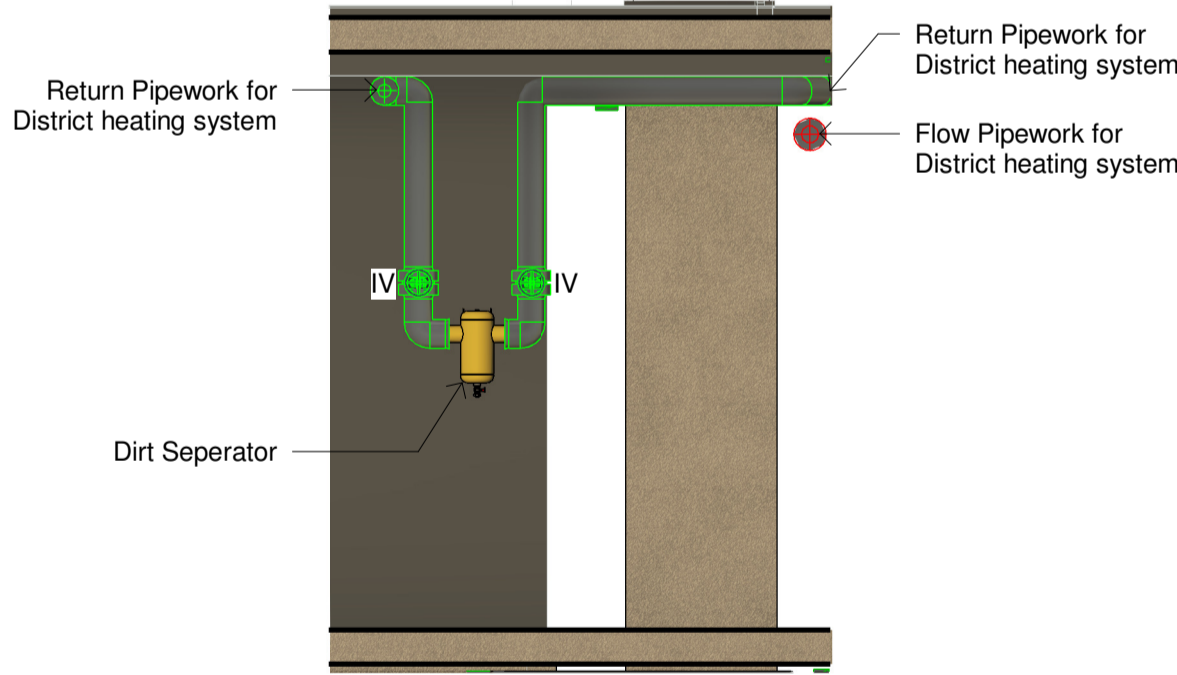
2 Energy Centre - Section 1
1 : 50



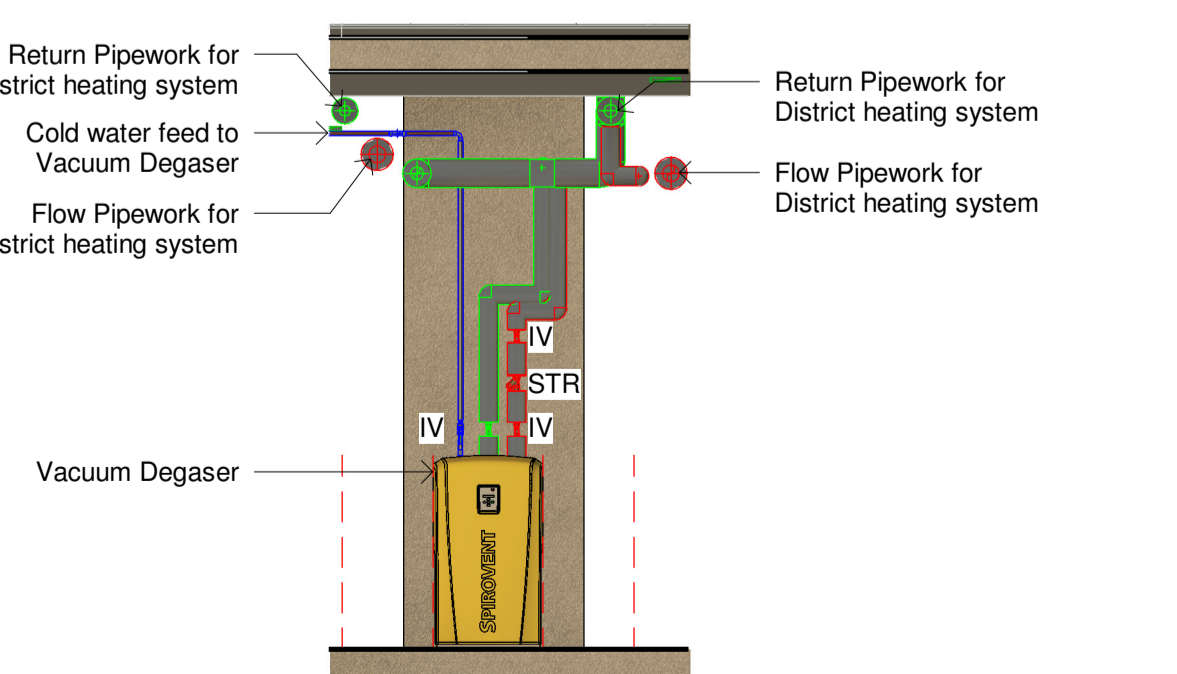
3 Energy Centre - Section 2
1 : 50



4 Energy Centre - Section 3
1 : 50



5 Energy Centre - Section 4
1 : 50



6 Energy Centre - Section 5
1 : 50

Appendix E

**DER Worksheets – Be
Clean/Green**

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



Property Reference	006422		Issued on Date	17/07/2023
Assessment Reference	A.02.05	Prop Type Ref	2B4P	
Property				

SAP Rating	84 B	DER	12.58	TER	24.47
Environmental	91 B	% DER<TER	48.58		
CO ₂ Emissions (t/year)	0.75	DFEE	40.73	TFEE	45.93
General Requirements Compliance	Pass	% DFEE<TFEE	11.32		

Assessor Details	Mr. Michael Wride, Michael Wride, Tel: 02036 031 600, Michael@hodkinsonconsultancy.com	Assessor ID	R572-0001
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Client	
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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 73 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) 24.47 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 12.58 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)45.9 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)40.7 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.15 (max. 0.30)	0.15 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.26 (max. 2.00)	1.30 (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: 0.20 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: 0.59
Maximum 1.5 OK
MVHR efficiency: 89%
Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): Slight OK
Based on:
Overshading: Average
Windows facing North East: 8.15 m², No overhang
Windows facing North West: 4.09 m², No overhang
Air change rate: 4.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Door U-value 1.00 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 (m2)	Storey height (m)	Volume (m3)
Ground floor	72.8200 (1b)	2.8700 (2b)	208.9934 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.8200		208.9934 (4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	208.9934 (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)

	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	0.1626	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:												
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.3511	0.3479	0.3447	0.3288	0.3256	0.3096	0.3096	0.3064	0.3160	0.3256	0.3319	0.3383 (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 = 1.30)			12.2400	1.2357	15.1255		(27)	
Main Entrance			2.0500	1.0000	2.0500		(26)	
External Wall 1	47.6100	12.2400	35.3700	0.1500	5.3055		(29a)	
Corridor Wall	14.7200	2.0500	12.6700	0.1415	1.7929		(29a)	
Total net area of external elements Aum(A, m2)				62.3300			(31)	
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	24.2739		(33)	
Party Wall 1			37.1700	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)								10.3718 (36)
Total fabric heat loss								(33) + (36) = 34.6457 (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	24.2120	23.9922	23.7723	22.6732	22.4533	21.3542	21.3542	21.1343	21.7938	22.4533	22.8930	23.3327 (38)
Heat transfer coeff	58.8577	58.6379	58.4180	57.3189	57.0990	55.9999	55.9999	55.7800	56.4395	57.0990	57.5387	57.9784 (39)
Average = Sum(39)m / 12 =	57.2639 (39)											
HLP	0.8083	0.8052	0.8022	0.7871	0.7841	0.7690	0.7690	0.7660	0.7751	0.7841	0.7901	0.7962 (40)
HLP (average)	0.7864 (40)											
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												
Average daily hot water use (litres/day)	89.1241 (43)											
Daily hot water use	98.0366	94.4716	90.9066	87.3417	83.7767	80.2117	80.2117	83.7767	87.3417	90.9066	94.4716	98.0366 (44)
Energy conte	145.3854	127.1550	131.2126	114.3943	109.7640	94.7180	87.7702	100.7176	101.9204	118.7784	129.6560	140.7980 (45)
Energy content (annual)	Total = Sum(45)m = 1402.2699 (45)											
Distribution loss (46)m = 0.15 x (45)m												
Water storage loss:	21.8078	19.0732	19.6819	17.1591	16.4646	14.2077	13.1655	15.1076	15.2881	17.8168	19.4484	21.1197 (46)

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)												0.0191 (51)
Volume factor from Table 2a												3.4200 (52)
Temperature factor from Table 2b												1.0000 (53)
Enter (49) or (54) in (55)												0.1960 (55)
Total storage loss	6.0757	5.4877	6.0757	5.8797	6.0757	5.8797	6.0757	6.0757	5.8797	6.0757	5.8797	6.0757 (56)
If cylinder contains dedicated solar storage	6.0757	5.4877	6.0757	5.8797	6.0757	5.8797	6.0757	6.0757	5.8797	6.0757	5.8797	6.0757 (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	174.7235	153.6539	160.5506	142.7860	139.1021	123.1097	117.1082	130.0556	130.3121	148.1165	158.0477	170.1361 (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	174.7235	153.6539	160.5506	142.7860	139.1021	123.1097	117.1082	130.0556	130.3121	148.1165	158.0477	170.1361 (64)
	Total per year (kWh/year) = Sum(64)m =											1747.7020 (64)
Heat gains from water heating, kWh/month	71.8111	63.4782	67.0986	60.7494	59.9670	54.2071	52.6540	56.9590	56.6019	62.9643	65.8240	70.2858 (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	115.6298	115.6298	115.6298	115.6298	115.6298	115.6298	115.6298	115.6298	115.6298	115.6298	115.6298	115.6298 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.5543	16.4797	13.4022	10.1463	7.5845	6.4032	6.9188	8.9934	12.0709	15.3268	17.8886	19.0699 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	203.7873	205.9019	200.5730	189.2284	174.9079	161.4486	152.4569	150.3423	155.6712	167.0158	181.3363	194.7956 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5630	34.5630	34.5630	34.5630	34.5630	34.5630	34.5630	34.5630	34.5630	34.5630	34.5630	34.5630 (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)	-92.5038	-92.5038	-92.5038	-92.5038	-92.5038	-92.5038	-92.5038	-92.5038	-92.5038	-92.5038	-92.5038	-92.5038 (71)
Water heating gains (Table 5)	96.5203	94.4615	90.1863	84.3742	80.6008	75.2876	70.7716	76.5579	78.6137	84.6294	91.4222	94.4701 (72)
Total internal gains	376.5508	374.5322	361.8505	341.4379	320.7821	300.8283	287.8363	293.5824	304.0447	324.6609	348.3360	366.0247 (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 Specific data or Table 6c	Access factor Table 6d	Gains W					
Northeast	8.1500	11.2829	0.5000	0.7500	0.7700	23.8971 (75)						
Northwest	4.0900	11.2829	0.5000	0.7500	0.7700	11.9925 (81)						
Solar gains	35.8896	73.0543	131.6205	216.1587	290.5597	309.7674	289.7811	231.0168	160.3817	89.2781	45.1584	29.3092 (83)
Total gains	412.4403	447.5864	493.4711	557.5966	611.3419	610.5957	577.6174	524.5993	464.4264	413.9390	393.4944	395.3339 (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	85.9181	86.2402	86.5648	88.2248	88.5644	90.3028	90.3028	90.6587	89.5993	88.5644	87.8877	87.2212
alpha	6.7279	6.7493	6.7710	6.8817	6.9043	7.0202	7.0202	7.0439	6.9733	6.9043	6.8592	6.8147
util living area	0.9983	0.9966	0.9891	0.9468	0.8044	0.5811	0.4260	0.4875	0.7860	0.9734	0.9961	0.9987 (86)
MIT	20.2145	20.3147	20.5057	20.7713	20.9457	20.9951	20.9995	20.9988	20.9662	20.7362	20.4371	20.2015 (87)
Th 2	20.2462	20.2488	20.2514	20.2645	20.2671	20.2803	20.2803	20.2829	20.2750	20.2671	20.2619	20.2566 (88)
util rest of house	0.9978	0.9955	0.9854	0.9301	0.7587	0.5184	0.3566	0.4124	0.7223	0.9618	0.9946	0.9983 (89)
MIT 2	19.1846	19.3328	19.6120	19.9959	20.2159	20.2771	20.2801	20.2824	20.2485	19.9557	19.5221	19.1739 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	19.5647	19.6953	19.9419	20.2821	20.4853	20.5421	20.5456	20.5468	20.5134	20.2438	19.8599	19.5532 (92)
Temperature adjustment	0.0000											
adjusted MIT	19.5647	19.6953	19.9419	20.2821	20.4853	20.5421	20.5456	20.5468	20.5134	20.2438	19.8599	19.5532 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9971	0.9944	0.9836	0.9305	0.7730	0.5414	0.3823	0.4402	0.7444	0.9613	0.9935	0.9978 (94)
Useful gains	411.2527	445.0834	485.3577	518.8614	472.5691	330.6050	220.7946	230.9063	345.6966	397.9355	390.9429	394.4619 (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	898.4467	867.5621	785.2499	652.4102	501.6313	332.7568	220.9550	231.3110	361.9710	550.6533	734.1865	890.1545 (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	362.4723	283.9057	223.1198	96.1552	21.6223	0.0000	0.0000	0.0000	0.0000	113.6220	247.1354	368.7953 (98)
Space heating per m ²												(98) / (4) = 23.5763 (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	1.0000 (303b)
Fraction of total space heat from community Heat pump	1.0000 (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	1716.8281 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.05	1802.6695 (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	1747.7020 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.05	1835.0871 (310b)
Electricity used for heat distribution	36.3776 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7375)	
mechanical ventilation fans (SFP = 0.7375)	188.0418 (330a)
Total electricity for the above, kWh/year	188.0418 (331)
Electricity for lighting (calculated in Appendix L)	327.6741 (332)
Total delivered energy for all uses	4153.4725 (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			300.0000 (367b)
Space heating from Heat pump	1212.5855	0.5190	629.3319 (368)
Electrical energy for heat distribution	36.3776	0.5190	18.8800 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			648.2119 (373)
Space and water heating			648.2119 (376)
Pumps and fans	188.0418	0.5190	97.5937 (378)
Energy for lighting	327.6741	0.5190	170.0629 (379)
Total CO2, kg/year			915.8684 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			12.5800 (384)

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

DER		12.5800 ZC1
Total Floor Area		TFA 72.8200
Assumed number of occupants		N 2.3126
CO2 emission factor in Table 12 for electricity displaced from grid		EF 0.5190
CO2 emissions from appliances, equation (L14)		16.5834 ZC2
CO2 emissions from cooking, equation (L16)		2.3964 ZC3
Total CO2 emissions		31.5597 ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000 ZC5
Additional allowable electricity generation, kWh/m ² /year		0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000 ZC7
Net CO2 emissions		31.5597 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	72.8200 (1b)	2.8700 (2b)	208.9934 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.8200		208.9934 (4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 208.9934 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ 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				3 * 10 =	30.0000 (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) =				30.0000 / (5) =	0.1435 (8)
Pressure test				Yes	
Measured/design AP50					5.0000
Infiltration rate					0.3935 (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) =	0.3345 (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	0.4265	0.4181	0.4098	0.3680	0.3596	0.3178	0.3178	0.3094	0.3345	0.3596	0.3763	0.3931 (22b)
	0.5910	0.5874	0.5840	0.5677	0.5647	0.5505	0.5505	0.5479	0.5559	0.5647	0.5708	0.5772 (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			2.0500	1.0000	2.0500		(26)
TER Opening Type (Uw = 1.40)			12.2400	1.3258	16.2273		(27)
External Wall 1	47.6100	12.2400	35.3700	0.1800	6.3666		(29a)
Corridor Wall	14.7200	2.0500	12.6700	0.1800	2.2806		(29a)
Total net area of external elements Aum(A, m ²)			62.3300				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 26.9245		(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)							5.3075 (36)
Total fabric heat loss							(33) + (36) = 32.2320 (37)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	40.7567	40.5132	40.2744	39.1530	38.9431	37.9664	37.9664	37.7855	38.3426	38.9431	39.3676	39.8114 (38)
Heat transfer coeff	72.9887	72.7451	72.5064	71.3849	71.1751	70.1984	70.1984	70.0175	70.5746	71.1751	71.5996	72.0433 (39)
Average = Sum(39)m / 12 =												71.3839 (39)
HLP	1.0023	0.9990	0.9957	0.9803	0.9774	0.9640	0.9640	0.9615	0.9692	0.9774	0.9832	0.9893 (40)
HLP (average)												0.9803 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.3126 (42)
Average daily hot water use (litres/day)												89.1241 (43)
Daily hot water use	98.0366	94.4716	90.9066	87.3417	83.7767	80.2117	80.2117	83.7767	87.3417	90.9066	94.4716	98.0366 (44)
Energy content (annual)	145.3854	127.1550	131.2126	114.3943	109.7640	94.7180	87.7702	100.7176	101.9204	118.7784	129.6560	140.7980 (45)
Distribution loss (46)m = 0.15 x (45)m	21.8078	19.0732	19.6819	17.1591	16.4646	14.2077	13.1655	15.1076	15.2881	17.8168	19.4484	21.1197 (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)												
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	173.0031	152.1000	158.8302	141.1211	137.3817	121.4448	115.3878	128.3352	128.6472	146.3961	156.3827	168.4157 (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	173.0031	152.1000	158.8302	141.1211	137.3817	121.4448	115.3878	128.3352	128.6472	146.3961	156.3827	168.4157 (64)
Heat gains from water heating, kWh/month	70.4348	62.2350	65.7223	59.4175	58.5907	52.8752	51.2777	55.5827	55.2700	61.5880	64.4920	68.9095 (65)

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

Metabolic gains (Table 5), Watts (66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.7764	16.6770	13.5627	10.2678	7.6753	6.4798	7.0017	9.1010	12.2154	15.5103	18.1028	19.2983	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	203.7873	205.9019	200.5730	189.2284	174.9079	161.4486	152.4569	150.3423	155.6712	167.0158	181.3363	194.7956	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5630	34.5630	34.5630	34.5630	34.5630	34.5630	34.5630	34.5630	34.5630	34.5630	34.5630	34.5630	(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)	-92.5038	-92.5038	-92.5038	-92.5038	-92.5038	-92.5038	-92.5038	-92.5038	-92.5038	-92.5038	-92.5038	-92.5038	(71)
Water heating gains (Table 5)	94.6704	92.6117	88.3364	82.5243	78.7509	73.4377	68.9217	74.7080	76.7638	82.7795	89.5723	92.6203	(72)
Total internal gains	377.9230	375.8796	363.1611	342.7095	322.0230	302.0551	289.0692	294.8402	305.3394	325.9945	349.7003	367.4031	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	g Specific data or Table 6c	FF	Access factor Table 6d	Gains W						
Northeast	8.1500	11.2829	0.6300	0.7000	0.7700	28.1029	(75)						
Northwest	4.0900	11.2829	0.6300	0.7000	0.7700	14.1032	(81)						
Solar gains	42.2061	85.9118	154.7858	254.2027	341.6983	364.2865	340.7826	271.6758	188.6089	104.9910	53.1062	34.4677	(83)
Total gains	420.1291	461.7914	517.9468	596.9122	663.7213	666.3416	629.8518	566.5160	493.9482	430.9856	402.8065	401.8707	(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	69.2839	69.5159	69.7448	70.8405	71.0493	72.0379	72.0379	72.2240	71.6539	71.0493	70.6281	70.1931	
alpha	5.6189	5.6344	5.6497	5.7227	5.7366	5.8025	5.8025	5.8149	5.7769	5.7366	5.7085	5.6795	
util living area	0.9983	0.9968	0.9906	0.9593	0.8504	0.6503	0.4864	0.5591	0.8463	0.9807	0.9966	0.9987	(86)
MIT	19.9404	20.0572	20.2857	20.6126	20.8702	20.9787	20.9966	20.9929	20.9081	20.5772	20.2102	19.9252	(87)
Th 2	20.0814	20.0842	20.0869	20.0998	20.1022	20.1134	20.1134	20.1155	20.1091	20.1022	20.0973	20.0922	(88)
util rest of house	0.9978	0.9957	0.9873	0.9446	0.8038	0.5702	0.3905	0.4565	0.7805	0.9713	0.9952	0.9983	(89)
MIT 2	18.6592	18.8318	19.1661	19.6405	19.9763	20.0995	20.1122	20.1125	20.0337	19.5996	19.0654	18.6450	(90)
Living area fraction	19.1321	19.2841	19.5794	19.9993	20.3063	20.4241	20.4386	20.4375	20.3565	19.9604	19.4879	19.1176	(92)
Temperature adjustment	19.1321	19.2841	19.5794	19.9993	20.3063	20.4241	20.4386	20.4375	20.3565	19.9604	19.4879	19.1176	(93)
adjusted MIT	19.1321	19.2841	19.5794	19.9993	20.3063	20.4241	20.4386	20.4375	20.3565	19.9604	19.4879	19.1176	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	418.8670	459.2094	510.0945	562.7004	541.1682	399.2101	268.3449	280.1867	395.5129	417.7745	400.3665	400.9267	(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	1082.5778	1046.3769	948.3389	792.3242	612.5535	408.8398	269.4664	282.6956	441.5487	666.2304	886.9718	1074.7105	(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	493.8008	394.5766	326.0538	165.3291	53.1107	0.0000	0.0000	0.0000	0.0000	184.8512	350.3558	501.2952	(98)
Space heating													2469.3731 (99)
Space heating per m2													(98) / (4) = 33.9106 (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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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													2641.0408 (211)
Space heating requirement	493.8008	394.5766	326.0538	165.3291	53.1107	0.0000	0.0000	0.0000	0.0000	184.8512	350.3558	501.2952	(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)	528.1292	422.0070	348.7206	176.8226	56.8029	0.0000	0.0000	0.0000	0.0000	197.7018	374.7121	536.1446	(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	173.0031	152.1000	158.8302	141.1211	137.3817	121.4448	115.3878	128.3352	128.6472	146.3961	156.3827	168.4157	(64)
Efficiency of water heater (217)m	87.4575	87.2452	86.6924	85.2369	82.5202	79.8000	79.8000	79.8000	79.8000	85.4370	86.9040	87.5480	(217)
Fuel for water heating, kWh/month	197.8139	174.3362	183.2114	165.5633	166.4825	152.1865	144.5963	160.8211	161.2121	171.3497	179.9489	192.3696	(219)
Water heating fuel used													2049.8915 (219)
Annual totals kWh/year													
Space heating fuel - main system													2641.0408 (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)													331.5971 (232)
Total delivered energy for all uses													5097.5293 (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	2641.0408	0.2160	570.4648 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2049.8915	0.2160	442.7766 (264)
Space and water heating			1013.2414 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	331.5971	0.5190	172.0989 (268)
Total CO2, kg/m2/year			1224.2652 (272)
Emissions per m2 for space and water heating			13.9143 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.3633 (272b)
Emissions per m2 for pumps and fans			0.5345 (272c)
Target Carbon Dioxide Emission Rate (TER) = (13.9143 * 1.55) + 2.3633 + 0.5345, rounded to 2 d.p.			24.4700 (273)

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CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
 CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

1. Overall dwelling dimensions

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	72.8200 (1b)	2.8700 (2b)	208.9934 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.8200		208.9934 (4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	208.9934 (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				3 * 10 =	30.0000 (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) =				30.0000 / (5) =	0.1435 (8)
Pressure test				Yes	
Measured/design AP50				3.0000	
Infiltration rate					0.2935 (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) =		0.2495 (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	0.3181	0.3119	0.3057	0.2745	0.2682	0.2370	0.2370	0.2308	0.2495	0.2682	0.2807	0.2932 (22b)
	0.5506	0.5486	0.5467	0.5377	0.5360	0.5281	0.5281	0.5266	0.5311	0.5360	0.5394	0.5430 (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 = 1.30)			12.2400	1.2357	15.1255		(27)					
Main Entrance			2.0500	1.0000	2.0500		(26)					
External Wall 1	47.6100	12.2400	35.3700	0.1500	5.3055		(29a)					
Corridor Wall	14.7200	2.0500	12.6700	0.1415	1.7929		(29a)					
Total net area of external elements Aum(A, m2)			62.3300				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	24.2739		(33)					
Party Wall 1			37.1700	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)							10.3718 (36)					
Total fabric heat loss						(33) + (36) =	34.6457 (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	37.9739	37.8384	37.7055	37.0816	36.9649	36.4215	36.4215	36.3208	36.6308	36.9649	37.2010	37.4479 (38)
Average = Sum(39)m / 12 =	72.6196	72.4841	72.3512	71.7273	71.6106	71.0672	71.0672	70.9665	71.2765	71.6106	71.8467	72.0936 (39)
												71.7268 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.9972	0.9954	0.9936	0.9850	0.9834	0.9759	0.9759	0.9745	0.9788	0.9834	0.9866	0.9900 (40)
Days in month												0.9850 (40)
	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.3126 (42)
Average daily hot water use (litres/day)												89.1241 (43)
Daily hot water use	98.0366	94.4716	90.9066	87.3417	83.7767	80.2117	80.2117	83.7767	87.3417	90.9066	94.4716	98.0366 (44)
Energy conte	145.3854	127.1550	131.2126	114.3943	109.7640	94.7180	87.7702	100.7176	101.9204	118.7784	129.6560	140.7980 (45)
Energy content (annual)												Total = Sum(45)m = 1402.2699 (45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)

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Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Heat gains from water heating, kWh/month	30.8944	27.0204	27.8827	24.3088	23.3249	20.1276	18.6512	21.4025	21.6581	25.2404	27.5519	29.9196	(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	115.6298	115.6298	115.6298	115.6298	115.6298	115.6298	115.6298	115.6298	115.6298	115.6298	115.6298	115.6298	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.5543	16.4797	13.4022	10.1463	7.5845	6.4032	6.9188	8.9934	12.0709	15.3268	17.8886	19.0699	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	203.7873	205.9019	200.5730	189.2284	174.9079	161.4486	152.4569	150.3423	155.6712	167.0158	181.3363	194.7956	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5630	34.5630	34.5630	34.5630	34.5630	34.5630	34.5630	34.5630	34.5630	34.5630	34.5630	34.5630	(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)	-92.5038	-92.5038	-92.5038	-92.5038	-92.5038	-92.5038	-92.5038	-92.5038	-92.5038	-92.5038	-92.5038	-92.5038	(71)
Water heating gains (Table 5)	41.5247	40.2090	37.4767	33.7622	31.3506	27.9550	25.0688	28.7668	30.0807	33.9253	38.2665	40.2145	(72)
Total internal gains	321.5552	320.2796	309.1409	290.8259	271.5319	253.4956	242.1335	245.7913	255.5117	273.9568	295.1804	311.7690	(73)

6. Solar gains

[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							
Northeast	8.1500	11.2829	0.5000	0.7500	0.7700	23.8971 (75)							
Northwest	4.0900	11.2829	0.5000	0.7500	0.7700	11.9925 (81)							
Solar gains	35.8896	73.0543	131.6205	216.1587	290.5597	309.7674	289.7811	231.0168	160.3817	89.2781	45.1584	29.3092	(83)
Total gains	357.4448	393.3338	440.7614	506.9846	562.0917	563.2631	531.9146	476.8082	415.8934	363.2349	340.3388	341.0782	(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	69.6361	69.7663	69.8944	70.5024	70.6173	71.1573	71.1573	71.2582	70.9483	70.6173	70.3852	70.1441	
alpha	5.6424	5.6511	5.6596	5.7002	5.7078	5.7438	5.7438	5.7505	5.7299	5.7078	5.6923	5.6763	
util living area	0.9993	0.9986	0.9957	0.9800	0.9128	0.7479	0.5761	0.6582	0.9127	0.9914	0.9986	0.9995	(86)
MIT	19.8650	19.9726	20.1899	20.5067	20.7966	20.9553	20.9917	20.9832	20.8506	20.4884	20.1243	19.8439	(87)
Th 2	20.0856	20.0872	20.0887	20.0959	20.0972	20.1034	20.1034	20.1046	20.1010	20.0972	20.0945	20.0917	(88)
util rest of house	0.9990	0.9981	0.9941	0.9719	0.8781	0.6658	0.4649	0.5432	0.8631	0.9868	0.9980	0.9993	(89)
MIT 2	19.0386	19.1473	19.3652	19.6833	19.9538	20.0820	20.1012	20.0994	20.0095	19.6694	19.3050	19.0225	(90)
Living area fraction	fLA = Living area / (4) =												
MIT	19.3437	19.4519	19.6696	19.9872	20.2649	20.4044	20.4299	20.4256	20.3200	19.9717	19.6074	19.3257	(92)
Temperature adjustment	0.0000												
adjusted MIT	19.3437	19.4519	19.6696	19.9872	20.2649	20.4044	20.4299	20.4256	20.3200	19.9717	19.6074	19.3257	(93)

8. Space heating requirement

Utilisation	0.9988	0.9976	0.9931	0.9707	0.8854	0.6950	0.5063	0.5861	0.8772	0.9860	0.9975	0.9991	(94)
Useful gains	357.0045	392.3968	437.7264	492.1371	497.6694	391.4799	269.3146	279.4679	364.8194	358.1398	339.4962	340.7583	(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	1092.4644	1054.7822	952.8384	795.2549	613.3401	412.4994	272.1783	285.6838	443.3367	671.1135	898.6148	1090.4661	(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	547.1821	445.1230	383.2433	218.2448	86.0590	0.0000	0.0000	0.0000	0.0000	232.8524	402.5654	557.7826	(98)
Space heating												2873.0525	(98)
Space heating per m ²												39.4542	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b													
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	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	668.0313	525.8969	539.3456	0.0000	0.0000	0.0000	0.0000	
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8937	0.9455	0.9156	0.0000	0.0000	0.0000	0.0000	
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	597.0039	497.2603	493.8312	0.0000	0.0000	0.0000	0.0000	
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	744.4368	706.0588	643.1014	0.0000	0.0000	0.0000	0.0000	
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	106.1517	155.3461	111.0570	0.0000	0.0000	0.0000	0.0000	
Space cooling												372.5547	(104)
Cooled fraction												1.0000	(105)
Intermittency factor (Table 10b)												fC = cooled area / (4) =	

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Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	26.5379	38.8365	27.7643	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling per m2												93.1387 (107)
Energy for space heating												1.2790 (108)
Energy for space cooling												39.4542 (99)
Total												1.2790 (108)
Dwelling Fabric Energy Efficiency (DFEE)												40.7332 (109)
												40.7 (109)

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CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	72.8200 (1b)	2.8700 (2b)	208.9934 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.8200		208.9934 (4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	208.9934 (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				3 * 10 =	30.0000 (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) =				30.0000 / (5) =	0.1435 (8)
Pressure test				Yes	
Measured/design AP50					5.0000
Infiltration rate					0.3935 (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) =		0.3345 (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	0.4265	0.4181	0.4098	0.3680	0.3596	0.3178	0.3178	0.3094	0.3345	0.3596	0.3763	0.3931 (22b)
Effective ac	0.5910	0.5874	0.5840	0.5677	0.5647	0.5505	0.5505	0.5479	0.5559	0.5647	0.5708	0.5772 (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			2.0500	1.0000	2.0500		(26)
TER Opening Type (Uw = 1.40)			12.2400	1.3258	16.2273		(27)
External Wall 1	47.6100	12.2400	35.3700	0.1800	6.3666		(29a)
Corridor Wall	14.7200	2.0500	12.6700	0.1800	2.2806		(29a)
Total net area of external elements Aum(A, m2)			62.3300				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 26.9245		(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	5.3075 (36)
Total fabric heat loss	(33) + (36) = 32.2320 (37)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	40.7567	40.5132	40.2744	39.1530	38.9431	37.9664	37.9664	37.7855	38.3426	38.9431	39.3676	39.8114 (38)
Heat transfer coeff	72.9887	72.7451	72.5064	71.3849	71.1751	70.1984	70.1984	70.0175	70.5746	71.1751	71.5996	72.0433 (39)
Average = Sum(39)m / 12 =												71.3839 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0023	0.9990	0.9957	0.9803	0.9774	0.9640	0.9640	0.9615	0.9692	0.9774	0.9832	0.9893 (40)
HLP (average)												0.9803 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.3126 (42)
Average daily hot water use (litres/day)												89.1241 (43)
Daily hot water use	98.0366	94.4716	90.9066	87.3417	83.7767	80.2117	80.2117	83.7767	87.3417	90.9066	94.4716	98.0366 (44)
Energy conte	145.3854	127.1550	131.2126	114.3943	109.7640	94.7180	87.7702	100.7176	101.9204	118.7784	129.6560	140.7980 (45)
Energy content (annual)										Total = Sum(45)m =		1402.2699 (45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
												0.0000 (59)

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Heat gains from water heating, kWh/month
 30.8944 27.0204 27.8827 24.3088 23.3249 20.1276 18.6512 21.4025 21.6581 25.2404 27.5519 29.9196 (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	115.6298	115.6298	115.6298	115.6298	115.6298	115.6298	115.6298	115.6298	115.6298	115.6298	115.6298	115.6298 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.7764	16.6770	13.5627	10.2678	7.6753	6.4798	7.0017	9.1010	12.2154	15.5103	18.1028	19.2983 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	203.7873	205.9019	200.5730	189.2284	174.9079	161.4486	152.4569	150.3423	155.6712	167.0158	181.3363	194.7956 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5630	34.5630	34.5630	34.5630	34.5630	34.5630	34.5630	34.5630	34.5630	34.5630	34.5630	34.5630 (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)	-92.5038	-92.5038	-92.5038	-92.5038	-92.5038	-92.5038	-92.5038	-92.5038	-92.5038	-92.5038	-92.5038	-92.5038 (71)
Water heating gains (Table 5)	41.5247	40.2090	37.4767	33.7622	31.3506	27.9550	25.0688	28.7668	30.0807	33.9253	38.2665	40.2145 (72)
Total internal gains	321.7773	320.4769	309.3013	290.9474	271.6227	253.5723	242.2163	245.8990	255.6562	274.1403	295.3946	311.9973 (73)

6. Solar gains

[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						
Northeast	8.1500	11.2829	0.6300	0.7000	0.7700	28.1029 (75)						
Northwest	4.0900	11.2829	0.6300	0.7000	0.7700	14.1032 (81)						
Solar gains	42.2061	85.9118	154.7858	254.2027	341.6983	364.2865	340.7826	271.6758	188.6089	104.9910	53.1062	34.4677 (83)
Total gains	363.9835	406.3887	464.0871	545.1500	613.3210	617.8588	582.9989	517.5748	444.2651	379.1313	348.5008	346.4649 (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	69.2839	69.5159	69.7448	70.8405	71.0493	72.0379	72.0379	72.2240	71.6539	71.0493	70.6281	70.1931
alpha	5.6189	5.6344	5.6497	5.7227	5.7366	5.8025	5.8025	5.8149	5.7769	5.7366	5.7085	5.6795
util living area	0.9992	0.9983	0.9945	0.9723	0.8820	0.6919	0.5235	0.6068	0.8886	0.9894	0.9984	0.9994 (86)
MIT	19.8665	19.9848	20.2173	20.5559	20.8389	20.9709	20.9951	20.9893	20.8770	20.5138	20.1390	19.8520 (87)
Th 2	20.0814	20.0842	20.0869	20.0998	20.1022	20.1134	20.1134	20.1155	20.1091	20.1022	20.0973	20.0922 (88)
util rest of house	0.9989	0.9977	0.9924	0.9615	0.8406	0.6102	0.4214	0.4980	0.8319	0.9838	0.9977	0.9992 (89)
MIT 2	19.0367	19.1570	19.3908	19.7334	19.9924	20.1001	20.1121	20.1123	20.0364	19.6983	19.3220	19.0310 (90)
Living area fraction	fLA = Living area / (4) =											0.3691 (91)
MIT	19.3430	19.4626	19.6959	20.0370	20.3049	20.4215	20.4381	20.4360	20.3467	19.9993	19.6236	19.3341 (92)
Temperature adjustment												0.0000
adjusted MIT	19.3430	19.4626	19.6959	20.0370	20.3049	20.4215	20.4381	20.4360	20.3467	19.9993	19.6236	19.3341 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9986	0.9972	0.9913	0.9606	0.8510	0.6398	0.4593	0.5385	0.8491	0.9830	0.9972	0.9990 (94)
Useful gains	363.4912	405.2535	460.0441	523.6745	521.9075	395.2892	267.7729	278.7290	377.2437	372.6706	347.5319	346.1134 (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	1097.9694	1059.3585	956.7873	795.0122	612.4519	408.6627	269.4257	282.5934	440.8598	668.9984	896.6837	1090.3104 (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	546.4518	439.5586	369.5769	195.3631	67.3651	0.0000	0.0000	0.0000	0.0000	220.4679	395.3893	553.6825 (98)
Space heating												2787.8552 (98)
Space heating per m ²												(98) / (4) = 38.2842 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	659.8648	519.4680	532.1330	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9244	0.9636	0.9394	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	609.9954	500.5502	499.9031	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	808.3521	765.8780	690.8941	0.0000	0.0000	0.0000	0.0000 (103)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000 (103a)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	142.8168	197.4039	142.0973	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												482.3179 (104)
Cooled fraction												fC = cooled area / (4) = 1.0000 (105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	35.7042	49.3510	35.5243	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling													120.5795 (107)
Space cooling per m2													1.6559 (108)
Energy for space heating													38.2842 (99)
Energy for space cooling													1.6559 (108)
Total													39.9401 (109)
Target Fabric Energy Efficiency (TFEE)													45.9 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



Property Reference	006423		Issued on Date	17/07/2023
Assessment Reference	F.02.01	Prop Type Ref	2B4P	
Property				

SAP Rating	84 B	DER	12.18	TER	22.91
Environmental	91 B	% DER<TER	46.83		
CO ₂ Emissions (t/year)	0.79	DFEE	38.95	TFEE	42.56
General Requirements Compliance	Pass	% DFEE<TFEE	8.47		

Assessor Details	Mr. Michael Wride, Michael Wride, Tel: 02036 031 600, Michael@hodkinsonconsultancy.com	Assessor ID	R572-0001
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Client	
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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 78 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) 22.91 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 12.18 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)42.6 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)38.9 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.15 (max. 0.30)	0.15 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.26 (max. 2.00)	1.30 (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: 0.20 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: 0.59
Maximum 1.5 OK
MVHR efficiency: 89%
Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): Slight OK
Based on:
Overshading: Average
Windows facing North: 2.47 m², No overhang
Windows facing South: 9.86 m², No overhang
Windows facing South West: 2.47 m², No overhang
Air change rate: 4.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Door U-value 1.00 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	78.1400 (1b)	2.8700 (2b)	224.2618 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.1400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	224.2618 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ 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				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)

	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	0.1769	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:												0.5000 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												62.3000 (23c)
Effective ac	0.3654	0.3619	0.3585	0.3411	0.3377	0.3203	0.3203	0.3168	0.3273	0.3377	0.3446	0.3515 (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 = 1.30)			14.8000	1.2357	18.2890		(27)
Main Entrance			2.4900	1.0000	2.4900		(26)
External Wall 1	80.5300	14.8000	65.7300	0.1500	9.8595		(29a)
Corridor Wall	6.7200	2.4900	4.2300	0.1415	0.5986		(29a)
Total net area of external elements Aum(A, m ²)			87.2500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	31.2371		(33)
Party Wall 1			33.5500	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)							13.2277 (36)
Total fabric heat loss						(33) + (36) =	44.4648 (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	27.0424	26.7857	26.5290	25.2454	24.9887	23.7052	23.7052	23.4485	24.2186	24.9887	25.5021	26.0156 (38)
Average = Sum(39)m / 12 =	71.5072	71.2504	70.9937	69.7102	69.4535	68.1699	68.1699	67.9132	68.6834	69.4535	69.9669	70.4803 (39)
												69.6460 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.9151	0.9118	0.9085	0.8921	0.8888	0.8724	0.8724	0.8691	0.8790	0.8888	0.8954	0.9020 (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												2.4266 (42)
Average daily hot water use (litres/day)												91.8323 (43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	101.0155	97.3422	93.6689	89.9956	86.3223	82.6490	82.6490	86.3223	89.9956	93.6689	97.3422	101.0155 (44)
Energy content (annual)	149.8030	131.0187	135.1996	117.8703	113.0993	97.5961	90.4371	103.7779	105.0174	122.3876	133.5957	145.0763 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 1444.8790 (45)
Water storage loss:	22.4705	19.6528	20.2799	17.6805	16.9649	14.6394	13.5656	15.5667	15.7526	18.3581	20.0394	21.7614 (46)

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)															0.0191 (51)
Volume factor from Table 2a															1.0000 (52)
Temperature factor from Table 2b															1.0000 (53)
Enter (49) or (54) in (55)															0.1960 (55)
Total storage loss	6.0757	5.4877	6.0757	5.8797	6.0757	5.8797	6.0757	6.0757	5.8797	6.0757	5.8797	6.0757	5.8797	6.0757	(56)
If cylinder contains dedicated solar storage	6.0757	5.4877	6.0757	5.8797	6.0757	5.8797	6.0757	6.0757	5.8797	6.0757	5.8797	6.0757	5.8797	6.0757	(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	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month	179.1411	157.5176	164.5376	146.2619	142.4374	125.9878	119.7752	133.1160	133.4091	151.7257	161.9874	174.4143	174.4143	174.4143	(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	0.0000	0.0000	(63)
Output from w/h	179.1411	157.5176	164.5376	146.2619	142.4374	125.9878	119.7752	133.1160	133.4091	151.7257	161.9874	174.4143	174.4143	174.4143	(64)
Heat gains from water heating, kWh/month	73.2800	64.7628	68.4243	61.9052	61.0760	55.1641	53.5408	57.9766	57.6316	64.1643	67.1339	71.7083	71.7083	71.7083	(65)

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

Metabolic gains (Table 5), Watts																	
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec					
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	121.3311	121.3311	121.3311	121.3311	121.3311	121.3311	121.3311	121.3311	121.3311	121.3311	121.3311	121.3311	121.3311	121.3311	121.3311	121.3311	121.3311
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	19.3201	17.1600	13.9554	10.5651	7.8976	6.6675	7.2044	9.3646	12.5691	15.9594	18.6270	19.8571	19.8571	19.8571	19.8571	19.8571	19.8571
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	215.5093	217.7456	212.1101	200.1130	184.9687	170.7352	161.2264	158.9901	164.6255	176.6227	191.7669	206.0004	206.0004	206.0004	206.0004	206.0004	206.0004
Pumps, fans	35.1331	35.1331	35.1331	35.1331	35.1331	35.1331	35.1331	35.1331	35.1331	35.1331	35.1331	35.1331	35.1331	35.1331	35.1331	35.1331	35.1331
Losses e.g. evaporation (negative values) (Table 5)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Water heating gains (Table 5)	-97.0649	-97.0649	-97.0649	-97.0649	-97.0649	-97.0649	-97.0649	-97.0649	-97.0649	-97.0649	-97.0649	-97.0649	-97.0649	-97.0649	-97.0649	-97.0649	-97.0649
Total internal gains	392.7233	390.6781	377.4331	356.0569	334.3570	313.4188	299.7936	305.6796	316.6379	338.2238	363.0348	381.6390	381.6390	381.6390	381.6390	381.6390	381.6390

6. Solar gains

[Jan]																	
	Area	Solar flux	g	Specific data	FF	Access	Gains										
	m ²	Table 6a	W/m ²	or Table 6b	Specific data	factor	W										
					or Table 6c	Table 6d											
North	2.4700	10.6334	0.5000		0.7500	0.7700	6.8255	(74)									
South	9.8600	46.7521	0.5000		0.7500	0.7700	119.7960	(78)									
Southwest	2.4700	36.7938	0.5000		0.7500	0.7700	23.6176	(79)									
Solar gains	150.2391	249.4684	327.1261	386.2652	418.6932	410.4455	397.8178	373.8154	347.3184	271.6039	178.7077	129.4166	129.4166	129.4166	129.4166	129.4166	129.4166
Total gains	542.9624	640.1465	704.5591	742.3222	753.0502	723.8642	697.6114	679.4949	663.9563	609.8277	541.7425	511.0556	511.0556	511.0556	511.0556	511.0556	511.0556

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)																		
tau	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec						
alpha	75.8860	76.1594	76.4348	77.8421	78.1298	79.6009	79.6009	79.9018	79.0059	78.1298	77.5565	76.9915	76.9915	76.9915	76.9915	76.9915	76.9915	76.9915
util living area	6.0591	6.0773	6.0957	6.1895	6.2087	6.3067	6.3067	6.3268	6.2671	6.2087	6.1704	6.1328	6.1328	6.1328	6.1328	6.1328	6.1328	6.1328
MIT	0.9954	0.9870	0.9664	0.9095	0.7874	0.5926	0.4288	0.4579	0.6868	0.9228	0.9878	0.9967	0.9967	0.9967	0.9967	0.9967	0.9967	0.9967
Th 2	20.1792	20.3526	20.5619	20.7877	20.9332	20.9908	20.9989	20.9984	20.9773	20.7986	20.4487	20.1507	20.1507	20.1507	20.1507	20.1507	20.1507	20.1507
util rest of house	20.1547	20.1575	20.1602	20.1742	20.1770	20.1910	20.1910	20.1938	20.1854	20.1770	20.1714	20.1658	20.1658	20.1658	20.1658	20.1658	20.1658	20.1658
MIT 2	0.9939	0.9831	0.9565	0.8842	0.7373	0.5221	0.3506	0.3787	0.6162	0.8957	0.9835	0.9957	0.9957	0.9957	0.9957	0.9957	0.9957	0.9957
Living area fraction	19.0622	19.3151	19.6154	19.9349	20.1150	20.1851	20.1906	20.1932	20.1691	19.9572	19.4667	19.0293	19.0293	19.0293	19.0293	19.0293	19.0293	19.0293
Ext temp.	19.4339	19.6603	19.9303	20.2187	20.3872	20.4532	20.4596	20.4611	20.4380	20.2372	19.7935	19.4025	19.4025	19.4025	19.4025	19.4025	19.4025	19.4025
Temperature adjustment																		
adjusted MIT	19.4339	19.6603	19.9303	20.2187	20.3872	20.4532	20.4596	20.4611	20.4380	20.2372	19.7935	19.4025	19.4025	19.4025	19.4025	19.4025	19.4025	19.4025

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec						
Useful gains	0.9923	0.9803	0.9532	0.8857	0.7508	0.5454	0.3767	0.4051	0.6388	0.8980	0.9810	0.9944	0.9944	0.9944	0.9944	0.9944	0.9944	0.9944
Heat loss rate W	538.7868	627.5094	671.6190	657.5060	565.3754	394.7717	262.7571	275.2571	424.1586	547.6180	531.4402	508.1884	508.1884	508.1884	508.1884	508.1884	508.1884	508.1884
Month fracti	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	4.2000	4.2000	4.2000	4.2000	4.2000	4.2000
Space heating kWh	1082.1796	1051.6803	953.4697	789.0262	603.3575	399.0108	263.1071	275.8035	435.3153	669.3359	888.1223	1071.4746	1071.4746	1071.4746	1071.4746	1071.4746	1071.4746	1071.4746
Space heating per m ²	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Space heating	404.2842	285.0428	209.6969	94.6945	28.2586	0.0000	0.0000	0.0000	0.0000	90.5582	256.8111	419.0849	419.0849	419.0849	419.0849	419.0849	419.0849	419.0849
Space heating per m ²																		
										(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	1.0000 (303b)
Fraction of total space heat from community Heat pump	1.0000 (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	1788.4313 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.05	1877.8528 (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	1790.3112 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.05	1879.8268 (310b)
Electricity used for heat distribution	37.5768 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7375)	
mechanical ventilation fans (SFP = 0.7375)	201.7796 (330a)
Total electricity for the above, kWh/year	201.7796 (331)
Electricity for lighting (calculated in Appendix L)	341.1994 (332)
Total delivered energy for all uses	4300.6586 (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			300.0000 (367b)
Space heating from Heat pump	1252.5599	0.5190	650.0786 (368)
Electrical energy for heat distribution	37.5768	0.5190	19.5024 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			669.5809 (373)
Space and water heating			669.5809 (376)
Pumps and fans	201.7796	0.5190	104.7236 (378)
Energy for lighting	341.1994	0.5190	177.0825 (379)
Total CO2, kg/year			951.3870 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			12.1800 (384)

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

DER			12.1800 ZC1
Total Floor Area		TFA	78.1400
Assumed number of occupants		N	2.4266
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190
CO2 emissions from appliances, equation (L14)			16.3433 ZC2
CO2 emissions from cooking, equation (L16)			2.2682 ZC3
Total CO2 emissions			30.7915 ZC4
Residual CO2 emissions offset from biofuel CHP			0.0000 ZC5
Additional allowable electricity generation, kWh/m ² /year			0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation			0.0000 ZC7
Net CO2 emissions			30.7915 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	78.1400 (1b)	2.8700 (2b)	224.2618 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.1400		224.2618 (4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 224.2618 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ 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				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) = 0.1338 (8)
Measured/design AP50					Yes
Infiltration rate					5.0000
Number of sides sheltered					0.3838 (18)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3550 (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	0.4526	0.4437	0.4349	0.3905	0.3816	0.3372	0.3372	0.3284	0.3550	0.3816	0.3994	0.4171 (22b)
Effective ac	0.6024	0.5985	0.5946	0.5762	0.5728	0.5569	0.5569	0.5539	0.5630	0.5728	0.5797	0.5870 (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			2.4900	1.0000	2.4900		(26)					
TER Opening Type (Uw = 1.40)			14.8000	1.3258	19.6212		(27)					
External Wall 1	80.5300	14.8000	65.7300	0.1800	11.8314		(29a)					
Corridor Wall	6.7200	2.4900	4.2300	0.1800	0.7614		(29a)					
Total net area of external elements Aum(A, m ²)			87.2500				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 34.7040		(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)							6.6618 (36)					
Total fabric heat loss							(33) + (36) = 41.3658 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	44.5836	44.2892	44.0007	42.6455	42.3919	41.2116	41.2116	40.9930	41.6662	42.3919	42.9049	43.4411 (38)
Heat transfer coeff	85.9494	85.6550	85.3665	84.0113	83.7577	82.5774	82.5774	82.3588	83.0321	83.7577	84.2707	84.8069 (39)
Average = Sum(39)m / 12 =												84.0101 (39)
HLP	1.0999	1.0962	1.0925	1.0751	1.0719	1.0568	1.0568	1.0540	1.0626	1.0719	1.0785	1.0853 (40)
HLP (average)												1.0751 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.4266 (42)
Average daily hot water use (litres/day)												91.8323 (43)
Daily hot water use	101.0155	97.3422	93.6689	89.9956	86.3223	82.6490	82.6490	86.3223	89.9956	93.6689	97.3422	101.0155 (44)
Energy content (annual)	149.8030	131.0187	135.1996	117.8703	113.0993	97.5961	90.4371	103.7779	105.0174	122.3876	133.5957	145.0763 (45)
Distribution loss (46)m = 0.15 x (45)m	22.4705	19.6528	20.2799	17.6805	16.9649	14.6394	13.5656	15.5667	15.7526	18.3581	20.0394	21.7614 (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)												
Total storage loss												

FULL SAP CALCULATION PRINTOUT

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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	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	177.4207	155.9637	162.8172	144.5970	140.7170	124.3229	118.0548	131.3956	131.7442	150.0053	160.3225	172.6939 (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	177.4207	155.9637	162.8172	144.5970	140.7170	124.3229	118.0548	131.3956	131.7442	150.0053	160.3225	172.6939 (64)
Heat gains from water heating, kWh/month	71.9037	63.5197	67.0480	60.5733	59.6997	53.8321	52.1645	56.6003	56.2997	62.7880	65.8020	70.3320 (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	121.3311	121.3311	121.3311	121.3311	121.3311	121.3311	121.3311	121.3311	121.3311	121.3311	121.3311	121.3311	121.3311 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	19.4756	17.2981	14.0677	10.6502	7.9611	6.7211	7.2624	9.4400	12.6703	16.0878	18.7769	20.0169	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	215.5093	217.7456	212.1101	200.1130	184.9687	170.7352	161.2264	158.9901	164.6255	176.6227	191.7669	206.0004	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.1331	35.1331	35.1331	35.1331	35.1331	35.1331	35.1331	35.1331	35.1331	35.1331	35.1331	35.1331	(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)	-97.0649	-97.0649	-97.0649	-97.0649	-97.0649	-97.0649	-97.0649	-97.0649	-97.0649	-97.0649	-97.0649	-97.0649	(71)
Water heating gains (Table 5)	96.6447	94.5234	90.1183	84.1296	80.2415	74.7668	70.1136	76.0757	78.1940	84.3925	91.3916	94.5322	(72)
Total internal gains	394.0289	391.9664	378.6955	357.2920	335.5706	314.6225	301.0017	306.9050	317.8891	339.5024	364.3348	382.9489	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	g	Specific data or Table 6c	FF	Access factor Table 6d	Gains W					
North	2.4700	10.6334	0.6300	0.6300	0.7000	0.7700	8.0268	(74)					
South	9.8600	46.7521	0.6300	0.6300	0.7000	0.7700	140.8801	(78)					
Southwest	2.4700	36.7938	0.6300	0.6300	0.7000	0.7700	27.7743	(79)					
Solar gains	176.6812	293.3748	384.7003	454.2479	492.3832	482.6839	467.8338	439.6069	408.4464	319.4062	210.1602	152.1939	(83)
Total gains	570.7101	685.3411	763.3957	811.5400	827.9539	797.3064	768.8355	746.5119	726.3355	658.9085	574.4950	535.1428	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, t_{hl} (C)													21.0000 (85)
Utilisation factor for gains for living area, $n_{l,m}$ (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	63.1347	63.3517	63.5658	64.5912	64.7867	65.7128	65.7128	65.8872	65.3529	64.7867	64.3924	63.9852	
alpha	5.2090	5.2234	5.2377	5.3061	5.3191	5.3809	5.3809	5.3925	5.3569	5.3191	5.2928	5.2657	
util living area	0.9950	0.9868	0.9679	0.9195	0.8150	0.6365	0.4681	0.5010	0.7288	0.9334	0.9881	0.9964	(86)
MIT	19.9478	20.1470	20.3940	20.6706	20.8730	20.9743	20.9958	20.9940	20.9468	20.6878	20.2649	19.9157	(87)
Th 2	20.0009	20.0040	20.0070	20.0212	20.0239	20.0363	20.0363	20.0386	20.0315	20.0239	20.0185	20.0128	(88)
util rest of house	0.9934	0.9826	0.9578	0.8943	0.7616	0.5516	0.3680	0.3997	0.6483	0.9071	0.9837	0.9952	(89)
MIT 2	18.6107	18.9012	19.2565	19.6490	19.9049	20.0199	20.0348	20.0362	19.9928	19.6817	19.0847	18.5727	(90)
Living area fraction													fLA = Living area / (4) = 0.3327 (91)
MIT	19.0556	19.3157	19.6350	19.9889	20.2270	20.3375	20.3545	20.3549	20.3102	20.0164	19.4774	19.0196	(92)
Temperature adjustment													0.0000
adjusted MIT	19.0556	19.3157	19.6350	19.9889	20.2270	20.3375	20.3545	20.3549	20.3102	20.0164	19.4774	19.0196	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9913	0.9789	0.9531	0.8933	0.7737	0.5790	0.4014	0.4335	0.6729	0.9069	0.9804	0.9936	(94)
Useful gains	565.7733	670.8878	727.6160	724.9793	640.5509	461.6637	308.6404	323.6160	488.7292	597.5373	563.2463	531.6985	(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	1268.2354	1234.7808	1121.2886	931.5947	714.2041	473.7842	310.0407	325.7234	515.6483	788.6997	1043.0503	1256.8021	(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	522.6318	378.9361	292.8925	148.7631	54.7980	0.0000	0.0000	0.0000	0.0000	142.2248	345.4588	539.4771	(98)
Space heating													2425.1823 (98)
Space heating per m2													(98) / (4) = 31.0364 (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													2593.7778 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	522.6318	378.9361	292.8925	148.7631	54.7980	0.0000	0.0000	0.0000	0.0000	142.2248	345.4588	539.4771	(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)	558.9645	405.2792	313.2540	159.1050	58.6075	0.0000	0.0000	0.0000	0.0000	152.1121	369.4747	576.9808	(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	177.4207	155.9637	162.8172	144.5970	140.7170	124.3229	118.0548	131.3956	131.7442	150.0053	160.3225	172.6939	(64)
Efficiency of water heater (217)m	87.5257	87.0949	86.3627	84.8896	82.5350	79.8000	79.8000	79.8000	79.8000	84.6722	86.8104	87.6501	(216)
Fuel for water heating, kWh/month	202.7071	179.0732	188.5273	170.3354	170.4937	155.7931	147.9384	164.6562	165.0929	177.1600	184.6812	197.0264	(219)
Water heating fuel used													2103.4850 (219)
Annual totals kWh/year													
Space heating fuel - main system													2593.7778 (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)													343.9454 (232)
Total delivered energy for all uses													5116.2082 (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	2593.7778	0.2160	560.2560 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2103.4850	0.2160	454.3528 (264)
Space and water heating			1014.6088 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	343.9454	0.5190	178.5077 (268)
Total CO2, kg/m2/year			1232.0414 (272)
Emissions per m2 for space and water heating			12.9845 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.2845 (272b)
Emissions per m2 for pumps and fans			0.4981 (272c)
Target Carbon Dioxide Emission Rate (TER) = (12.9845 * 1.55) + 2.2845 + 0.4981, rounded to 2 d.p.			22.9100 (273)

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CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
 CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	78.1400 (1b)	2.8700 (2b)	224.2618 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.1400		224.2618 (4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 224.2618 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ 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				3 * 10 =	30.0000 (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) =				30.0000 / (5) =	0.1338 (8)
Pressure test				Yes	
Measured/design AP50				3.0000	
Infiltration rate				0.2838	(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) =	0.2625 (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	0.3347	0.3281	0.3215	0.2887	0.2822	0.2494	0.2494	0.2428	0.2625	0.2822	0.2953	0.3084 (22b)
Effective ac	0.5560	0.5538	0.5517	0.5417	0.5398	0.5311	0.5311	0.5295	0.5345	0.5398	0.5436	0.5476 (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 = 1.30)			14.8000	1.2357	18.2890		(27)
Main Entrance			2.4900	1.0000	2.4900		(26)
External Wall 1	80.5300	14.8000	65.7300	0.1500	9.8595		(29a)
Corridor Wall	6.7200	2.4900	4.2300	0.1415	0.5986		(29a)
Total net area of external elements Aum(A, m ²)			87.2500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	31.2371		(33)
Party Wall 1			33.5500	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)							13.2277 (36)
Total fabric heat loss							(33) + (36) = 44.4648 (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	41.1478	40.9869	40.8291	40.0881	39.9495	39.3042	39.3042	39.1847	39.5527	39.9495	40.2300	40.5232 (38)
Heat transfer coeff	85.6126	85.4516	85.2939	84.5529	84.4143	83.7689	83.7689	83.6494	84.0175	84.4143	84.6947	84.9879 (39)
Average = Sum(39)m / 12 =												84.5522 (39)
HLP	1.0956	1.0936	1.0916	1.0821	1.0803	1.0720	1.0720	1.0705	1.0752	1.0803	1.0839	1.0876 (40)
HLP (average)												1.0821 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.4266 (42)
Average daily hot water use (litres/day)												91.8323 (43)
Daily hot water use	101.0155	97.3422	93.6689	89.9956	86.3223	82.6490	82.6490	86.3223	89.9956	93.6689	97.3422	101.0155 (44)
Energy conte	149.8030	131.0187	135.1996	117.8703	113.0993	97.5961	90.4371	103.7779	105.0174	122.3876	133.5957	145.0763 (45)
Energy content (annual)												Total = Sum(45)m = 1444.8790 (45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Heat gains from water heating, kWh/month	31.8331	27.8415	28.7299	25.0474	24.0336	20.7392	19.2179	22.0528	22.3162	26.0074	28.3891	30.8287	(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	121.3311	121.3311	121.3311	121.3311	121.3311	121.3311	121.3311	121.3311	121.3311	121.3311	121.3311	121.3311	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	19.3201	17.1600	13.9554	10.5651	7.8976	6.6675	7.2044	9.3646	12.5691	15.9594	18.6270	19.8571	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	215.5093	217.7456	212.1101	200.1130	184.9687	170.7352	161.2264	158.9901	164.6255	176.6227	191.7669	206.0004	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.1331	35.1331	35.1331	35.1331	35.1331	35.1331	35.1331	35.1331	35.1331	35.1331	35.1331	35.1331	(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)	-97.0649	-97.0649	-97.0649	-97.0649	-97.0649	-97.0649	-97.0649	-97.0649	-97.0649	-97.0649	-97.0649	-97.0649	(71)
Water heating gains (Table 5)	42.7865	41.4308	38.6155	34.7881	32.3032	28.8044	25.8305	29.6409	30.9947	34.9561	39.4293	41.4364	(72)
Total internal gains	337.0152	335.7356	324.0804	304.8655	284.5688	265.6064	253.6606	257.3949	267.5887	286.9375	309.2225	326.6933	(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	2.4700		10.6334		0.5000		0.7500		0.7700		6.8255 (74)	
South	9.8600		46.7521		0.5000		0.7500		0.7700		119.7960 (78)	
Southwest	2.4700		36.7938		0.5000		0.7500		0.7700		23.6176 (79)	

Solar gains	150.2391	249.4684	327.1261	386.2652	418.6932	410.4455	397.8178	373.8154	347.3184	271.6039	178.7077	129.4166	(83)
Total gains	487.2543	585.2040	651.2064	691.1308	703.2620	676.0519	651.4785	631.2102	614.9070	558.5414	487.9302	456.1099	(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	63.3831	63.5025	63.6199	64.1774	64.2828	64.7781	64.7781	64.8706	64.5864	64.2828	64.0700	63.8489	63.8489		
alpha	5.2255	5.2335	5.2413	5.2785	5.2855	5.3185	5.3185	5.3247	5.3058	5.2855	5.2713	5.2566	5.2566		
util living area	0.9976	0.9934	0.9833	0.9553	0.8833	0.7308	0.5536	0.5918	0.8156	0.9646	0.9943	0.9983	0.9983	(86)	
MIT	19.8545	20.0353	20.2754	20.5584	20.8005	20.9488	20.9903	20.9863	20.9047	20.5872	20.1580	19.8178	19.8178	(87)	
Th 2	20.0044	20.0061	20.0077	20.0155	20.0170	20.0237	20.0237	20.0250	20.0211	20.0170	20.0140	20.0109	20.0109	(88)	
util rest of house	0.9968	0.9912	0.9775	0.9389	0.8402	0.6431	0.4371	0.4753	0.7409	0.9483	0.9921	0.9977	0.9977	(89)	
MIT 2	18.9619	19.1430	19.3814	19.6614	19.8816	19.9999	20.0212	20.0211	19.9701	19.6941	19.2723	18.9306	18.9306	(90)	
Living area fraction													fLA = Living area / (4) =	0.3327	(91)
MIT	19.2589	19.4399	19.6789	19.9599	20.1874	20.3156	20.3437	20.3422	20.2811	19.9912	19.5670	19.2258	19.2258	(92)	
Temperature adjustment													0.0000		
adjusted MIT	19.2589	19.4399	19.6789	19.9599	20.1874	20.3156	20.3437	20.3422	20.2811	19.9912	19.5670	19.2258	19.2258	(93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
Utilisation	0.9960	0.9996	0.9751	0.9378	0.8486	0.6710	0.4762	0.5144	0.7628	0.9478	0.9907	0.9971	(94)		
Useful gains	485.3142	579.1291	634.9996	648.1366	596.7977	453.6466	310.2400	324.7182	469.0610	529.3919	483.4093	454.7992	(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	1280.6704	1242.4545	1124.0778	935.1453	716.4544	478.7885	313.6035	329.7654	519.3198	792.7538	1055.8915	1277.0110	(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	591.7450	445.7547	363.8742	206.6463	89.0246	0.0000	0.0000	0.0000	0.0000	195.9413	412.1872	611.7256	(98)		
Space heating													2916.8988	(98)	
Space heating per m2													(98) / (4) =	37.3291	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
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			
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	787.4278	619.8900	635.7355	0.0000	0.0000	0.0000	0.0000	(100)		
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8848	0.9415	0.9299	0.0000	0.0000	0.0000	0.0000	(101)		
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	696.7035	583.6500	591.1757	0.0000	0.0000	0.0000	0.0000	(102)		
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	880.5620	849.9786	827.7968	0.0000	0.0000	0.0000	0.0000	(103)		
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	(103a)		
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	132.3782	198.1485	176.0461	0.0000	0.0000	0.0000	0.0000	(104)		
Space cooling													506.5727	(104)	
Cooled fraction													fC = cooled area / (4) =	1.0000	(105)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



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Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	33.0945	49.5371	44.0115	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling												126.6432 (107)
Space cooling per m2												1.6207 (108)
Energy for space heating												37.3291 (99)
Energy for space cooling												1.6207 (108)
Total												38.9499 (109)
Dwelling Fabric Energy Efficiency (DFEE)												38.9 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	78.1400 (1b)	2.8700 (2b)	224.2618 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.1400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	224.2618 (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				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) =	0.1338 (8)
Measured/design AP50					Yes	5.0000
Infiltration rate						0.3838 (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) =		0.3550 (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 infiltr rate	0.4526	0.4437	0.4349	0.3905	0.3816	0.3372	0.3372	0.3284	0.3550	0.3816	0.3994	0.4171 (22b)
Effective ac	0.6024	0.5985	0.5946	0.5762	0.5728	0.5569	0.5569	0.5539	0.5630	0.5728	0.5797	0.5870 (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			2.4900	1.0000	2.4900		(26)
TER Opening Type (Uw = 1.40)			14.8000	1.3258	19.6212		(27)
External Wall 1	80.5300	14.8000	65.7300	0.1800	11.8314		(29a)
Corridor Wall	6.7200	2.4900	4.2300	0.1800	0.7614		(29a)
Total net area of external elements Aum(A, m2)			87.2500				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	34.7040	(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							6.6618 (36)
Total fabric heat loss						(33) + (36) =	41.3658 (37)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	44.5836	44.2892	44.0007	42.6455	42.3919	41.2116	41.2116	40.9930	41.6662	42.3919	42.9049	43.4411 (38)
Heat transfer coeff	85.9494	85.6550	85.3665	84.0113	83.7577	82.5774	82.5774	82.3588	83.0321	83.7577	84.2707	84.8069 (39)
Average = Sum(39)m / 12 =												84.0101 (39)
HLP	1.0999	1.0962	1.0925	1.0751	1.0719	1.0568	1.0568	1.0540	1.0626	1.0719	1.0785	1.0853 (40)
HLP (average)												1.0751 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.4266 (42)
Average daily hot water use (litres/day)												91.8323 (43)
Daily hot water use	101.0155	97.3422	93.6689	89.9956	86.3223	82.6490	82.6490	86.3223	89.9956	93.6689	97.3422	101.0155 (44)
Energy conte	149.8030	131.0187	135.1996	117.8703	113.0993	97.5961	90.4371	103.7779	105.0174	122.3876	133.5957	145.0763 (45)
Energy content (annual)												Total = Sum(45)m = 1444.8790 (45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
												0.0000 (59)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Heat gains from water heating, kWh/month
 31.8331 27.8415 28.7299 25.0474 24.0336 20.7392 19.2179 22.0528 22.3162 26.0074 28.3891 30.8287 (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	121.3311	121.3311	121.3311	121.3311	121.3311	121.3311	121.3311	121.3311	121.3311	121.3311	121.3311	121.3311 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	19.4756	17.2981	14.0677	10.6502	7.9611	6.7211	7.2624	9.4400	12.6703	16.0878	18.7769	20.0169 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	215.5093	217.7456	212.1101	200.1130	184.9687	170.7352	161.2264	158.9901	164.6255	176.6227	191.7669	206.0004 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.1331	35.1331	35.1331	35.1331	35.1331	35.1331	35.1331	35.1331	35.1331	35.1331	35.1331	35.1331 (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)	-97.0649	-97.0649	-97.0649	-97.0649	-97.0649	-97.0649	-97.0649	-97.0649	-97.0649	-97.0649	-97.0649	-97.0649 (71)
Water heating gains (Table 5)	42.7865	41.4308	38.6155	34.7881	32.3032	28.8044	25.8305	29.6409	30.9947	34.9561	39.4293	41.4364 (72)
Total internal gains	337.1707	335.8737	324.1927	304.9506	284.6324	265.6601	253.7186	257.4702	267.6898	287.0660	309.3724	326.8531 (73)

6. Solar gains

[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						
North	2.4700	10.6334	0.6300	0.7000	0.7700	8.0268 (74)						
South	9.8600	46.7521	0.6300	0.7000	0.7700	140.8801 (78)						
Southwest	2.4700	36.7938	0.6300	0.7000	0.7700	27.7743 (79)						
Solar gains	176.6812	293.3748	384.7003	454.2479	492.3832	482.6839	467.8338	439.6069	408.4464	319.4062	210.1602	152.1939 (83)
Total gains	513.8519	629.2485	708.8929	759.1985	777.0156	748.3440	721.5524	697.0771	676.1362	606.4722	519.5327	479.0470 (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)	63.1347	63.3517	63.5658	64.5912	64.7867	65.7128	65.7128	65.8872	65.3529	64.7867	64.3924	63.9852
tau	5.2090	5.2234	5.2377	5.3061	5.3191	5.3809	5.3809	5.3925	5.3569	5.3191	5.2928	5.2657
util living area	0.9969	0.9909	0.9762	0.9361	0.8428	0.6704	0.4972	0.5340	0.7655	0.9507	0.9924	0.9979 (86)
MIT	19.8804	20.0830	20.3371	20.6273	20.8487	20.9672	20.9944	20.9919	20.9325	20.6409	20.2014	19.8486 (87)
Th 2	20.0009	20.0040	20.0070	20.0212	20.0239	20.0363	20.0363	20.0386	20.0315	20.0239	20.0185	20.0128 (88)
util rest of house	0.9959	0.9880	0.9683	0.9146	0.7928	0.5839	0.3917	0.4273	0.6866	0.9297	0.9895	0.9972 (89)
MIT 2	18.9848	19.1882	19.4402	19.7288	19.9249	20.0217	20.0349	20.0364	19.9970	19.7489	19.3188	18.9628 (90)
Living area fraction									fLA = Living area / (4) =			0.3327 (91)
MIT	19.2828	19.4859	19.7387	20.0278	20.2323	20.3363	20.3542	20.3543	20.3082	20.0457	19.6125	19.2575 (92)
Temperature adjustment												0.0000
adjusted MIT	19.2828	19.4859	19.7387	20.0278	20.2323	20.3363	20.3542	20.3543	20.3082	20.0457	19.6125	19.2575 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9950	0.9860	0.9657	0.9148	0.8045	0.6120	0.4270	0.4631	0.7109	0.9302	0.9879	0.9964 (94)
Useful gains	511.2650	620.4411	684.6029	694.5093	625.1367	457.9984	308.1240	322.7860	480.6340	564.1589	513.2391	477.3293 (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	1287.7593	1249.3583	1130.1372	934.8595	714.6463	473.6884	310.0090	325.6734	515.4826	791.1524	1054.4334	1276.9828 (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	577.7118	422.6324	331.4775	173.0521	66.5952	0.0000	0.0000	0.0000	0.0000	168.8831	389.6599	594.9422 (98)
Space heating												2724.9542 (98)
Space heating per m ²										(98) / (4) =		34.8727 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	776.2276	611.0728	625.9271	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9193	0.9619	0.9533	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	713.5586	587.7843	596.7160	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	965.1307	931.9604	904.8844	0.0000	0.0000	0.0000	0.0000 (103)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000 (103a)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	181.1319	256.0670	229.2773	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												666.4762 (104)
Cooled fraction									fC = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000	(106)
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	45.2830	64.0168	57.3193	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling per m2													166.6191 (107)
Energy for space heating													2.1323 (108)
Energy for space cooling													34.8727 (99)
Total													2.1323 (108)
Target Fabric Energy Efficiency (TFEE)													37.0050 (109)
													42.6 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



Property Reference	006424		Issued on Date	17/07/2023
Assessment Reference	G.02.02	Prop Type Ref	1B2P (D)	
Property				

SAP Rating	84 B	DER	12.08	TER	22.83
Environmental	91 B	% DER<TER	47.08		
CO ₂ Emissions (t/year)	0.71	DFEE	37.50	TFEE	40.86
General Requirements Compliance	Pass	% DFEE<TFEE	8.22		

Assessor Details	Mr. Michael Wride, Michael Wride, Tel: 02036 031 600, Michael@hodkinsonconsultancy.com	Assessor ID	R572-0001
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Client	
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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 70 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) 22.83 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 12.08 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 40.9 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 37.5 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.15 (max. 0.30)	0.15 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.27 (max. 2.00)	1.30 (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: 0.20 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: 0.59
Maximum 1.5 OK
MVHR efficiency: 89%
Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): Slight OK
Based on:
Overshading: Average
Windows facing East: 9.88 m², No overhang
Windows facing South: 7.40 m², No overhang
Air change rate: 4.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Door U-value 1.00 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	70.3800 (1b)	2.8700 (2b)	201.9906 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.3800		201.9906 (4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 201.9906 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ 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					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)

	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	0.1769	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) =												
Effective ac	0.3654	0.3619	0.3585	0.3411	0.3377	0.3203	0.3203	0.3168	0.3273	0.3377	0.3446	0.3515 (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 = 1.30)			17.2800	1.2357	21.3536		(27)	
Main Entrance			2.0500	1.0000	2.0500		(26)	
External Wall 1	47.2100	17.2800	29.9300	0.1500	4.4895		(29a)	
Corridor Wall	9.5000	2.0500	7.4500	0.1415	1.0542		(29a)	
Total net area of external elements Aum(A, m ²)				56.7100			(31)	
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	28.9474		(33)	
Party Wall 1			41.7300	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)								10.4132 (36)
Total fabric heat loss								(33) + (36) = 39.3606 (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	24.3568	24.1256	23.8944	22.7383	22.5071	21.3510	21.3510	21.1198	21.8135	22.5071	22.9696	23.4320 (38)
Average = Sum(39)m / 12 =	63.7174	63.4862	63.2550	62.0989	61.8677	60.7116	60.7116	60.4804	61.1740	61.8677	62.3301	62.7925 (39)
	62.0411 (39)											

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.9053	0.9020	0.8988	0.8823	0.8791	0.8626	0.8626	0.8593	0.8692	0.8791	0.8856	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												2.2553 (42)
Average daily hot water use (litres/day)												87.7637 (43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	96.5401	93.0296	89.5190	86.0085	82.4979	78.9874	78.9874	82.4979	86.0085	89.5190	93.0296	96.5401 (44)
Energy content (annual)	143.1662	125.2141	129.2097	112.6481	108.0886	93.2722	86.4304	99.1802	100.3647	116.9654	127.6769	138.6488 (45)
Distribution loss (46)m = 0.15 x (45)m	Total = Sum(45)m = 1380.8652 (45)											
Water storage loss:	21.4749	18.7821	19.3815	16.8972	16.2133	13.9908	12.9646	14.8770	15.0547	17.5448	19.1515	20.7973 (46)

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)												0.0191	(51)		
Volume factor from Table 2a															
Temperature factor from Table 2b												1.0000	(53)		
Enter (49) or (54) in (55)												0.1960	(55)		
Total storage loss	6.0757	5.4877	6.0757	5.8797	6.0757	5.8797	6.0757	6.0757	5.8797	6.0757	5.8797	6.0757	5.8797	6.0757	(56)
If cylinder contains dedicated solar storage	6.0757	5.4877	6.0757	5.8797	6.0757	5.8797	6.0757	6.0757	5.8797	6.0757	5.8797	6.0757	5.8797	6.0757	(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	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month	172.5043	151.7130	158.5478	141.0398	137.4267	121.6639	115.7685	128.5183	128.7564	146.3035	156.0685	167.9869	167.9869	167.9869	(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	0.0000	0.0000	(63)
Output from w/h	172.5043	151.7130	158.5478	141.0398	137.4267	121.6639	115.7685	128.5183	128.7564	146.3035	156.0685	167.9869	167.9869	167.9869	(64)
Heat gains from water heating, kWh/month	71.0732	62.8328	66.4327	60.1689	59.4099	53.7264	52.2086	56.4479	56.0846	62.3615	65.1659	69.5712	69.5712	69.5712	(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	112.7657	112.7657	112.7657	112.7657	112.7657	112.7657	112.7657	112.7657	112.7657	112.7657	112.7657	112.7657
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.6681	15.6926	12.7621	9.6617	7.2223	6.0973	6.5884	8.5638	11.4944	14.5947	17.0342	18.1592
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	198.1823	200.2388	195.0565	184.0239	170.0972	157.0081	148.2638	146.2073	151.3896	162.4222	176.3489	189.4380
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.2766	34.2766	34.2766	34.2766	34.2766	34.2766	34.2766	34.2766	34.2766	34.2766	34.2766	34.2766
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
Losses e.g. evaporation (negative values) (Table 5)	-90.2126	-90.2126	-90.2126	-90.2126	-90.2126	-90.2126	-90.2126	-90.2126	-90.2126	-90.2126	-90.2126	-90.2126
Water heating gains (Table 5)	95.5285	93.5012	89.2912	83.5679	79.8520	74.6199	70.1728	75.8708	77.8953	83.8192	90.5082	93.5097
Total internal gains	368.2087	366.2624	353.9396	334.0832	314.0012	294.5551	281.8547	287.4716	297.6090	317.6658	340.7210	357.9365

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	9.8800	19.6403	0.5000	0.7500	0.7700	50.4277
South	7.4000	46.7521	0.5000	0.7500	0.7700	89.9077
Solar gains	140.3354	245.8929	350.0228	448.9242	511.2786	509.8400
Total gains	508.5441	612.1553	703.9623	783.0074	825.2798	804.3951

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)	tau	76.7059	76.9852	77.2667	78.7051	78.9993	80.5036	80.5036	80.8113	79.8950	78.9993	78.4131
	alpha	6.1137	6.1323	6.1511	6.2470	6.2666	6.3669	6.3669	6.3874	6.3263	6.2666	6.2275
util living area	0.9942	0.9822	0.9462	0.8436	0.6734	0.4806	0.3455	0.3794	0.6068	0.8946	0.9845	0.9960
MIT	20.2200	20.4119	20.6489	20.8726	20.9725	20.9972	20.9997	20.9995	20.9888	20.8422	20.4895	20.1883
Th 2	20.1630	20.1658	20.1686	20.1825	20.1853	20.1994	20.1994	20.2022	20.1938	20.1853	20.1797	20.1741
util rest of house	0.9925	0.9771	0.9319	0.8098	0.6220	0.4216	0.2828	0.3139	0.5407	0.8620	0.9791	0.9947
MIT 2	19.1278	19.4063	19.7413	20.0458	20.1614	20.1977	20.1993	20.2020	20.1861	20.0180	19.5314	19.0903
Living area fraction	fLA = Living area / (4) =											
MIT	19.5777	19.8205	20.1151	20.3864	20.4955	20.5270	20.5290	20.5305	20.5167	20.3575	19.9260	19.5426
Temperature adjustment	0.0000											
adjusted MIT	19.5777	19.8205	20.1151	20.3864	20.4955	20.5270	20.5290	20.5305	20.5167	20.3575	19.9260	19.5426

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9909	0.9745	0.9308	0.8188	0.6420	0.4459	0.3086	0.3409	0.5676	0.8696	0.9770	0.9934
Ext temp.	503.9129	596.5742	655.2539	641.0917	529.8305	358.6502	238.4421	249.6427	387.4084	516.1260	498.4576	473.9641
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	16.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000
Month fracti	973.4568	947.2470	861.2244	713.2910	544.1562	359.8397	238.5349	249.8138	392.5376	603.6735	799.4486	963.3995
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
Space heating per m2	349.3407	235.6521	153.2421	51.9835	10.6583	0.0000	0.0000	0.0000	0.0000	65.1353	216.7135	364.1400
												1446.8655
												(98) / (4) =
												20.5579

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	1.0000 (303b)
Fraction of total space heat from community Heat pump	1.0000 (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	1446.8655 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.05	1519.2087 (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	1726.2974 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.05	1812.6123 (310b)
Electricity used for heat distribution	33.3182 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7375)	
mechanical ventilation fans (SFP = 0.7375)	181.7410 (330a)
Total electricity for the above, kWh/year	181.7410 (331)
Electricity for lighting (calculated in Appendix L)	312.0242 (332)
Total delivered energy for all uses	3825.5862 (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			300.0000 (367b)
Space heating from Heat pump	1110.6070	0.5190	576.4050 (368)
Electrical energy for heat distribution	33.3182	0.5190	17.2922 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			593.6972 (373)
Space and water heating			593.6972 (376)
Pumps and fans	181.7410	0.5190	94.3236 (378)
Energy for lighting	312.0242	0.5190	161.9405 (379)
Total CO2, kg/year			849.9613 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			12.0800 (384)

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

DER			12.0800 ZC1
Total Floor Area		TFA	70.3800
Assumed number of occupants		N	2.2553
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190
CO2 emissions from appliances, equation (L14)			16.6864 ZC2
CO2 emissions from cooking, equation (L16)			2.4599 ZC3
Total CO2 emissions			31.2263 ZC4
Residual CO2 emissions offset from biofuel CHP			0.0000 ZC5
Additional allowable electricity generation, kWh/m ² /year			0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation			0.0000 ZC7
Net CO2 emissions			31.2263 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	70.3800 (1b)	2.8700 (2b)	201.9906 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.3800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	201.9906 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ 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				3 * 10 =	30.0000 (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) =				30.0000 / (5) =	0.1485 (8)
Pressure test				Yes	
Measured/design AP50				5.0000	
Infiltration rate				0.3985	(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) =	0.3686 (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	0.4700	0.4608	0.4516	0.4055	0.3963	0.3502	0.3502	0.3410	0.3686	0.3963	0.4147	0.4331 (22b)
Effective ac	0.6105	0.6062	0.6020	0.5822	0.5785	0.5613	0.5613	0.5581	0.5679	0.5785	0.5860	0.5938 (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			2.0500	1.0000	2.0500		(26)					
TER Opening Type (Uw = 1.40)			15.5500	1.3258	20.6155		(27)					
External Wall 1	47.2100	15.5500	31.6600	0.1800	5.6988		(29a)					
Corridor Wall	9.5000	2.0500	7.4500	0.1800	1.3410		(29a)					
Total net area of external elements Aum(A, m ²)			56.7100				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	29.7053	(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)							5.0149 (36)					
Total fabric heat loss							(33) + (36) = 34.7202 (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	40.6909	40.4050	40.1248	38.8085	38.5623	37.4159	37.4159	37.2036	37.8575	38.5623	39.0605	39.5813 (38)
Average = Sum(39)m / 12 =	75.4111	75.1252	74.8450	73.5288	73.2825	72.1361	72.1361	71.9238	72.5777	73.2825	73.7807	74.3015 (39)
												73.5276 (39)
HLP	1.0715	1.0674	1.0634	1.0447	1.0412	1.0250	1.0250	1.0219	1.0312	1.0412	1.0483	1.0557 (40)
HLP (average)												1.0447 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.2553 (42)
Average daily hot water use (litres/day)												87.7637 (43)
Daily hot water use	96.5401	93.0296	89.5190	86.0085	82.4979	78.9874	78.9874	82.4979	86.0085	89.5190	93.0296	96.5401 (44)
Energy conte	143.1662	125.2141	129.2097	112.6481	108.0886	93.2722	86.4304	99.1802	100.3647	116.9654	127.6769	138.6488 (45)
Energy content (annual)												Total = Sum(45)m = 1380.8652 (45)
Distribution loss (46)m = 0.15 x (45)m	21.4749	18.7821	19.3815	16.8972	16.2133	13.9908	12.9646	14.8770	15.0547	17.5448	19.1515	20.7973 (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)												
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	170.7839	150.1591	156.8274	139.3749	135.7062	119.9990	114.0481	126.7978	127.0915	144.5831	154.4036	166.2665 (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	170.7839	150.1591	156.8274	139.3749	135.7062	119.9990	114.0481	126.7978	127.0915	144.5831	154.4036	166.2665 (64)
Heat gains from water heating, kWh/month	69.6969	61.5897	65.0564	58.8369	58.0336	52.3944	50.8323	55.0715	54.7527	60.9851	63.8340	68.1949 (65)

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

Metabolic gains (Table 5), Watts (66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.6719	15.6960	12.7649	9.6638	7.2238	6.0987	6.5898	8.5657	11.4969	14.5979	17.0379	18.1631	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	198.1823	200.2388	195.0565	184.0239	170.0972	157.0081	148.2638	146.2073	151.3896	162.4222	176.3489	189.4380	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.2766	34.2766	34.2766	34.2766	34.2766	34.2766	34.2766	34.2766	34.2766	34.2766	34.2766	34.2766	(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)	-90.2126	-90.2126	-90.2126	-90.2126	-90.2126	-90.2126	-90.2126	-90.2126	-90.2126	-90.2126	-90.2126	-90.2126	(71)
Water heating gains (Table 5)	93.6786	91.6513	87.4413	81.7180	78.0021	72.7701	68.3229	74.0209	76.0454	81.9693	88.6583	91.6598	(72)
Total internal gains	369.3626	367.4159	355.0925	335.2354	315.1529	295.7066	283.0063	288.6236	298.7616	318.8191	341.8748	359.0906	(73)

6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains							
	m ²	Table 6a	Specific data	Specific data	factor	W							
		W/m ²	or Table 6b	or Table 6c	Table 6d								
East	8.8900	19.6403	0.6300	0.7000	0.7700	53.3606 (76)							
South	6.6600	46.7521	0.6300	0.7000	0.7700	95.1583 (78)							
Solar gains	148.5190	260.2295	370.4254	475.0849	541.0681	539.5439	519.2975	470.7253	407.3108	291.9545	179.3295	126.1067	(83)
Total gains	517.8816	627.6454	725.5179	810.3203	856.2210	835.2504	802.3037	759.3488	706.0724	610.7736	521.2043	485.1973	(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	64.8114	65.0580	65.3016	66.4706	66.6940	67.7539	67.7539	67.9539	67.3416	66.6940	66.2436	65.7793	
alpha	5.3208	5.3372	5.3534	5.4314	5.4463	5.5169	5.5169	5.5303	5.4894	5.4463	5.4162	5.3853	
util living area	0.9948	0.9853	0.9584	0.8811	0.7351	0.5431	0.3942	0.4332	0.6742	0.9217	0.9873	0.9962	(86)
MIT	19.9925	20.1992	20.4713	20.7609	20.9291	20.9891	20.9984	20.9974	20.9662	20.7289	20.3053	19.9615	(87)
Th 2	20.0242	20.0275	20.0308	20.0462	20.0491	20.0626	20.0626	20.0651	20.0574	20.0491	20.0433	20.0372	(88)
util rest of house	0.9931	0.9807	0.9459	0.8493	0.6776	0.4678	0.3110	0.3465	0.5956	0.8927	0.9825	0.9950	(89)
MIT 2	18.6928	18.9939	19.3826	19.7844	19.9860	20.0559	20.0620	20.0641	20.0337	19.7555	19.1614	18.6572	(90)
Living area fraction	fLA = Living area / (4) =												0.4119 (91)
MIT	19.2282	19.4903	19.8311	20.1866	20.3745	20.4403	20.4477	20.4485	20.4178	20.1564	19.6326	19.1944	(92)
Temperature adjustment													0.0000
adjusted MIT	19.2282	19.4903	19.8311	20.1866	20.3745	20.4403	20.4477	20.4485	20.4178	20.1564	19.6326	19.1944	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	513.3568	613.5502	684.0902	692.3459	597.7944	416.4551	277.0410	290.2891	442.5303	547.5139	510.7468	482.0669	(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	1125.7502	1096.1030	997.7640	829.8932	635.6879	421.2967	277.5613	291.1863	458.5342	700.3206	924.6610	1114.1085	(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	455.6207	324.2755	233.3734	99.0340	28.1928	0.0000	0.0000	0.0000	0.0000	113.6882	298.0182	470.2390	(98)
Space heating													2022.4417 (99)
Space heating per m2													(98) / (4) = 28.7360 (99)

8c. Space cooling requirement

Not applicable

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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													2163.0393 (211)
Space heating requirement	455.6207	324.2755	233.3734	99.0340	28.1928	0.0000	0.0000	0.0000	0.0000	113.6882	298.0182	470.2390	(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)	487.2949	346.8187	249.5972	105.9187	30.1527	0.0000	0.0000	0.0000	0.0000	121.5916	318.7361	502.9294	(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	170.7839	150.1591	156.8274	139.3749	135.7062	119.9990	114.0481	126.7978	127.0915	144.5831	154.4036	166.2665	(64)
Efficiency of water heater (217)m	87.3083	86.8157	85.8723	83.9216	81.4566	79.8000	79.8000	79.8000	79.8000	84.1812	86.5399	87.4375	(217)
Fuel for water heating, kWh/month	195.6102	172.9630	182.6286	166.0774	166.5994	150.3747	142.9174	158.8945	159.2625	171.7523	178.4191	190.1547	(219)
Water heating fuel used													2035.6540 (219)
Annual totals kWh/year													
Space heating fuel - main system													2163.0393 (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)													312.0917 (232)
Total delivered energy for all uses													4585.7849 (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	2163.0393	0.2160	467.2165 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2035.6540	0.2160	439.7013 (264)
Space and water heating			906.9177 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	312.0917	0.5190	161.9756 (268)
Total CO2, kg/m2/year			1107.8183 (272)
Emissions per m2 for space and water heating			12.8860 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.3014 (272b)
Emissions per m2 for pumps and fans			0.5531 (272c)
Target Carbon Dioxide Emission Rate (TER) = (12.8860 * 1.55) + 2.3014 + 0.5531, rounded to 2 d.p.			22.8300 (273)

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CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
 CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	70.3800 (1b)	2.8700 (2b)	201.9906 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.3800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	201.9906 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ 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				3 * 10 =	30.0000 (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) =				30.0000 / (5) =	0.1485 (8)
Pressure test				Yes	
Measured/design AP50				3.0000	
Infiltration rate				0.2985	(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) =		0.2761 (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	0.3521	0.3452	0.3383	0.3037	0.2968	0.2623	0.2623	0.2554	0.2761	0.2968	0.3106	0.3245 (22b)
Effective ac	0.5620	0.5596	0.5572	0.5461	0.5441	0.5344	0.5344	0.5326	0.5381	0.5441	0.5483	0.5526 (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 = 1.30)			17.2800	1.2357	21.3536		(27)					
Main Entrance			2.0500	1.0000	2.0500		(26)					
External Wall 1	47.2100	17.2800	29.9300	0.1500	4.4895		(29a)					
Corridor Wall	9.5000	2.0500	7.4500	0.1415	1.0542		(29a)					
Total net area of external elements Aum(A, m ²)			56.7100				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	28.9474		(33)					
Party Wall 1			41.7300	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)							10.4132 (36)					
Total fabric heat loss							(33) + (36) = 39.3606 (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	37.4596	37.2992	37.1419	36.4034	36.2652	35.6219	35.6219	35.5028	35.8697	36.2652	36.5447	36.8370 (38)
Average = Sum(39)m / 12 =	76.8202	76.6597	76.5025	75.7639	75.6258	74.9825	74.9825	74.8634	75.2303	75.6258	75.9053	76.1975 (39)
HLP	1.0915	1.0892	1.0870	1.0765	1.0745	1.0654	1.0654	1.0637	1.0689	1.0745	1.0785	1.0827 (40)
HLP (average)												1.0765 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.2553 (42)
Average daily hot water use (litres/day)												87.7637 (43)
Daily hot water use	96.5401	93.0296	89.5190	86.0085	82.4979	78.9874	78.9874	82.4979	86.0085	89.5190	93.0296	96.5401 (44)
Energy conte	143.1662	125.2141	129.2097	112.6481	108.0886	93.2722	86.4304	99.1802	100.3647	116.9654	127.6769	138.6488 (45)
Energy content (annual)												Total = Sum(45)m = 1380.8652 (45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)

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CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Heat gains from water heating, kWh/month	30.4228	26.6080	27.4571	23.9377	22.9688	19.8203	18.3665	21.0758	21.3275	24.8551	27.1313	29.4629	(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	112.7657	112.7657	112.7657	112.7657	112.7657	112.7657	112.7657	112.7657	112.7657	112.7657	112.7657	112.7657	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.6681	15.6926	12.7621	9.6617	7.2223	6.0973	6.5884	8.5638	11.4944	14.5947	17.0342	18.1592	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	198.1823	200.2388	195.0565	184.0239	170.0972	157.0081	148.2638	146.2073	151.3896	162.4222	176.3489	189.4380	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.2766	34.2766	34.2766	34.2766	34.2766	34.2766	34.2766	34.2766	34.2766	34.2766	34.2766	34.2766	(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)	-90.2126	-90.2126	-90.2126	-90.2126	-90.2126	-90.2126	-90.2126	-90.2126	-90.2126	-90.2126	-90.2126	-90.2126	(71)
Water heating gains (Table 5)	40.8909	39.5952	36.9047	33.2468	30.8721	27.5283	24.6861	28.3277	29.6215	33.4075	37.6824	39.6006	(72)
Total internal gains	313.5710	312.3564	301.5530	283.7622	265.0213	247.4634	236.3680	239.9285	249.3352	267.2541	287.8952	304.0275	(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	9.8800		19.6403		0.5000		0.7500		0.7700		50.4277	(76)	
South	7.4000		46.7521		0.5000		0.7500		0.7700		89.9077	(78)	
Solar gains	140.3354	245.8929	350.0228	448.9242	511.2786	509.8400	490.7075	444.8064	384.8789	275.8715	169.4487	119.1578	(83)
Total gains	453.9064	558.2493	651.5758	732.6864	776.2999	757.3034	727.0755	684.7349	634.2141	543.1256	457.3439	423.1853	(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	63.6226	63.7558	63.8868	64.5096	64.6274	65.1819	65.1819	65.2856	64.9672	64.6274	64.3894	64.1425	21.0000 (85)
alpha	5.2415	5.2504	5.2591	5.3006	5.3085	5.3455	5.3455	5.3524	5.3311	5.3085	5.2926	5.2762	
util living area	0.9972	0.9914	0.9739	0.9191	0.7972	0.6122	0.4501	0.4965	0.7474	0.9520	0.9932	0.9981	(86)
MIT	19.8802	20.0814	20.3592	20.6709	20.8857	20.9780	20.9964	20.9941	20.9390	20.6354	20.1876	19.8412	(87)
Th 2	20.0078	20.0096	20.0115	20.0201	20.0217	20.0292	20.0292	20.0306	20.0263	20.0217	20.0184	20.0150	(88)
util rest of house	0.9963	0.9887	0.9654	0.8938	0.7421	0.5284	0.3528	0.3952	0.6672	0.9313	0.9905	0.9974	(89)
MIT 2	18.9902	19.1914	19.4653	19.7663	19.9496	20.0198	20.0283	20.0290	19.9956	19.7420	19.3051	18.9572	(90)
Living area fraction	fLA = Living area / (4) =												
MIT	19.3568	19.5580	19.8335	20.1389	20.3352	20.4145	20.4271	20.4265	20.3842	20.1100	19.6686	19.3213	(92)
Temperature adjustment	0.0000												
adjusted MIT	19.3568	19.5580	19.8335	20.1389	20.3352	20.4145	20.4271	20.4265	20.3842	20.1100	19.6686	19.3213	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9955	0.9871	0.9636	0.8972	0.7609	0.5625	0.3930	0.4372	0.6985	0.9336	0.9893	0.9968	(94)
Useful gains	451.8528	551.0227	627.8549	657.3754	590.6789	426.0162	285.7541	299.3377	442.9952	507.0395	452.4348	421.8257	(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	1156.6634	1123.6800	1020.0460	851.5015	653.0436	435.9832	286.9640	301.4386	472.7605	719.2037	954.0261	1152.2085	(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	524.3791	384.8258	291.7901	139.7708	46.3993	0.0000	0.0000	0.0000	0.0000	157.8502	361.1457	543.4048	(98)
Space heating	2449.5658 (98)												
Space heating per m2	34.8049 (99)												
(98) / (4) =													

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	704.8355	554.8705	568.9617	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9426	0.9737	0.9641	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	664.4101	540.2817	548.5225	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	968.9225	931.8941	883.7542	0.0000	0.0000	0.0000	0.0000	(103)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	(103a)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	219.2489	291.3596	249.4124	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling	760.0209 (104)												
Cooled fraction	fC = cooled area / (4) =												
Intermittency factor (Table 10b)	1.0000 (105)												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	54.8122	72.8399	62.3531	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling per m2												190.0052 (107)
Energy for space heating												2.6997 (108)
Energy for space cooling												34.8049 (99)
Total												2.6997 (108)
Dwelling Fabric Energy Efficiency (DFEE)												37.5046 (109)
												37.5 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	70.3800 (1b)	2.8700 (2b)	201.9906 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.3800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	201.9906 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ 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				3 * 10 =	30.0000 (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) =					30.0000 / (5) =	0.1485 (8)
Pressure test					Yes	
Measured/design AP50					5.0000	
Infiltration rate					0.3985	(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) =	0.3686 (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	0.4700	0.4608	0.4516	0.4055	0.3963	0.3502	0.3502	0.3410	0.3686	0.3963	0.4147	0.4331 (22b)
Effective ac	0.6105	0.6062	0.6020	0.5822	0.5785	0.5613	0.5613	0.5581	0.5679	0.5785	0.5860	0.5938 (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			2.0500	1.0000	2.0500		(26)		
TER Opening Type (Uw = 1.40)			15.5500	1.3258	20.6155		(27)		
External Wall 1	47.2100	15.5500	31.6600	0.1800	5.6988		(29a)		
Corridor Wall	9.5000	2.0500	7.4500	0.1800	1.3410		(29a)		
Total net area of external elements Aum(A, m ²)			56.7100				(31)		
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	29.7053	(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)								5.0149 (36)	
Total fabric heat loss								(33) + (36) =	34.7202 (37)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	40.6909	40.4050	40.1248	38.8085	38.5623	37.4159	37.4159	37.2036	37.8575	38.5623	39.0605	39.5813 (38)
Heat transfer coeff	75.4111	75.1252	74.8450	73.5288	73.2825	72.1361	72.1361	71.9238	72.5777	73.2825	73.7807	74.3015 (39)
Average = Sum(39)m / 12 =	73.5276 (39)											
HLP	1.0715	1.0674	1.0634	1.0447	1.0412	1.0250	1.0250	1.0219	1.0312	1.0412	1.0483	1.0557 (40)
HLP (average)	1.0447 (40)											
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy	2.2553 (42)											
Average daily hot water use (litres/day)	87.7637 (43)											
Daily hot water use	96.5401	93.0296	89.5190	86.0085	82.4979	78.9874	78.9874	82.4979	86.0085	89.5190	93.0296	96.5401 (44)
Energy conte	143.1662	125.2141	129.2097	112.6481	108.0886	93.2722	86.4304	99.1802	100.3647	116.9654	127.6769	138.6488 (45)
Energy content (annual)	Total = Sum(45)m = 1380.8652 (45)											
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Heat gains from water heating, kWh/month
30.4228 26.6080 27.4571 23.9377 22.9688 19.8203 18.3665 21.0758 21.3275 24.8551 27.1313 29.4629 (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	112.7657	112.7657	112.7657	112.7657	112.7657	112.7657	112.7657	112.7657	112.7657	112.7657	112.7657	112.7657 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.6719	15.6960	12.7649	9.6638	7.2238	6.0987	6.5898	8.5657	11.4969	14.5979	17.0379	18.1631 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	198.1823	200.2388	195.0565	184.0239	170.0972	157.0081	148.2638	146.2073	151.3896	162.4222	176.3489	189.4380 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.2766	34.2766	34.2766	34.2766	34.2766	34.2766	34.2766	34.2766	34.2766	34.2766	34.2766	34.2766 (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)	-90.2126	-90.2126	-90.2126	-90.2126	-90.2126	-90.2126	-90.2126	-90.2126	-90.2126	-90.2126	-90.2126	-90.2126 (71)
Water heating gains (Table 5)	40.8909	39.5952	36.9047	33.2468	30.8721	27.5283	24.6861	28.3277	29.6215	33.4075	37.6824	39.6006 (72)
Total internal gains	313.5749	312.3598	301.5558	283.7643	265.0229	247.4648	236.3694	239.9304	249.3377	267.2573	287.8989	304.0314 (73)

6. Solar gains

[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	8.8900	19.6403	0.6300	0.7000	0.7700	53.3606 (76)						
South	6.6600	46.7521	0.6300	0.7000	0.7700	95.1583 (78)						
Solar gains	148.5190	260.2295	370.4254	475.0849	541.0681	539.5439	519.2975	470.7253	407.3108	291.9545	179.3295	126.1067 (83)
Total gains	462.0938	572.5894	671.9812	758.8492	806.0910	787.0086	755.6669	710.6556	656.6486	559.2118	467.2284	430.1382 (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	64.8114	65.0580	65.3016	66.4706	66.6940	67.7539	67.7539	67.9539	67.3416	66.6940	66.2436	65.7793
alpha	5.3208	5.3372	5.3534	5.4314	5.4463	5.5169	5.5169	5.5303	5.4894	5.4463	5.4162	5.3853
util living area	0.9969	0.9902	0.9693	0.9032	0.7663	0.5734	0.4180	0.4619	0.7132	0.9429	0.9922	0.9979 (86)
MIT	19.9188	20.1295	20.4117	20.7221	20.9131	20.9858	20.9979	20.9965	20.9557	20.6803	20.2360	19.8880 (87)
Th 2	20.0242	20.0275	20.0308	20.0462	20.0491	20.0626	20.0626	20.0651	20.0574	20.0491	20.0433	20.0372 (88)
util rest of house	0.9959	0.9870	0.9596	0.8751	0.7100	0.4951	0.3300	0.3700	0.6342	0.9197	0.9893	0.9972 (89)
MIT 2	19.0419	19.2536	19.5320	19.8347	19.9953	20.0566	20.0621	20.0642	20.0356	19.8065	19.3733	19.0219 (90)
Living area fraction	fLA = Living area / (4) =											0.4119 (91)
MIT	19.4031	19.6144	19.8944	20.2002	20.3733	20.4394	20.4476	20.4482	20.4146	20.1664	19.7287	19.3786 (92)
Temperature adjustment												0.0000
adjusted MIT	19.4031	19.6144	19.8944	20.2002	20.3733	20.4394	20.4476	20.4482	20.4146	20.1664	19.7287	19.3786 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9951	0.9854	0.9580	0.8801	0.7302	0.5272	0.3664	0.4080	0.6655	0.9230	0.9880	0.9965 (94)
Useful gains	459.8258	564.2155	643.7292	667.8793	588.5903	414.8961	276.8469	289.9202	437.0114	516.1510	461.6203	428.6538 (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	1138.9426	1105.4195	1002.5013	830.8888	635.6037	421.2287	277.5473	291.1600	458.3012	701.0533	931.7510	1127.7942 (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	505.2629	363.6891	266.9265	117.3668	34.9779	0.0000	0.0000	0.0000	0.0000	137.5673	338.4941	520.1604 (98)
Space heating												2284.4451 (98)
Space heating per m ²												(98) / (4) = 32.4587 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	678.0794	533.8072	546.6209	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9596	0.9826	0.9757	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	650.6689	524.5277	533.3635	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1003.6446	965.3145	914.0536	0.0000	0.0000	0.0000	0.0000 (103)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000 (103a)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	254.1425	327.9454	283.2334	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												865.3213 (104)
Cooled fraction												fC = cooled area / (4) = 1.0000 (105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	63.5356	81.9863	70.8084	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling													216.3303 (107)
Space cooling per m2													3.0737 (108)
Energy for space heating													32.4587 (99)
Energy for space cooling													3.0737 (108)
Total													35.5325 (109)
Target Fabric Energy Efficiency (TFEE)													40.9 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



Property Reference	006425		Issued on Date	17/07/2023
Assessment Reference	C.07.03	Prop Type Ref	2B4P	
Property				

SAP Rating	79 C	DER	18.42	TER	35.74
Environmental	86 B	% DER<TER	48.47		
CO ₂ Emissions (t/year)	1.10	DFEE	72.37	TFEE	84.25
General Requirements Compliance	Pass	% DFEE<TFEE	14.10		

Assessor Details	Mr. Michael Wride, Michael Wride, Tel: 02036 031 600, Michael@hodkinsonconsultancy.com	Assessor ID	R572-0001
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Client	
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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 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) 35.74 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 18.42 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)84.2 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)72.4 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.15 (max. 0.30)	0.15 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.12 (max. 0.20)	0.12 (max. 0.35)	OK
Openings	1.27 (max. 2.00)	1.30 (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: 0.20 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: 0.59
Maximum 1.5 OK
MVHR efficiency: 89%
Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): Not significant OK
Based on:
Overshading: Average
Windows facing North East: 9.88 m², No overhang
Windows facing North West: 7.40 m², No overhang
Air change rate: 4.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Roof U-value 0.12 W/m²K
Door U-value 1.00 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	71.7000 (1b)	4.2000 (2b)	301.1400 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.7000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	301.1400 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ 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					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)

	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	0.1769	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) =												
Effective ac	0.3654	0.3619	0.3585	0.3411	0.3377	0.3203	0.3203	0.3168	0.3273	0.3377	0.3446	0.3515 (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 = 1.30)			17.2800	1.2357	21.3536		(27)	
Main Entrance			2.0500	1.0000	2.0500		(26)	
External Wall 1	70.5600	17.2800	53.2800	0.1500	7.9920		(29a)	
Corridor Wall	6.8900	2.0500	4.8400	0.1409	0.6820		(29a)	
External Roof 1	71.7000		71.7000	0.1200	8.6040		(30)	
Total net area of external elements Aum(A, m ²)				149.1500			(31)	
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	40.6816		(33)	
Party Wall 1			67.2000	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)								19.7581 (36)
Total fabric heat loss								(33) + (36) = 60.4397 (37)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	36.3127	35.9680	35.6233	33.8997	33.5550	31.8314	31.8314	31.4867	32.5209	33.5550	34.2444	34.9338 (38)
Heat transfer coeff	96.7524	96.4077	96.0630	94.3394	93.9947	92.2712	92.2712	91.9265	92.9606	93.9947	94.6841	95.3736 (39)
Average = Sum(39)m / 12 =												
HLP	1.3494	1.3446	1.3398	1.3158	1.3109	1.2869	1.2869	1.2821	1.2965	1.3109	1.3206	1.3302 (40)
HLP (average)												
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												
Average daily hot water use (litres/day)												
Daily hot water use	97.3595	93.8191	90.2788	86.7385	83.1981	79.6578	79.6578	83.1981	86.7385	90.2788	93.8191	97.3595 (44)
Energy conte	144.3813	126.2768	130.3064	113.6042	109.0060	94.0639	87.1640	100.0220	101.2166	117.9581	128.7605	139.8256 (45)
Energy content (annual)												Total = Sum(45)m = 1392.5854 (45)
Distribution loss (46)m = 0.15 x (45)m	21.6572	18.9415	19.5460	17.0406	16.3509	14.1096	13.0746	15.0033	15.1825	17.6937	19.3141	20.9738 (46)

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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)	0.0191 (51)											
Volume factor from Table 2a	3.4200 (52)											
Temperature factor from Table 2b	1.0000 (53)											
Enter (49) or (54) in (55)	0.1960 (55)											
Total storage loss	6.0757	5.4877	6.0757	5.8797	6.0757	5.8797	6.0757	6.0757	5.8797	6.0757	5.8797	6.0757 (56)
If cylinder contains dedicated solar storage	6.0757	5.4877	6.0757	5.8797	6.0757	5.8797	6.0757	6.0757	5.8797	6.0757	5.8797	6.0757 (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	173.7194	152.7757	159.6444	141.9959	138.3441	122.4556	116.5021	129.3600	129.6082	147.2962	157.1522	169.1637 (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	173.7194	152.7757	159.6444	141.9959	138.3441	122.4556	116.5021	129.3600	129.6082	147.2962	157.1522	169.1637 (64)
Heat gains from water heating, kWh/month	71.4772	63.1862	66.7973	60.4868	59.7149	53.9896	52.4525	56.7278	56.3679	62.6915	65.5262	69.9625 (65)
Solar input (sum of months) = Sum(63)m = 0.0000 (63)												
Total per year (kWh/year) = Sum(64)m = 1738.0176 (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	114.3340	114.3340	114.3340	114.3340	114.3340	114.3340	114.3340	114.3340	114.3340	114.3340	114.3340	114.3340 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.9400	15.9341	12.9585	9.8104	7.3334	6.1912	6.6898	8.6956	11.6712	14.8193	17.2963	18.4386 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	201.2318	203.3199	198.0578	186.8555	172.7145	159.4240	150.5451	148.4570	153.7191	164.9214	179.0624	192.3529 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4334	34.4334	34.4334	34.4334	34.4334	34.4334	34.4334	34.4334	34.4334	34.4334	34.4334	34.4334 (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)	-91.4672	-91.4672	-91.4672	-91.4672	-91.4672	-91.4672	-91.4672	-91.4672	-91.4672	-91.4672	-91.4672	-91.4672 (71)
Water heating gains (Table 5)	96.0716	94.0270	89.7814	84.0094	80.2620	74.9855	70.5007	76.2470	78.2887	84.2628	91.0086	94.0356 (72)
Total internal gains	372.5435	370.5813	358.0979	337.9755	317.6101	297.9009	285.0357	290.6998	300.9792	321.3037	344.6675	362.1272 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	g Specific data or Table 6c	FF Specific data or Table 6c	Access factor Table 6d	Gains W					
Northeast	9.8800	11.2829	0.5000	0.7500	0.7700	28.9697 (75)						
Northwest	7.4000	11.2829	0.5000	0.7500	0.7700	21.6979 (81)						
Solar gains	50.6676	103.1354	185.8172	305.1653	410.2020	437.3187	409.1027	326.1414	226.4212	126.0397	63.7530	41.3777 (83)
Total gains	423.2111	473.7167	543.9151	643.1407	727.8121	735.2196	694.1385	616.8412	527.4004	447.3434	408.4205	403.5050 (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	51.4630	51.6470	51.8323	52.7793	52.9728	53.9623	53.9623	54.1647	53.5621	52.9728	52.5871	52.2070
alpha	4.4309	4.4431	4.4555	4.5186	4.5315	4.5975	4.5975	4.6110	4.5708	4.5315	4.5058	4.4805
util living area	0.9980	0.9964	0.9907	0.9659	0.8854	0.7215	0.5632	0.6426	0.8906	0.9841	0.9965	0.9984 (86)
MIT	19.4916	19.6336	19.9187	20.3385	20.7077	20.9233	20.9807	20.9661	20.7809	20.3162	19.8450	19.4789 (87)
Th 2	19.8023	19.8061	19.8098	19.8285	19.8323	19.8511	19.8511	19.8549	19.8436	19.8323	19.8248	19.8173 (88)
util rest of house	0.9974	0.9951	0.9871	0.9518	0.8387	0.6224	0.4269	0.5029	0.8255	0.9753	0.9949	0.9979 (89)
MIT 2	17.8071	18.0169	18.4345	19.0486	19.5453	19.8008	19.8443	19.8410	19.6594	19.0281	18.3391	17.7985 (90)
Living area fraction	fLA = Living area / (4) = 0.3654 (91)											
MIT	18.4226	18.6077	18.9768	19.5199	19.9700	20.2109	20.2596	20.2521	20.0692	19.4988	18.8894	18.4125 (92)
Temperature adjustment	0.0000											
adjusted MIT	18.4226	18.6077	18.9768	19.5199	19.9700	20.2109	20.2596	20.2521	20.0692	19.4988	18.8894	18.4125 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9962	0.9933	0.9836	0.9471	0.8451	0.6559	0.4772	0.5543	0.8407	0.9718	0.9931	0.9969 (94)
Ext temp.	421.5859	470.5200	535.0038	609.1199	615.0733	482.1998	331.2456	341.9007	443.3829	434.7404	405.6184	402.2601 (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	1366.3999	1321.5265	1198.5619	1001.8758	777.3402	517.7277	337.6732	354.1137	554.9005	836.4376	1116.2661	1355.5004 (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	702.9417	571.8764	493.6872	282.7843	120.7266	0.0000	0.0000	0.0000	0.0000	298.8627	511.6664	709.2107 (98)
Space heating per m2	(98) / (4) = 51.4889 (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	1.0000 (303b)
Fraction of total space heat from community Heat pump	1.0000 (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	3691.7560 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.05	3876.3438 (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	1738.0176 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.05	1824.9184 (310b)
Electricity used for heat distribution	57.0126 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7375)	
mechanical ventilation fans (SFP = 0.7375)	270.9507 (330a)
Total electricity for the above, kWh/year	270.9507 (331)
Electricity for lighting (calculated in Appendix L)	316.8253 (332)
Total delivered energy for all uses	6289.0382 (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			300.0000 (367b)
Space heating from Heat pump	1900.4207	0.5190	986.3184 (368)
Electrical energy for heat distribution	57.0126	0.5190	29.5896 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			1015.9079 (373)
Space and water heating			1015.9079 (376)
Pumps and fans	270.9507	0.5190	140.6234 (378)
Energy for lighting	316.8253	0.5190	164.4323 (379)
Total CO2, kg/year			1320.9637 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			18.4200 (384)

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

DER			18.4200 ZC1
Total Floor Area		TFA	71.7000
Assumed number of occupants		N	2.2867
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190
CO2 emissions from appliances, equation (L14)			16.6312 ZC2
CO2 emissions from cooking, equation (L16)			2.4251 ZC3
Total CO2 emissions			37.4763 ZC4
Residual CO2 emissions offset from biofuel CHP			0.0000 ZC5
Additional allowable electricity generation, kWh/m ² /year			0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation			0.0000 ZC7
Net CO2 emissions			37.4763 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	71.7000 (1b)	4.2000 (2b)	301.1400 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.7000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	301.1400 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ 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				3 * 10 =	30.0000 (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) =				30.0000 / (5) =	0.0996 (8)
Pressure test				Yes	
Measured/design AP50				5.0000	
Infiltration rate				0.3496	(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) =		0.3234 (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	0.4123	0.4042	0.3962	0.3557	0.3477	0.3072	0.3072	0.2991	0.3234	0.3477	0.3638	0.3800 (22b)
Effective ac	0.5850	0.5817	0.5785	0.5633	0.5604	0.5472	0.5472	0.5447	0.5523	0.5604	0.5662	0.5722 (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			2.0500	1.0000	2.0500		(26)
TER Opening Type (Uw = 1.40)			15.8800	1.3258	21.0530		(27)
External Wall 1	70.5600	15.8800	54.6800	0.1800	9.8424		(29a)
Corridor Wall	6.8900	2.0500	4.8400	0.1800	0.8712		(29a)
External Roof 1	71.7000		71.7000	0.1300	9.3210		(30)
Total net area of external elements Aum(A, m ²)			149.1500				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	43.1376	(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)							15.7260 (36)
Total fabric heat loss						(33) + (36) =	58.8636 (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	58.1361	57.8080	57.4865	55.9762	55.6936	54.3782	54.3782	54.1346	54.8849	55.6936	56.2652	56.8629 (38)
Heat transfer coeff	116.9997	116.6717	116.3501	114.8398	114.5572	113.2418	113.2418	112.9982	113.7485	114.5572	115.1289	115.7265 (39)
Average = Sum(39)m / 12 =												114.8384 (39)
HLP	1.6318	1.6272	1.6227	1.6017	1.5977	1.5794	1.5794	1.5760	1.5865	1.5977	1.6057	1.6140 (40)
HLP (average)												1.6017 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.2867 (42)
Average daily hot water use (litres/day)												88.5086 (43)
Daily hot water use	97.3595	93.8191	90.2788	86.7385	83.1981	79.6578	79.6578	83.1981	86.7385	90.2788	93.8191	97.3595 (44)
Energy conte	144.3813	126.2768	130.3064	113.6042	109.0060	94.0639	87.1640	100.0220	101.2166	117.9581	128.7605	139.8256 (45)
Energy content (annual)												Total = Sum(45)m = 1392.5854 (45)
Distribution loss (46)m = 0.15 x (45)m	21.6572	18.9415	19.5460	17.0406	16.3509	14.1096	13.0746	15.0033	15.1825	17.6937	19.3141	20.9738 (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	171.9990	151.2218	157.9240	140.3310	136.6237	120.7907	114.7817	127.6396	127.9433	145.5758	155.4873	167.4433 (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	171.9990	151.2218	157.9240	140.3310	136.6237	120.7907	114.7817	127.6396	127.9433	145.5758	155.4873	167.4433 (64)
Heat gains from water heating, kWh/month	70.1009	61.9430	65.4210	59.1548	58.3386	52.6577	51.0762	55.3514	55.0359	61.3152	64.1943	68.5861 (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	114.3340	114.3340	114.3340	114.3340	114.3340	114.3340	114.3340	114.3340	114.3340	114.3340	114.3340	114.3340 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.9427	15.9365	12.9605	9.8119	7.3345	6.1921	6.6908	8.6969	11.6730	14.8216	17.2989	18.4414 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	201.2318	203.3199	198.0578	186.8555	172.7145	159.4240	150.5451	148.4570	153.7191	164.9214	179.0624	192.3529 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4334	34.4334	34.4334	34.4334	34.4334	34.4334	34.4334	34.4334	34.4334	34.4334	34.4334	34.4334 (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)	-91.4672	-91.4672	-91.4672	-91.4672	-91.4672	-91.4672	-91.4672	-91.4672	-91.4672	-91.4672	-91.4672	-91.4672 (71)
Water heating gains (Table 5)	94.2217	92.1771	87.9315	82.1595	78.4121	73.1356	68.6508	74.3971	76.4388	82.4129	89.1587	92.1857 (72)
Total internal gains	373.6963	371.7338	359.2499	339.1271	318.7613	299.0519	286.1869	291.8512	302.1310	322.4561	345.8203	363.2801 (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							
Northeast	9.0800	11.2829	0.6300	0.7000	0.7700	31.3098 (75)						
Northwest	6.8000	11.2829	0.6300	0.7000	0.7700	23.4479 (81)						
Solar gains	54.7576	111.4607	200.8168	329.7989	443.3144	472.6201	442.1264	352.4683	244.6984	136.2139	68.8993	44.7178 (83)
Total gains	428.4539	483.1945	560.0667	668.9259	762.0758	771.6720	728.3133	644.3195	546.8295	458.6699	414.7195	407.9980 (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	42.5571	42.6767	42.7947	43.3575	43.4644	43.9693	43.9693	44.0641	43.7735	43.4644	43.2486	43.0253	
alpha	3.8371	3.8451	3.8530	3.8905	3.8976	3.9313	3.9313	3.9376	3.9182	3.8976	3.8832	3.8684	
util living area	0.9977	0.9960	0.9904	0.9690	0.9043	0.7715	0.6267	0.7043	0.9114	0.9850	0.9961	0.9981 (86)	
MIT	19.1619	19.3163	19.6343	20.1027	20.5444	20.8428	20.9492	20.9198	20.6524	20.1043	19.5641	19.1437 (87)	
Th 2	19.5901	19.5934	19.5967	19.6121	19.6150	19.6285	19.6285	19.6310	19.6233	19.6150	19.6092	19.6031 (88)	
util rest of house	0.9968	0.9945	0.9865	0.9551	0.8586	0.6625	0.4577	0.5387	0.8479	0.9760	0.9943	0.9974 (89)	
MIT 2	17.1882	17.4158	17.8811	18.5640	19.1673	19.5250	19.6114	19.5990	19.3308	18.5772	17.7885	17.1697 (90)	
Living area fraction	fLA = Living area / (4) = 0.3654 (91)												
MIT	17.9094	18.1102	18.5217	19.1262	19.6705	20.0065	20.1002	20.0816	19.8137	19.1352	18.4373	17.8910 (92)	
Temperature adjustment	0.0000												
adjusted MIT	17.9094	18.1102	18.5217	19.1262	19.6705	20.0065	20.1002	20.0816	19.8137	19.1352	18.4373	17.8910 (93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9952	0.9920	0.9822	0.9485	0.8608	0.6964	0.5204	0.5995	0.8591	0.9715	0.9920	0.9961 (94)
Useful gains	426.4174	479.3456	550.0736	634.4978	656.0259	537.4171	378.9802	386.2568	469.8022	445.6079	411.4105	406.4033 (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	1592.3005	1541.2592	1398.7294	1174.3779	913.0771	612.2423	396.3707	416.0162	649.9264	977.7716	1305.2533	1584.4136 (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	867.4171	713.6060	631.3999	388.7136	191.2461	0.0000	0.0000	0.0000	0.0000	395.9299	643.5668	876.4397 (98)
Space heating	4708.3190 (98)											
Space heating per m2	(98) / (4) = 65.6669 (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													5035.6353	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	867.4171	713.6060	631.3999	388.7136	191.2461	0.0000	0.0000	0.0000	0.0000	395.9299	643.5668	876.4397	5035.6353	(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	93.5000	(210)
Space heating fuel (main heating system)	927.7188	763.2150	675.2940	415.7365	204.5413	0.0000	0.0000	0.0000	0.0000	423.4544	688.3067	937.3686	5035.6353	(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	0.0000	(215)
Water heating requirement	171.9990	151.2218	157.9240	140.3310	136.6237	120.7907	114.7817	127.6396	127.9433	145.5758	155.4873	167.4433	167.4433	(64)
Efficiency of water heater (217)m	88.5356	88.4268	88.1356	87.3918	85.7110	79.8000	79.8000	79.8000	79.8000	87.3513	88.1988	79.8000	79.8000	(216)
Fuel for water heating, kWh/month	194.2710	171.0136	179.1831	160.5769	159.4003	151.3667	143.8367	159.9494	160.3300	166.6556	176.2919	188.9996	2011.8750	(219)
Water heating fuel used													2011.8750	(219)
Annual totals kWh/year													5035.6353	(211)
Space heating fuel - main system													0.0000	(215)
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)													316.8732	(232)
Total delivered energy for all uses													7439.3836	(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	5035.6353	0.2160	1087.6972 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2011.8750	0.2160	434.5650 (264)
Space and water heating			1522.2622 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	316.8732	0.5190	164.4572 (268)
Total CO2, kg/m2/year			1725.6444 (272)
Emissions per m2 for space and water heating			21.2310 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.2937 (272b)
Emissions per m2 for pumps and fans			0.5429 (272c)
Target Carbon Dioxide Emission Rate (TER) = (21.2310 * 1.55) + 2.2937 + 0.5429, rounded to 2 d.p.			35.7400 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
 CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	71.7000 (1b)	4.2000 (2b)	301.1400 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.7000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	301.1400 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ 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				3 * 10 =	30.0000 (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) =				30.0000 / (5) =	0.0996 (8)
Pressure test				Yes	
Measured/design AP50				3.0000	
Infiltration rate				0.2496	0.2496 (18)
Number of sides sheltered				1	1 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.2309 (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	0.2944	0.2886	0.2829	0.2540	0.2482	0.2194	0.2194	0.2136	0.2309	0.2482	0.2598	0.2713 (22b)
Effective ac	0.5433	0.5417	0.5400	0.5323	0.5308	0.5241	0.5241	0.5228	0.5267	0.5308	0.5337	0.5368 (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 = 1.30)			17.2800	1.2357	21.3536		(27)					
Main Entrance			2.0500	1.0000	2.0500		(26)					
External Wall 1	70.5600	17.2800	53.2800	0.1500	7.9920		(29a)					
Corridor Wall	6.8900	2.0500	4.8400	0.1409	0.6820		(29a)					
External Roof 1	71.7000		71.7000	0.1200	8.6040		(30)					
Total net area of external elements Aum(A, m ²)			149.1500				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	40.6816		(33)					
Party Wall 1			67.2000	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)							19.7581 (36)					
Total fabric heat loss						(33) + (36) =	60.4397 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	53.9946	53.8273	53.6634	52.8935	52.7495	52.0789	52.0789	51.9547	52.3372	52.7495	53.0409	53.3455 (38)
Heat transfer coeff	114.4343	114.2671	114.1031	113.3332	113.1892	112.5186	112.5186	112.3945	112.7769	113.1892	113.4806	113.7852 (39)
Average = Sum(39)m / 12 =												113.3326 (39)
HLP	1.5960	1.5937	1.5914	1.5807	1.5786	1.5693	1.5693	1.5676	1.5729	1.5786	1.5827	1.5870 (40)
HLP (average)												1.5806 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.2867 (42)
Average daily hot water use (litres/day)												88.5086 (43)
Daily hot water use	97.3595	93.8191	90.2788	86.7385	83.1981	79.6578	79.6578	83.1981	86.7385	90.2788	93.8191	97.3595 (44)
Energy conte	144.3813	126.2768	130.3064	113.6042	109.0060	94.0639	87.1640	100.0220	101.2166	117.9581	128.7605	139.8256 (45)
Energy content (annual)										Total = Sum(45)m =		1392.5854 (45)
Distribution loss (46)m = 0.15 x (45)m												
Water storage loss:	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Heat gains from water heating, kWh/month	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
	30.6810	26.8338	27.6901	24.1409	23.1638	19.9886	18.5224	21.2547	21.5085	25.0661	27.3616	29.7129	(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	114.3340	114.3340	114.3340	114.3340	114.3340	114.3340	114.3340	114.3340	114.3340	114.3340	114.3340	114.3340	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.9400	15.9341	12.9585	9.8104	7.3334	6.1912	6.6898	8.6956	11.6712	14.8193	17.2963	18.4386	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	201.2318	203.3199	198.0578	186.8555	172.7145	159.4240	150.5451	148.4570	153.7191	164.9214	179.0624	192.3529	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4334	34.4334	34.4334	34.4334	34.4334	34.4334	34.4334	34.4334	34.4334	34.4334	34.4334	34.4334	(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)	-91.4672	-91.4672	-91.4672	-91.4672	-91.4672	-91.4672	-91.4672	-91.4672	-91.4672	-91.4672	-91.4672	-91.4672	(71)
Water heating gains (Table 5)	41.2379	39.9313	37.2179	33.5290	31.1341	27.7619	24.8956	28.5681	29.8729	33.6910	38.0022	39.9367	(72)
Total internal gains	317.7099	316.4855	305.5344	287.4951	268.4822	250.6773	239.4307	243.0209	252.5634	270.7319	291.6611	308.0284	(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			
Northeast	9.8800		11.2829		0.5000		0.7500		0.7700		28.9697 (75)	
Northwest	7.4000		11.2829		0.5000		0.7500		0.7700		21.6979 (81)	
Solar gains	50.6676	103.1354	185.8172	305.1653	410.2020	437.3187	409.1027	326.1414	226.4212	126.0397	63.7530	41.3777 (83)
Total gains	368.3775	419.6209	491.3516	592.6604	678.6842	687.9960	648.5334	569.1623	478.9846	396.7716	355.4141	349.4061 (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	43.5111	43.5748	43.6374	43.9339	43.9898	44.2519	44.2519	44.3008	44.1506	43.9898	43.8768	43.7593	
alpha	3.9007	3.9050	3.9092	3.9289	3.9327	3.9501	3.9501	3.9534	3.9434	3.9327	3.9251	3.9173	
util living area	0.9987	0.9976	0.9939	0.9786	0.9286	0.8158	0.6791	0.7581	0.9376	0.9908	0.9978	0.9989 (86)	
MIT	19.1306	19.2778	19.5862	20.0389	20.4867	20.8067	20.9334	20.8959	20.5998	20.0474	19.5154	19.1042 (87)	
Th 2	19.6163	19.6180	19.6196	19.6275	19.6290	19.6359	19.6359	19.6372	19.6333	19.6290	19.6260	19.6229 (88)	
util rest of house	0.9982	0.9967	0.9913	0.9686	0.8914	0.7143	0.5060	0.5951	0.8877	0.9850	0.9967	0.9986 (89)	
MIT 2	17.9384	18.0867	18.3953	18.8481	19.2736	19.5444	19.6196	19.6066	19.3915	18.8622	18.3303	17.9170 (90)	
Living area fraction	fLA = Living area / (4) =												
MIT	18.3741	18.5219	18.8304	19.2832	19.7169	20.0056	20.0997	20.0777	19.8330	19.2953	18.7633	18.3508 (92)	
Temperature adjustment	0.0000												
adjusted MIT	18.3741	18.5219	18.8304	19.2832	19.7169	20.0056	20.0997	20.0777	19.8330	19.2953	18.7633	18.3508 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9976	0.9956	0.9893	0.9653	0.8943	0.7461	0.5709	0.6556	0.8973	0.9830	0.9958	0.9980 (94)
Useful gains	367.4766	417.7844	486.0881	572.0885	606.9804	513.3227	370.2346	373.1613	429.7850	390.0458	353.9202	348.7174 (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	1610.5540	1556.5348	1406.9425	1176.7663	907.4282	608.2354	393.7813	413.3569	646.5519	984.2103	1323.5619	1610.1560 (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	924.8496	765.2403	685.1156	435.3681	223.5331	0.0000	0.0000	0.0000	0.0000	442.0584	698.1420	938.5103 (98)
Space heating												512.8175 (98)
Space heating per m2												(98) / (4) = 71.3085 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	1057.6752	832.6380	854.1979	0.0000	0.0000	0.0000	0.0000 (100)	
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7236	0.8021	0.7431	0.0000	0.0000	0.0000	0.0000 (101)	
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	765.3022	667.8246	634.7546	0.0000	0.0000	0.0000	0.0000 (102)	
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	889.0782	841.2266	749.8293	0.0000	0.0000	0.0000	0.0000 (103)	
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000 (103a)	
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	89.1187	129.0111	85.6156	0.0000	0.0000	0.0000	0.0000 (104)	
Space cooling												303.7454 (104)	
Cooled fraction												fC = cooled area / (4) = 1.0000 (105)	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	22.2797	32.2528	21.4039	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling												75.9364 (107)
Space cooling per m2												1.0591 (108)
Energy for space heating												71.3085 (99)
Energy for space cooling												1.0591 (108)
Total												72.3676 (109)
Dwelling Fabric Energy Efficiency (DFEE)												72.4 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	71.7000 (1b)	4.2000 (2b)	301.1400 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.7000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	301.1400 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ 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				3 * 10 =	30.0000 (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) =				30.0000 / (5) =	0.0996 (8)
Pressure test				Yes	
Measured/design AP50					5.0000
Infiltration rate					0.3496 (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) =		0.3234 (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	0.4123	0.4042	0.3962	0.3557	0.3477	0.3072	0.3072	0.2991	0.3234	0.3477	0.3638	0.3800 (22b)
Effective ac	0.5850	0.5817	0.5785	0.5633	0.5604	0.5472	0.5472	0.5447	0.5523	0.5604	0.5662	0.5722 (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			2.0500	1.0000	2.0500		(26)
TER Opening Type (Uw = 1.40)			15.8800	1.3258	21.0530		(27)
External Wall 1	70.5600	15.8800	54.6800	0.1800	9.8424		(29a)
Corridor Wall	6.8900	2.0500	4.8400	0.1800	0.8712		(29a)
External Roof 1	71.7000		71.7000	0.1300	9.3210		(30)
Total net area of external elements Aum(A, m ²)			149.1500				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	43.1376	(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)							15.7260 (36)
Total fabric heat loss						(33) + (36) =	58.8636 (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	58.1361	57.8080	57.4865	55.9762	55.6936	54.3782	54.3782	54.1346	54.8849	55.6936	56.2652	56.8629 (38)
Heat transfer coeff	116.9997	116.6717	116.3501	114.8398	114.5572	113.2418	113.2418	112.9982	113.7485	114.5572	115.1289	115.7265 (39)
Average = Sum(39)m / 12 =												114.8384 (39)
HLP	1.6318	1.6272	1.6227	1.6017	1.5977	1.5794	1.5794	1.5760	1.5865	1.5977	1.6057	1.6140 (40)
HLP (average)												1.6017 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.2867 (42)
Average daily hot water use (litres/day)												88.5086 (43)
Daily hot water use	97.3595	93.8191	90.2788	86.7385	83.1981	79.6578	79.6578	83.1981	86.7385	90.2788	93.8191	97.3595 (44)
Energy conte	144.3813	126.2768	130.3064	113.6042	109.0060	94.0639	87.1640	100.0220	101.2166	117.9581	128.7605	139.8256 (45)
Energy content (annual)												Total = Sum(45)m = 1392.5854 (45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Heat gains from water heating, kWh/month	30.6810	26.8338	27.6901	24.1409	23.1638	19.9886	18.5224	21.2547	21.5085	25.0661	27.3616	29.7129	(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	114.3340	114.3340	114.3340	114.3340	114.3340	114.3340	114.3340	114.3340	114.3340	114.3340	114.3340	114.3340	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.9427	15.9365	12.9605	9.8119	7.3345	6.1921	6.6908	8.6969	11.6730	14.8216	17.2989	18.4414	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	201.2318	203.3199	198.0578	186.8555	172.7145	159.4240	150.5451	148.4570	153.7191	164.9214	179.0624	192.3529	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.4334	34.4334	34.4334	34.4334	34.4334	34.4334	34.4334	34.4334	34.4334	34.4334	34.4334	34.4334	(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)	-91.4672	-91.4672	-91.4672	-91.4672	-91.4672	-91.4672	-91.4672	-91.4672	-91.4672	-91.4672	-91.4672	-91.4672	(71)
Water heating gains (Table 5)	41.2379	39.9313	37.2179	33.5290	31.1341	27.7619	24.8956	28.5681	29.8729	33.6910	38.0022	39.9367	(72)
Total internal gains	317.7126	316.4879	305.5364	287.4966	268.4833	250.6782	239.4317	243.0222	252.5652	270.7342	291.6638	308.0312	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	g Specific data or Table 6c	FF	Access factor Table 6d	Gains W						
Northeast	9.0800	11.2829	0.6300	0.7000	0.7700	31.3098	(75)						
Northwest	6.8000	11.2829	0.6300	0.7000	0.7700	23.4479	(81)						
Solar gains	54.7576	111.4607	200.8168	329.7989	443.3144	472.6201	442.1264	352.4683	244.6984	136.2139	68.8993	44.7178	(83)
Total gains	372.4702	427.9487	506.3532	617.2955	711.7977	723.2983	681.5581	595.4905	497.2636	406.9480	360.5630	352.7490	(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)	42.5571	42.6767	42.7947	43.3575	43.4644	43.9693	43.9693	44.0641	43.7735	43.4644	43.2486	43.0253	21.0000
tau	3.8371	3.8451	3.8530	3.8905	3.8976	3.9313	3.9313	3.9376	3.9182	3.8976	3.8832	3.8684	
alpha	0.9986	0.9974	0.9932	0.9759	0.9200	0.7980	0.6581	0.7400	0.9314	0.9899	0.9976	0.9989	(86)
util living area	19.0951	19.2507	19.5719	20.0473	20.5028	20.8208	20.9396	20.9038	20.6097	20.0450	19.4996	19.0774	(87)
MIT	19.5901	19.5934	19.5967	19.6121	19.6150	19.6285	19.6285	19.6310	19.6233	19.6150	19.6092	19.6031	(88)
Th 2	0.9981	0.9964	0.9904	0.9647	0.8795	0.6928	0.4858	0.5752	0.8779	0.9838	0.9965	0.9985	(89)
util rest of house	17.8836	18.0414	18.3638	18.8440	19.2750	19.5455	19.6141	19.6035	19.3907	18.8491	18.3019	17.8756	(90)
MIT 2	18.3263	18.4833	18.8052	19.2837	19.7237	20.0115	20.0984	20.0787	19.8361	19.2861	18.7395	18.3147	(92)
Living area fraction	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
MIT	18.3263	18.4833	18.8052	19.2837	19.7237	20.0115	20.0984	20.0787	19.8361	19.2861	18.7395	18.3147	(92)
Temperature adjustment	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
adjusted MIT	18.3263	18.4833	18.8052	19.2837	19.7237	20.0115	20.0984	20.0787	19.8361	19.2861	18.7395	18.3147	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
0.9974	0.9952	0.9881	0.9612	0.8834	0.7265	0.5503	0.6364	0.8887	0.9817	0.9955	0.9979	(94)	
Useful gains	371.4966	425.9106	500.3488	593.3593	628.7848	525.4458	375.0591	378.9848	441.9097	399.4811	358.9502	352.0126	(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	1641.0680	1584.7835	1431.7157	1192.4629	919.1697	612.8077	396.1704	415.6833	652.4745	995.0567	1340.0476	1633.4479	(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	944.5611	778.7626	692.9370	431.3546	216.0463	0.0000	0.0000	0.0000	0.0000	443.1083	706.3901	953.3879	(98)
Space heating												5166.5480	(98)
Space heating per m2												72.0579	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	1064.4729	837.9893	858.7863	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7403	0.8162	0.7578	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	788.0819	683.9310	650.7513	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	930.3419	879.8283	780.6043	0.0000	0.0000	0.0000	0.0000	(103)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	(103a)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	102.4272	145.7475	96.6106	0.0000	0.0000	0.0000	0.0000	(104)
Space cooling													344.7853
Cooled fraction													1.0000
Intermittency factor (Table 10b)													fc = cooled area / (4) =

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	25.6068	36.4369	24.1526	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling per m2												86.1963 (107)
Energy for space heating												1.2022 (108)
Energy for space cooling												72.0579 (99)
Total												1.2022 (108)
Target Fabric Energy Efficiency (TFEE)												73.2600 (109)
												84.2 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



Property Reference	006426		Issued on Date	17/07/2023
Assessment Reference	A.15.03	Prop Type Ref	1B2P	
Property				

SAP Rating	82 B	DER	15.20	TER	30.70
Environmental	90 B	% DER<TER	50.48		
CO ₂ Emissions (t/year)	0.70	DFEE	50.74	TFEE	60.86
General Requirements Compliance	Pass	% DFEE<TFEE	16.63		

Assessor Details	Mr. Michael Wride, Michael Wride, Tel: 02036 031 600, Michael@hodkinsonconsultancy.com	Assessor ID	R572-0001
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Client	
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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 56 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) 30.70 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 15.20 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 60.9 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 50.7 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.14 (max. 0.30)	0.15 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	0.12 (max. 0.20)	0.12 (max. 0.35)	OK
Openings	1.24 (max. 2.00)	1.30 (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
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: 0.59
Maximum 1.5 OK
MVHR efficiency: 89%
Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): Slight OK
Based on:
Overshading: Average
Windows facing North East: 9.13 m², No overhang
Air change rate: 4.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Roof U-value 0.12 W/m²K
Door U-value 1.00 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	55.8600 (1b)	2.8700 (2b)	160.3182 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	55.8600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	160.3182 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ 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					3	(19)
Shelter factor					(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor					(21) = (18) x (20) =	0.1163 (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	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1163	0.1250	0.1308	0.1366 (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	0.3367	0.3338	0.3309	0.3164	0.3135	0.2989	0.2989	0.2960	0.3048	0.3135	0.3193	0.3251 (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 = 1.30)			9.1300	1.2357	11.2823		(27)		
Main Entrance			2.0500	1.0000	2.0500		(26)		
External Wall 1	23.4200	9.1300	14.2900	0.1500	2.1435		(29a)		
Corridor Wall	27.6700	2.0500	25.6200	0.1409	3.6101		(29a)		
External Roof 1	55.8600		55.8600	0.1200	6.7032		(30)		
Total net area of external elements Aum(A, m ²)							(31)		
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	25.7892	(33)		
Party Wall 1			40.6100	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)								11.6174 (36)	
Total fabric heat loss								(33) + (36) =	37.4066 (37)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	17.8141	17.6604	17.5066	16.7378	16.5841	15.8153	15.8153	15.6615	16.1228	16.5841	16.8916	17.1991 (38)
Heat transfer coeff	55.2207	55.0669	54.9132	54.1444	53.9906	53.2219	53.2219	53.0681	53.5294	53.9906	54.2981	54.6057 (39)
Average = Sum(39)m / 12 =												
HLP	0.9886	0.9858	0.9830	0.9693	0.9665	0.9528	0.9528	0.9500	0.9583	0.9665	0.9720	0.9775 (40)
HLP (average)												
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												
Average daily hot water use (litres/day)												
Daily hot water use	86.2781	83.1407	80.0033	76.8659	73.7285	70.5911	70.5911	73.7285	76.8659	80.0033	83.1407	86.2781 (44)
Energy conte	127.9479	111.9040	115.4749	100.6739	96.5990	83.3576	77.2430	88.6375	89.6961	104.5322	114.1050	123.9107 (45)
Energy content (annual)												
Distribution loss (46)m = 0.15 x (45)m												
	19.1922	16.7856	17.3212	15.1011	14.4898	12.5036	11.5865	13.2956	13.4544	15.6798	17.1158	18.5866 (46)

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	1.0000 (303b)
Fraction of total space heat from community Heat pump	1.0000 (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	1829.7840 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.05	1921.2732 (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	1579.5140 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.05	1658.4897 (310b)
Electricity used for heat distribution	35.7976 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7375)	
mechanical ventilation fans (SFP = 0.7375)	144.2463 (330a)
Total electricity for the above, kWh/year	144.2463 (331)
Electricity for lighting (calculated in Appendix L)	262.3347 (332)
Total delivered energy for all uses	3986.3439 (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			300.0000 (367b)
Space heating from Heat pump	1193.2543	0.5190	619.2990 (368)
Electrical energy for heat distribution	35.7976	0.5190	18.5790 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			637.8779 (373)
Space and water heating			637.8779 (376)
Pumps and fans	144.2463	0.5190	74.8638 (378)
Energy for lighting	262.3347	0.5190	136.1517 (379)
Total CO2, kg/year			848.8935 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			15.2000 (384)

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

DER			15.2000 ZC1
Total Floor Area		TFA	55.8600
Assumed number of occupants		N	1.8625
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190
CO2 emissions from appliances, equation (L14)			17.2278 ZC2
CO2 emissions from cooking, equation (L16)			2.9305 ZC3
Total CO2 emissions			35.3583 ZC4
Residual CO2 emissions offset from biofuel CHP			0.0000 ZC5
Additional allowable electricity generation, kWh/m ² /year			0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation			0.0000 ZC7
Net CO2 emissions			35.3583 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	55.8600 (1b)	2.8700 (2b)	160.3182 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	55.8600		160.3182 (4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 160.3182 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ 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				2 * 10 =	20.0000 (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) =				20.0000 / (5) =	0.1248 (8)
Pressure test				Yes	
Measured/design AP50					5.0000
Infiltration rate					0.3748 (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) =	0.2904 (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	0.3703	0.3630	0.3558	0.3195	0.3122	0.2759	0.2759	0.2687	0.2904	0.3122	0.3267	0.3413 (22b)
Effective ac	0.5686	0.5659	0.5633	0.5510	0.5487	0.5381	0.5381	0.5361	0.5422	0.5487	0.5534	0.5582 (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			2.0500	1.0000	2.0500		(26)
TER Opening Type (Uw = 1.40)			9.1300	1.3258	12.1042		(27)
External Wall 1	23.4200	9.1300	14.2900	0.1800	2.5722		(29a)
Corridor Wall	27.6700	2.0500	25.6200	0.1800	4.6116		(29a)
External Roof 1	55.8600		55.8600	0.1300	7.2618		(30)
Total net area of external elements Aum(A, m ²)			106.9500				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	28.5998	(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)							10.2949 (36)
Total fabric heat loss							(33) + (36) = 38.8947 (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	30.0798	29.9389	29.8008	29.1524	29.0310	28.4663	28.4663	28.3617	28.6838	29.0310	29.2765	29.5331 (38)
Heat transfer coeff	68.9744	68.8336	68.6955	68.0470	67.9257	67.3609	67.3609	67.2563	67.5785	67.9257	68.1712	68.4278 (39)
Average = Sum(39)m / 12 =												68.0465 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2348	1.2323	1.2298	1.2182	1.2160	1.2059	1.2059	1.2040	1.2098	1.2160	1.2204	1.2250 (40)
HLP (average)												1.2182 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												1.8625 (42)
Average daily hot water use (litres/day)												78.4346 (43)
Daily hot water use	86.2781	83.1407	80.0033	76.8659	73.7285	70.5911	70.5911	73.7285	76.8659	80.0033	83.1407	86.2781 (44)
Energy conte	127.9479	111.9040	115.4749	100.6739	96.5990	83.3576	77.2430	88.6375	89.6961	104.5322	114.1050	123.9107 (45)
Energy content (annual)												Total = Sum(45)m = 1234.0818 (45)
Distribution loss (46)m = 0.15 x (45)m	19.1922	16.7856	17.3212	15.1011	14.4898	12.5036	11.5865	13.2956	13.4544	15.6798	17.1158	18.5866 (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	155.5656	136.8490	143.0926	127.4006	124.2166	110.0843	104.8607	116.2552	116.4229	132.1499	140.8318	151.5284 (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	155.5656	136.8490	143.0926	127.4006	124.2166	110.0843	104.8607	116.2552	116.4229	132.1499	140.8318	151.5284 (64)
Heat gains from water heating, kWh/month	64.6368	57.1641	60.4896	54.8555	54.2133	49.0978	47.7774	51.5661	51.2054	56.8511	59.3214	63.2944 (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	93.1255	93.1255	93.1255	93.1255	93.1255	93.1255	93.1255	93.1255	93.1255	93.1255	93.1255	93.1255 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	15.0421	13.3602	10.8653	8.2257	6.1488	5.1911	5.6092	7.2910	9.7860	12.4255	14.5024	15.4601 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	162.3990	164.0842	159.8375	150.7970	139.3849	128.6591	121.4936	119.8084	124.0551	133.0956	144.5077	155.2335 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.3125	32.3125	32.3125	32.3125	32.3125	32.3125	32.3125	32.3125	32.3125	32.3125	32.3125	32.3125 (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)	-74.5004	-74.5004	-74.5004	-74.5004	-74.5004	-74.5004	-74.5004	-74.5004	-74.5004	-74.5004	-74.5004	-74.5004 (71)
Water heating gains (Table 5)	86.8774	85.0656	81.3032	76.1882	72.8673	68.1914	64.2170	69.3093	71.1186	76.4128	82.3908	85.0732 (72)
Total internal gains	318.2561	316.4477	305.9436	289.1485	272.3387	255.9792	245.2574	250.3463	258.8972	275.8716	295.3386	309.7045 (73)

6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains						
	m ²	Table 6a	Specific data	Specific data	factor	W						
		W/m ²	or Table 6b	or Table 6c	Table 6d							
Northeast	9.1300	11.2829	0.6300	0.7000	0.7700	31.4822 (75)						
Solar gains	31.4822	64.0829	115.4570	189.6136	254.8779	271.7268	254.1948	202.6471	140.6862	78.3144	39.6127	25.7099 (83)
Total gains	349.7383	380.5306	421.4007	478.7621	527.2165	527.7060	499.4523	452.9934	399.5834	354.1859	334.9513	335.4144 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, T _{hl} (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	56.2407	56.3557	56.4690	57.0071	57.1090	57.5878	57.5878	57.6774	57.4024	57.1090	56.9033	56.6900
alpha	4.7494	4.7570	4.7646	4.8005	4.8073	4.8392	4.8392	4.8452	4.8268	4.8073	4.7936	4.7793
util living area	0.9976	0.9959	0.9904	0.9676	0.8933	0.7358	0.5732	0.6447	0.8855	0.9816	0.9956	0.9980 (86)
MIT	19.6705	19.7920	20.0409	20.4020	20.7330	20.9287	20.9831	20.9712	20.8130	20.4040	19.9806	19.6485 (87)
Th 2	19.8923	19.8943	19.8962	19.9055	19.9072	19.9153	19.9153	19.9168	19.9122	19.9072	19.9037	19.9001 (88)
util rest of house	0.9967	0.9945	0.9867	0.9545	0.8501	0.6412	0.4421	0.5112	0.8212	0.9719	0.9937	0.9974 (89)
MIT 2	18.1296	18.3084	18.6718	19.1955	19.6412	19.8674	19.9091	19.9047	19.7547	19.2065	18.5908	18.1029 (90)
Living area fraction	f _{LA} = Living area / (4) =											0.4400 (91)
MIT	18.8076	18.9612	19.2743	19.7264	20.1216	20.3344	20.3817	20.3740	20.2204	19.7335	19.2024	18.7830 (92)
Temperature adjustment												0.0000
adjusted MIT	18.8076	18.9612	19.2743	19.7264	20.1216	20.3344	20.3817	20.3740	20.2204	19.7335	19.2024	18.7830 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	348.1905	377.7965	414.6547	455.6928	453.2741	358.9862	249.8434	258.3642	336.5872	343.5052	332.2936	334.1969 (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	1000.6560	967.8856	877.5350	736.7020	572.0450	386.2748	254.7401	267.2742	413.6061	620.3962	825.0319	997.8823 (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	485.4344	396.5399	344.3830	202.3266	88.3656	0.0000	0.0000	0.0000	0.0000	206.0069	354.7715	493.7819 (98)
Space heating												2571.6098 (98)
Space heating per m ²												46.0367 (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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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													2750.3848 (211)
Space heating requirement	485.4344	396.5399	344.3830	202.3266	88.3656	0.0000	0.0000	0.0000	0.0000	206.0069	354.7715	493.7819	(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)	519.1812	424.1068	368.3240	216.3921	94.5086	0.0000	0.0000	0.0000	0.0000	220.3282	379.4348	528.1090	(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	155.5656	136.8490	143.0926	127.4006	124.2166	110.0843	104.8607	116.2552	116.4229	132.1499	140.8318	151.5284	(64)
Efficiency of water heater (217)m	87.6478	87.4902	87.0729	86.0423	83.9246	79.8000	79.8000	79.8000	79.8000	85.9939	87.1783	87.7376	(217)
Fuel for water heating, kWh/month	177.4894	156.4164	164.3366	148.0674	148.0098	137.9503	131.4044	145.6832	145.8934	153.6735	161.5445	172.7064	(219)
Water heating fuel used													1843.1752 (219)
Annual totals kWh/year													
Space heating fuel - main system													2750.3848 (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)													265.6477 (232)
Total delivered energy for all uses													4934.2077 (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	2750.3848	0.2160	594.0831 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1843.1752	0.2160	398.1258 (264)
Space and water heating			992.2090 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	265.6477	0.5190	137.8712 (268)
Total CO2, kg/m2/year			1169.0051 (272)
Emissions per m2 for space and water heating			17.7624 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.4682 (272b)
Emissions per m2 for pumps and fans			0.6968 (272c)
Target Carbon Dioxide Emission Rate (TER) = (17.7624 * 1.55) + 2.4682 + 0.6968, rounded to 2 d.p.			30.7000 (273)

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CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
 CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	55.8600 (1b)	2.8700 (2b)	160.3182 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	55.8600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	160.3182 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ 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				2 * 10 =	20.0000 (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) =				20.0000 / (5) =	0.1248 (8)
Pressure test					Yes
Measured/design AP50					3.0000
Infiltration rate					0.2748 (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) =	0.2129 (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	0.2715	0.2662	0.2608	0.2342	0.2289	0.2023	0.2023	0.1970	0.2129	0.2289	0.2395	0.2502 (22b)
Effective ac	0.5369	0.5354	0.5340	0.5274	0.5262	0.5205	0.5205	0.5194	0.5227	0.5262	0.5287	0.5313 (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 = 1.30)			9.1300	1.2357	11.2823		(27)					
Main Entrance			2.0500	1.0000	2.0500		(26)					
External Wall 1	23.4200	9.1300	14.2900	0.1500	2.1435		(29a)					
Corridor Wall	27.6700	2.0500	25.6200	0.1409	3.6101		(29a)					
External Roof 1	55.8600		55.8600	0.1200	6.7032		(30)					
Total net area of external elements Aum(A, m ²)			106.9500				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	25.7892	(33)					
Party Wall 1			40.6100	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)							11.6174 (36)					
Total fabric heat loss						(33) + (36) =	37.4066 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	28.4022	28.3265	28.2523	27.9037	27.8385	27.5349	27.5349	27.4787	27.6519	27.8385	27.9705	28.1084 (38)
Heat transfer coeff	65.8088	65.7331	65.6589	65.3103	65.2451	64.9415	64.9415	64.8853	65.0584	65.2451	65.3770	65.5149 (39)
Average = Sum(39)m / 12 =												65.3100 (39)
HLP	1.1781	1.1767	1.1754	1.1692	1.1680	1.1626	1.1626	1.1616	1.1647	1.1680	1.1704	1.1728 (40)
HLP (average)												1.1692 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												1.8625 (42)
Average daily hot water use (litres/day)												78.4346 (43)
Daily hot water use	86.2781	83.1407	80.0033	76.8659	73.7285	70.5911	70.5911	73.7285	76.8659	80.0033	83.1407	86.2781 (44)
Energy conte	127.9479	111.9040	115.4749	100.6739	96.5990	83.3576	77.2430	88.6375	89.6961	104.5322	114.1050	123.9107 (45)
Energy content (annual)												Total = Sum(45)m = 1234.0818 (45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	15.7699	23.9988	17.0727	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling per m2												56.8414 (107)
Energy for space heating												1.0176 (108)
Energy for space cooling												49.7267 (99)
Total												1.0176 (108)
Dwelling Fabric Energy Efficiency (DFEE)												50.7442 (109)
												50.7 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	55.8600 (1b)	2.8700 (2b)	160.3182 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	55.8600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	160.3182 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ 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				2 * 10 =	20.0000 (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) =				20.0000 / (5) =	0.1248 (8)
Pressure test				Yes	
Measured/design AP50					5.0000
Infiltration rate					0.3748 (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) =	0.2904 (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 infiltr rate												
Effective ac	0.3703	0.3630	0.3558	0.3195	0.3122	0.2759	0.2759	0.2687	0.2904	0.3122	0.3267	0.3413 (22b)
Effective ac	0.5686	0.5659	0.5633	0.5510	0.5487	0.5381	0.5381	0.5361	0.5422	0.5487	0.5534	0.5582 (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			2.0500	1.0000	2.0500		(26)
TER Opening Type (Uw = 1.40)			9.1300	1.3258	12.1042		(27)
External Wall 1	23.4200	9.1300	14.2900	0.1800	2.5722		(29a)
Corridor Wall	27.6700	2.0500	25.6200	0.1800	4.6116		(29a)
External Roof 1	55.8600		55.8600	0.1300	7.2618		(30)
Total net area of external elements Aum(A, m ²)			106.9500				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	28.5998	(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)							10.2949 (36)
Total fabric heat loss							(33) + (36) =

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	30.0798	29.9389	29.8008	29.1524	29.0310	28.4663	28.4663	28.3617	28.6838	29.0310	29.2765	29.5331 (38)
Average = Sum(39)m / 12 =	68.9744	68.8336	68.6955	68.0470	67.9257	67.3609	67.3609	67.2563	67.5785	67.9257	68.1712	68.4278 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.2348	1.2323	1.2298	1.2182	1.2160	1.2059	1.2059	1.2040	1.2098	1.2160	1.2204	1.2250 (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	1.8625 (42)											
Average daily hot water use (litres/day)	78.4346 (43)											
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	86.2781	83.1407	80.0033	76.8659	73.7285	70.5911	70.5911	73.7285	76.8659	80.0033	83.1407	86.2781 (44)
Energy content (annual)	127.9479	111.9040	115.4749	100.6739	96.5990	83.3576	77.2430	88.6375	89.6961	104.5322	114.1050	123.9107 (45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Heat gains from water heating, kWh/month	27.1889	23.7796	24.5384	21.3932	20.5273	17.7135	16.4141	18.8355	19.0604	22.2131	24.2473	26.3310	26.3310	(65)

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

Metabolic gains (Table 5), Watts														
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	93.1255	93.1255	93.1255	93.1255	93.1255	93.1255	93.1255	93.1255	93.1255	93.1255	93.1255	93.1255	93.1255	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5														
	15.0421	13.3602	10.8653	8.2257	6.1488	5.1911	5.6092	7.2910	9.7860	12.4255	14.5024	15.4601	15.4601	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5														
	162.3990	164.0842	159.8375	150.7970	139.3849	128.6591	121.4936	119.8084	124.0551	133.0956	144.5077	155.2335	155.2335	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5														
	32.3125	32.3125	32.3125	32.3125	32.3125	32.3125	32.3125	32.3125	32.3125	32.3125	32.3125	32.3125	32.3125	(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	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)														
	-74.5004	-74.5004	-74.5004	-74.5004	-74.5004	-74.5004	-74.5004	-74.5004	-74.5004	-74.5004	-74.5004	-74.5004	-74.5004	(71)
Water heating gains (Table 5)														
	36.5443	35.3863	32.9818	29.7128	27.5904	24.6021	22.0620	25.3165	26.4728	29.8563	33.6768	35.3912	35.3912	(72)
Total internal gains														
	264.9230	263.7684	254.6222	239.6731	224.0618	209.3899	200.1024	203.3536	211.2515	226.3151	243.6246	257.0225	257.0225	(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						
Northeast			9.1300	11.2829	0.6300	0.7000	0.7700	31.4822 (75)						
Solar gains	31.4822	64.0829	115.4570	189.6136	254.8779	271.7268	254.1948	202.6471	140.6862	78.3144	39.6127	25.7099	25.7099	(83)
Total gains	296.4052	327.8513	370.0792	429.2867	478.9396	481.1167	454.2973	406.0006	351.9377	304.6295	283.2374	282.7324	282.7324	(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)														
tau	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
alpha	56.2407	56.3557	56.4690	57.0071	57.1090	57.5878	57.5878	57.6774	57.4024	57.1090	56.9033	56.6900	56.6900	
util living area	4.7494	4.7570	4.7646	4.8005	4.8073	4.8392	4.8392	4.8452	4.8268	4.8073	4.7936	4.7793	4.7793	
	0.9988	0.9979	0.9944	0.9785	0.9201	0.7803	0.6211	0.7009	0.9217	0.9900	0.9979	0.9991	0.9991	(86)
MIT	19.5830	19.7062	19.9591	20.3302	20.6826	20.9073	20.9763	20.9587	20.7640	20.3274	19.8962	19.5618	19.5618	(87)
Th 2	19.8923	19.8943	19.8962	19.9055	19.9072	19.9153	19.9153	19.9168	19.9122	19.9072	19.9037	19.9001	19.9001	(88)
util rest of house	0.9984	0.9971	0.9922	0.9693	0.8841	0.6887	0.4834	0.5640	0.8705	0.9843	0.9969	0.9988	0.9988	(89)
MIT 2	18.6016	18.7261	18.9797	19.3528	19.6846	19.8709	19.9091	19.9043	19.7684	19.3551	18.9235	18.5865	18.5865	(90)
Living area fraction														fLA = Living area / (4) =
MIT	19.0334	19.1574	19.4107	19.7829	20.1237	20.3270	20.3787	20.3683	20.2065	19.7829	19.3515	19.0157	19.0157	(92)
Temperature adjustment												0.0000	0.0000	
adjusted MIT	19.0334	19.1574	19.4107	19.7829	20.1237	20.3270	20.3787	20.3683	20.2065	19.7829	19.3515	19.0157	19.0157	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Useful gains	0.9980	0.9964	0.9909	0.9680	0.8924	0.7265	0.5448	0.6251	0.8871	0.9834	0.9963	0.9984	0.9984	(94)
Ext temp.	295.8011	326.6634	366.7061	415.5365	427.4122	349.5413	247.5165	253.7830	312.2023	299.5793	282.1858	282.2762	282.2762	(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	4.2000	(96)
Month fracti	1016.2312	981.3863	886.9051	740.5504	572.1880	385.7729	254.5383	266.8902	412.6693	623.7569	835.2010	1013.8031	1013.8031	(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	1.0000	(97a)
Space heating	536.0000	439.9738	387.0280	234.0100	107.7132	0.0000	0.0000	0.0000	0.0000	241.1881	398.1709	544.2560	544.2560	(98)
Space heating per m2												2888.3401	2888.3401	(98)
												(98) / (4) =	51.7068	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b														
Ext. temp.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
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	4.2000	
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	633.1926	498.4708	511.1481	0.0000	0.0000	0.0000	0.0000	0.0000	(100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.8283	0.8956	0.8540	0.0000	0.0000	0.0000	0.0000	0.0000	(101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	524.4662	446.4126	436.5322	0.0000	0.0000	0.0000	0.0000	0.0000	(102)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	632.4988	599.8173	544.5105	0.0000	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(103a)
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	77.7834	114.1331	80.3359	0.0000	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction													272.2524	(104)
Intermittency factor (Table 10b)													1.0000	(105)
	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000	0.0000	(106)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	19.4459	28.5333	20.0840	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling													68.0631 (107)
Space cooling per m2													1.2185 (108)
Energy for space heating													51.7068 (99)
Energy for space cooling													1.2185 (108)
Total													52.9252 (109)
Target Fabric Energy Efficiency (TFEE)													60.9 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



Property Reference	006427		Issued on Date	17/07/2023
Assessment Reference	B.00.02	Prop Type Ref	2B4P - Duplex House	
Property				

SAP Rating	85 B	DER	18.40	TER	30.76
Environmental	87 B	% DER<TER	40.18		
CO ₂ Emissions (t/year)	1.06	DFEE	54.85	TFEE	63.99
General Requirements Compliance	Pass	% DFEE<TFEE	14.28		

Assessor Details	Mr. Michael Wride, Michael Wride, Tel: 02036 031 600, Michael@hodkinsonconsultancy.com	Assessor ID	R572-0001
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 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
Fuel factor:1.55 (electricity)
Target Carbon Dioxide Emission Rate (TER) 30.76 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 18.40 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 64.0 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 54.8 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.15 (max. 0.30)	0.15 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.20 (max. 0.25)	0.20 (max. 0.70)	OK
Roof	0.12 (max. 0.20)	0.12 (max. 0.35)	OK
Openings	1.25 (max. 2.00)	1.30 (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
Vaillant aroTHERM plus 5kW + AI VWL55/6A230V S2 + VWZAIMB

Secondary heating system: None

5 Cylinder insulation

Hot water storage Measured cylinder loss: 1.50 kWh/day
Permitted by DBSCG 2.10 OK
Primary pipework insulated: Yes OK

6 Controls

Space heating controls: Programmer and room thermostat OK

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: 0.59
Maximum 1.5 OK
MVHR efficiency: 89%
Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): Not significant OK

Based on:

Overshading: Average
Windows facing South East: 9.27 m², No overhang
Windows facing North West: 4.95 m², No overhang
Air change rate: 4.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Party wall U-value 0.00 W/m²K
Roof U-value 0.12 W/m²K
Roof U-value 0.12 W/m²K
Door U-value 1.00 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 (m2)	Storey height (m)	Volume (m3)
Ground floor	20.4000 (1b)	3.3800 (2b)	68.9520 (1b) - (3b)
First floor	50.1800 (1c)	2.8700 (2c)	144.0166 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.5800		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 212.9686 (5)
Dwelling volume			

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)							
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 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 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	0.1626	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) =												62.3000 (23c)
Effective ac	0.3511	0.3479	0.3447	0.3288	0.3256	0.3096	0.3096	0.3064	0.3160	0.3256	0.3319	0.3383 (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 = 1.30)			14.2200	1.2357	17.5722		(27)					
Main Entrance			3.1400	1.0000	3.1400		(26)					
Ground Floor			20.4000	0.2000	4.0800		(28a)					
Exposed Floor 1F			36.2900	0.2000	7.2580		(28b)					
External Wall GF	27.6800	7.4800	20.2000	0.1500	3.0300		(29a)					
External Wall 1F	17.7900	9.8800	7.9100	0.1500	1.1865		(29a)					
Exposed Roof GF	6.4600		6.4600	0.1200	0.7752		(30)					
Roof	50.1800		50.1800	0.1200	6.0216		(30)					
Total net area of external elements Aum(A, m2)			158.8000				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26) ... (30) + (32) =		43.0635 (33)					
Party Wall GF			33.6200	0.0000	0.0000		(32)					
Party Wall 1F			70.3700	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)							14.2134 (36)					
Total fabric heat loss							(33) + (36) = 57.2769 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 24.6725	Feb 24.4485	Mar 24.2245	Apr 23.1044	May 22.8804	Jun 21.7603	Jul 21.7603	Aug 21.5363	Sep 22.2084	Oct 22.8804	Nov 23.3284	Dec 23.7765 (38)
Heat transfer coeff	81.9495	81.7255	81.5015	80.3814	80.1574	79.0373	79.0373	78.8133	79.4853	80.1574	80.6054	81.0534 (39)
Average = Sum(39)m / 12 =												80.3254 (39)
HLP	Jan 1.1611	Feb 1.1579	Mar 1.1547	Apr 1.1389	May 1.1357	Jun 1.1198	Jul 1.1198	Aug 1.1167	Sep 1.1262	Oct 1.1357	Nov 1.1420	Dec 1.1484 (40)
HLP (average)												1.1381 (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												2.2601 (42)
Average daily hot water use (litres/day)												87.8779 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

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Energy cont	96.6657	93.1506	89.6355	86.1204	82.6053	79.0901	79.0901	82.6053	86.1204	89.6355	93.1506	96.6657 (44)
Energy content (annual)	143.3525	125.3770	129.3778	112.7947	108.2292	93.3936	86.5429	99.3092	100.4953	117.1176	127.8430	138.8292 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		1382.6620 (45)
Water storage loss:	21.5029	18.8065	19.4067	16.9192	16.2344	14.0090	12.9814	14.8964	15.0743	17.5676	19.1764	20.8244 (46)
Store volume												180.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.5000 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.8100 (55)
Total storage loss												
25.1100	22.6800	25.1100	24.3000	25.1100	24.3000	25.1100	25.1100	24.3000	25.1100	24.3000	25.1100	25.1100 (56)
If cylinder contains dedicated solar storage												
25.1100	22.6800	25.1100	24.3000	25.1100	24.3000	25.1100	25.1100	24.3000	25.1100	24.3000	25.1100	25.1100 (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												
191.7249	169.0682	177.7502	159.6067	156.6016	140.2056	134.9153	147.6816	147.3073	165.4900	174.6550	187.2016	187.2016 (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												
191.7249	169.0682	177.7502	159.6067	156.6016	140.2056	134.9153	147.6816	147.3073	165.4900	174.6550	187.2016	187.2016 (64)
Heat gains from water heating, kWh/month												
86.3626	76.6408	81.7160	74.9538	74.6841	68.5030	67.4734	71.7182	70.8643	77.6395	79.9574	84.8586	84.8586 (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	113.0062	113.0062	113.0062	113.0062	113.0062	113.0062	113.0062	113.0062	113.0062	113.0062	113.0062	113.0062 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.7291	15.7468	12.8062	9.6951	7.2472	6.1184	6.6111	8.5934	11.5341	14.6451	17.0930	18.2218 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	198.6469	200.7083	195.5138	184.4553	170.4960	157.3762	148.6114	146.5500	151.7445	162.8030	176.7623	189.8821 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.3006	34.3006	34.3006	34.3006	34.3006	34.3006	34.3006	34.3006	34.3006	34.3006	34.3006	34.3006 (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)	-90.4049	-90.4049	-90.4049	-90.4049	-90.4049	-90.4049	-90.4049	-90.4049	-90.4049	-90.4049	-90.4049	-90.4049 (71)
Water heating gains (Table 5)	116.0788	114.0488	109.8334	104.1026	100.3819	95.1430	90.6901	96.3955	98.4226	104.3542	111.0519	114.0573 (72)
Total internal gains	389.3567	387.4058	375.0552	355.1548	335.0269	315.5395	302.8145	308.4408	318.6031	338.7042	361.8091	379.0631 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	FF	Access factor Table 6d	Gains W					
Southeast	9.2700	36.7938	0.5000	0.7500	0.7700	88.6379 (77)						
Northwest	4.9500	11.2829	0.5000	0.7500	0.7700	14.5142 (81)						
Solar gains	103.1520	180.5271	259.8105	343.3818	404.2075	409.9021	391.6031	344.9069	288.5444	202.9736	124.4303	87.7085 (83)
Total gains	492.5087	567.9328	634.8657	698.5366	739.2345	725.4415	694.4175	653.3477	607.1475	541.6777	486.2394	466.7716 (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)												
tau	59.8099	59.9738	60.1387	60.9767	61.1471	62.0136	62.0136	62.1899	61.6641	61.1471	60.8072	60.4711
alpha	4.9873	4.9983	5.0092	5.0651	5.0765	5.1342	5.1342	5.1460	5.1109	5.0765	5.0538	5.0314
util living area	0.9961	0.9914	0.9789	0.9391	0.8389	0.6601	0.4935	0.5426	0.7911	0.9577	0.9916	0.9970 (86)
Tweekday	19.4130	19.5558	19.7740	20.0516	20.2571	20.3596	20.3769	20.3768	20.3208	20.0575	19.6912	19.3957
Tweekend	20.3995	20.4800	20.6038	20.7607	20.8844	20.9483	20.9625	20.9607	20.9215	20.7618	20.5529	20.3867
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	0	0	0	0	0	0	0	0	0	0	0	0
16 / 9	0	0	0	0	0	0	0	0	0	0	0	0
MIT	20.0733	20.1956	20.3885	20.6263	20.8216	20.9206	20.9422	20.9393	20.8774	20.6323	20.3019	20.0534 (87)
Th 2	20.4195	20.4210	20.4226	20.4306	20.4322	20.4401	20.4401	20.4417	20.4369	20.4322	20.4290	20.4258 (88)
util rest of house												
0.9954	0.9900	0.9752	0.9283	0.8118	0.6121	0.4335	0.4813	0.7497	0.9481	0.9900	0.9965 (89)	
Tweekday	19.4130	19.5558	19.7740	20.0516	20.2571	20.3596	20.3769	20.3768	20.3208	20.0575	19.6912	19.3957
Tweekend	19.8494	19.9310	20.0553	20.2159	20.3330	20.3945	20.4043	20.4049	20.3711	20.2200	20.0111	19.8424
MIT 2	19.5397	19.6630	19.8557	20.0954	20.2791	20.3701	20.3849	20.3849	20.3342	20.1047	19.7765	19.5254 (90)
Living area fraction									fLA = Living area / (4) =			0.2744 (91)
MIT	19.6861	19.8091	20.0019	20.2411	20.4280	20.5212	20.5378	20.5371	20.4833	20.2495	19.9207	19.6703 (92)
Temperature adjustment												0.0000
adjusted MIT	19.6861	19.8091	20.0019	20.2411	20.4280	20.5212	20.5378	20.5371	20.4833	20.2495	19.9207	19.6703 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9944	0.9881	0.9721	0.9242	0.8116	0.6192	0.4441	0.4920	0.7533	0.9445	0.9882	0.9956 (94)
	489.7370	561.1837	617.1349	645.6173	599.9558	449.2198	308.4255	321.4242	457.3726	511.6172	480.4783	464.7360 (95)

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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	1260.8844	1218.4564	1100.4248	911.6165	699.6136	467.9922	311.2348	326.0572	507.3773	773.4783	1033.4160	1253.9200 (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	573.7337	441.6872	359.5676	191.5194	74.1454	0.0000	0.0000	0.0000	0.0000	194.8247	398.1151	587.1529 (98)
Space heating												2820.7461 (98)
Space heating per m2												(98) / (4) = 39.9652 (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 %)												224.9242 (206)
Efficiency of secondary/supplementary heating system, %												100.0000 (208)
Space heating requirement												1254.0876 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	573.7337	441.6872	359.5676	191.5194	74.1454	0.0000	0.0000	0.0000	0.0000	194.8247	398.1151	587.1529 (98)
Space heating efficiency (main heating system 1)	224.9242	224.9242	224.9242	224.9242	224.9242	0.0000	0.0000	0.0000	0.0000	224.9242	224.9242	224.9242 (210)
Space heating fuel (main heating system)	255.0787	196.3716	159.8617	85.1484	32.9646	0.0000	0.0000	0.0000	0.0000	86.6179	176.9997	261.0448 (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	191.7249	169.0682	177.7502	159.6067	156.6016	140.2056	134.9153	147.6816	147.3073	165.4900	174.6550	187.2016 (64)
Efficiency of water heater (217)m	262.4850	262.4850	262.4850	262.4850	262.4850	262.4850	262.4850	262.4850	262.4850	262.4850	262.4850	262.4850 (217)
Fuel for water heating, kWh/month	73.0422	64.4106	67.7182	60.8060	59.6612	53.4147	51.3992	56.2629	56.1203	63.0474	66.5390	71.3190 (219)
Water heating fuel used												743.7408 (219)
Annual totals kWh/year												
Space heating fuel - main system												1254.0876 (211)
Space heating fuel - secondary												0.0000 (215)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7375)												
mechanical ventilation fans (SFP = 0.7375)												191.6185 (230a)
Total electricity for the above, kWh/year												191.6185 (231)
Electricity for lighting (calculated in Appendix L)												313.1014 (232)
Total delivered energy for all uses												2502.5483 (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	1254.0876	0.5190	650.8715 (261)
Space heating - secondary	0.0000	0.5190	0.0000 (263)
Water heating (other fuel)	743.7408	0.5190	386.0015 (264)
Space and water heating			1036.8729 (265)
Pumps and fans	191.6185	0.5190	99.4500 (267)
Energy for lighting	313.1014	0.5190	162.4996 (268)
Total CO2, kg/year			1298.8226 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			18.4000 (273)

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

DER		18.4000 ZC1
Total Floor Area		70.5800 TFA
Assumed number of occupants		2.2601 N
CO2 emission factor in Table 12 for electricity displaced from grid		0.5190 EF
CO2 emissions from appliances, equation (L14)		16.6781 ZC2
CO2 emissions from cooking, equation (L16)		2.4546 ZC3
Total CO2 emissions		37.5327 ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000 ZC5
Additional allowable electricity generation, kWh/m ² /year		0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000 ZC7
Net CO2 emissions		37.5327 ZC8

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	20.4000 (1b)	3.3800 (2b)	68.9520 (1b) - (3b)
First floor	50.1800 (1c)	2.8700 (2c)	144.0166 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.5800		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 212.9686 (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				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) =	0.1409 (8)							
Pressure test					Yes							
Measured/design AP50					5.0000							
Infiltration rate					0.3909 (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) =		0.3322 (21)							
Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 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	0.4236	0.4153	0.4070	0.3655	0.3572	0.3156	0.3156	0.3073	0.3322	0.3572	0.3738	0.3904 (22b)
Effective ac	0.5897	0.5862	0.5828	0.5668	0.5638	0.5498	0.5498	0.5472	0.5552	0.5638	0.5699	0.5762 (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			3.1400	1.0000	3.1400		(26)					
TER Opening Type (Uw = 1.40)			14.2200	1.3258	18.8523		(27)					
Ground Floor			20.4000	0.1300	2.6520		(28a)					
Exposed Floor 1F			36.2900	0.1300	4.7177		(28b)					
External Wall GF	27.6800	7.4800	20.2000	0.1800	3.6360		(29a)					
External Wall 1F	17.7900	9.8800	7.9100	0.1800	1.4238		(29a)					
Exposed Roof GF	6.4600		6.4600	0.1300	0.8398		(30)					
Roof	50.1800		50.1800	0.1300	6.5234		(30)					
Total net area of external elements Aum(A, m2)			158.8000				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	41.7850	(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							16.3607 (36)					
Total fabric heat loss						(33) + (36) =	58.1457 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 41.4452	Feb 41.2004	Mar 40.9604	Apr 39.8331	May 39.6222	Jun 38.6404	Jul 38.6404	Aug 38.4586	Sep 39.0186	Oct 39.6222	Nov 40.0489	Dec 40.4949 (38)
Heat transfer coeff	99.5909	99.3461	99.1061	97.9788	97.7679	96.7861	96.7861	96.6043	97.1643	97.7679	98.1945	98.6406 (39)
Average = Sum(39)m / 12 =												97.9778 (39)
HLP	Jan 1.4110	Feb 1.4076	Mar 1.4042	Apr 1.3882	May 1.3852	Jun 1.3713	Jul 1.3713	Aug 1.3687	Sep 1.3767	Oct 1.3852	Nov 1.3913	Dec 1.3976 (40)
HLP (average)												1.3882 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.2601 (42)
Average daily hot water use (litres/day)												87.8779 (43)
Daily hot water use	96.6657	93.1506	89.6355	86.1204	82.6053	79.0901	79.0901	82.6053	86.1204	89.6355	93.1506	96.6657 (44)
Energy conte	143.3525	125.3770	129.3778	112.7947	108.2292	93.3936	86.5429	99.3092	100.4953	117.1176	127.8430	138.8292 (45)
Energy content (annual)												Total = Sum(45)m = 1382.6620 (45)
Distribution loss (46)m = 0.15 x (45)m												
	21.5029	18.8065	19.4067	16.9192	16.2344	14.0090	12.9814	14.8964	15.0743	17.5676	19.1764	20.8244 (46)
Water storage loss:												

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Store volume													180.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.5520 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.8381 (55)
Total storage loss													
	25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803	(56)
If cylinder contains dedicated solar storage													
	25.9803	23.4661	25.9803	25.1422	25.9803	25.1422	25.9803	25.9803	25.1422	25.9803	25.1422	25.9803	(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													
	192.5951	169.8542	178.6205	160.4489	157.4719	141.0478	135.7856	148.5519	148.1495	166.3602	175.4972	188.0719	(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													
	192.5951	169.8542	178.6205	160.4489	157.4719	141.0478	135.7856	148.5519	148.1495	166.3602	175.4972	188.0719	(64)
Heat gains from water heating, kWh/month													
	87.0588	77.2696	82.4123	75.6276	75.3804	69.1767	68.1696	72.4145	71.5380	78.3357	80.6312	85.5548	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	113.0062	113.0062	113.0062	113.0062	113.0062	113.0062	113.0062	113.0062	113.0062	113.0062	113.0062	113.0062	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	17.8209	15.8284	12.8725	9.7453	7.2847	6.1501	6.6454	8.6379	11.5938	14.7210	17.1816	18.3162	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	198.6469	200.7083	195.5138	184.4553	170.4960	157.3762	148.6114	146.5500	151.7445	162.8030	176.7623	189.8821	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	34.3006	34.3006	34.3006	34.3006	34.3006	34.3006	34.3006	34.3006	34.3006	34.3006	34.3006	34.3006	(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)													
	-90.4049	-90.4049	-90.4049	-90.4049	-90.4049	-90.4049	-90.4049	-90.4049	-90.4049	-90.4049	-90.4049	-90.4049	(71)
Water heating gains (Table 5)													
	117.0146	114.9846	110.7692	105.0383	101.3177	96.0788	91.6259	97.3313	99.3584	105.2900	111.9877	114.9931	(72)
Total internal gains													
	393.3843	391.4231	379.0573	359.1408	339.0003	319.5069	306.7845	312.4211	322.5986	342.7158	365.8334	383.0933	(73)

6. Solar gains

[Jan]													
		Area	Solar flux	Specific data	g	Specific data	FF	Access	Gains				
		m ²	Table 6a	or Table 6b	W/m ²	or Table 6c		factor	W				
								Table 6d					
Southeast		9.2700	36.7938	0.6300	0.7000	0.7700	104.2381	(77)					
Northwest		4.9500	11.2829	0.6300	0.7000	0.7700	17.0687	(81)					
Solar gains	121.3068	212.2998	305.5372	403.8170	475.3480	482.0448	460.5252	405.6105	339.3283	238.6969	146.3300	103.1452	(83)
Total gains	514.6911	603.7229	684.5945	762.9578	814.3483	801.5517	767.3097	718.0316	661.9268	581.4127	512.1635	486.2385	(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	49.2152	49.3365	49.4560	50.0250	50.1329	50.6415	50.6415	50.7368	50.4444	50.1329	49.9151	49.6894	
alpha	4.2810	4.2891	4.2971	4.3350	4.3422	4.3761	4.3761	4.3825	4.3630	4.3422	4.3277	4.3126	
util living area	0.9954	0.9904	0.9779	0.9417	0.8547	0.6970	0.5354	0.5877	0.8187	0.9602	0.9910	0.9964	(86)
MIT	19.5382	19.7270	20.0239	20.4043	20.7279	20.9223	20.9808	20.9714	20.8358	20.4149	19.9072	19.5069	(87)
Th 2	19.7549	19.7575	19.7601	19.7724	19.7747	19.7854	19.7854	19.7874	19.7813	19.7747	19.7700	19.7652	(88)
util rest of house	0.9939	0.9871	0.9700	0.9197	0.8000	0.5933	0.3973	0.4477	0.7332	0.9406	0.9873	0.9952	(89)
MIT 2	17.8430	18.1192	18.5492	19.0933	19.5168	19.7361	19.7790	19.7766	19.6564	19.1204	18.3914	17.8044	(90)
Living area fraction										FLA = Living area / (4) =		0.2744	(91)
MIT	18.3082	18.5604	18.9539	19.4531	19.8492	20.0617	20.1088	20.1045	19.9801	19.4757	18.8074	18.2717	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.3082	18.5604	18.9539	19.4531	19.8492	20.0617	20.1088	20.1045	19.9801	19.4757	18.8074	18.2717	(93)

8. Space heating requirement

Utilisation	0.9911	0.9826	0.9630	0.9125	0.8038	0.6188	0.4355	0.4863	0.7493	0.9343	0.9830	0.9929	(94)
Useful gains	510.1207	593.1922	659.2568	696.2286	654.5853	496.0223	334.1885	349.1768	495.9609	543.1994	503.4623	482.7983	(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	1395.0933	1357.1107	1234.2567	1033.9791	796.7294	528.6125	339.6019	357.8682	571.3356	867.7549	1149.6001	1388.0369	(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	658.4197	513.3532	427.7999	243.1804	105.7552	0.0000	0.0000	0.0000	0.0000	241.4693	465.2192	673.4975	(98)
Space heating												3328.6944	(98)
Space heating per m2												(98) / (4) =	47.1620 (99)

8c. Space cooling requirement

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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													3560.1009 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	658.4197	513.3532	427.7999	243.1804	105.7552	0.0000	0.0000	0.0000	0.0000	241.4693	465.2192	673.4975	(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)	704.1921	549.0409	457.5400	260.0860	113.1072	0.0000	0.0000	0.0000	0.0000	258.2559	497.5606	720.3182	(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	192.5951	169.8542	178.6205	160.4489	157.4719	141.0478	135.7856	148.5519	148.1495	166.3602	175.4972	188.0719	(64)
Efficiency of water heater (217)m	87.8346	87.5805	87.0615	85.9204	83.7796	79.8000	79.8000	79.8000	79.8000	85.8068	87.2940	79.8000	(216)
Fuel for water heating, kWh/month	219.2701	193.9408	205.1658	186.7414	187.9596	176.7516	170.1573	186.1553	185.6510	193.8778	201.0416	213.8968	(219)
Water heating fuel used													2320.6092 (219)
Annual totals kWh/year													
Space heating fuel - main system													3560.1009 (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)													314.7231 (232)
Total delivered energy for all uses													6270.4332 (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	3560.1009	0.2160	768.9818 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2320.6092	0.2160	501.2516 (264)
Space and water heating			1270.2334 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	314.7231	0.5190	163.3413 (268)
Total CO2, kg/m2/year			1472.4997 (272)
Emissions per m2 for space and water heating			17.9971 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.3143 (272b)
Emissions per m2 for pumps and fans			0.5515 (272c)
Target Carbon Dioxide Emission Rate (TER) = (17.9971 * 1.55) + 2.3143 + 0.5515, rounded to 2 d.p.			30.7600 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
 CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	20.4000 (1b)	3.3800 (2b)	68.9520 (1b) - (3b)
First floor	50.1800 (1c)	2.8700 (2c)	144.0166 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.5800		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 212.9686 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ 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				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) =	0.1409 (8)							
Pressure test				Yes								
Measured/design AP50				3.0000								
Infiltration rate					0.2909 (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) =	0.2472 (21)							
Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 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	0.3152	0.3090	0.3029	0.2720	0.2658	0.2349	0.2349	0.2287	0.2472	0.2658	0.2781	0.2905 (22b)
	0.5497	0.5478	0.5459	0.5370	0.5353	0.5276	0.5276	0.5262	0.5306	0.5353	0.5387	0.5422 (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 = 1.30)			14.2200	1.2357	17.5722		(27)					
Main Entrance			3.1400	1.0000	3.1400		(26)					
Ground Floor			20.4000	0.2000	4.0800		(28a)					
Exposed Floor 1F			36.2900	0.2000	7.2580		(28b)					
External Wall GF	27.6800	7.4800	20.2000	0.1500	3.0300		(29a)					
External Wall 1F	17.7900	9.8800	7.9100	0.1500	1.1865		(29a)					
Exposed Roof GF	6.4600		6.4600	0.1200	0.7752		(30)					
Roof	50.1800		50.1800	0.1200	6.0216		(30)					
Total net area of external elements Aum(A, m ²)			158.8000				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	43.0635	(33)					
Party Wall GF			33.6200	0.0000	0.0000		(32)					
Party Wall 1F			70.3700	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)							14.2134 (36)					
Total fabric heat loss						(33) + (36) =	57.2769 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 38.6316	Feb 38.4960	Mar 38.3631	Apr 37.7388	May 37.6220	Jun 37.0783	Jul 37.0783	Aug 36.9777	Sep 37.2878	Oct 37.6220	Nov 37.8583	Dec 38.1053 (38)
Heat transfer coeff	95.9085	95.7729	95.6400	95.0158	94.8990	94.3553	94.3553	94.2546	94.5647	94.8990	95.1353	95.3823 (39)
Average = Sum(39)m / 12 =												95.0152 (39)
HLP	Jan 1.3589	Feb 1.3569	Mar 1.3551	Apr 1.3462	May 1.3446	Jun 1.3369	Jul 1.3369	Aug 1.3354	Sep 1.3398	Oct 1.3446	Nov 1.3479	Dec 1.3514 (40)
HLP (average)												1.3462 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.2601 (42)
Average daily hot water use (litres/day)												87.8779 (43)
Daily hot water use	96.6657	93.1506	89.6355	86.1204	82.6053	79.0901	79.0901	82.6053	86.1204	89.6355	93.1506	96.6657 (44)
Energy conte	143.3525	125.3770	129.3778	112.7947	108.2292	93.3936	86.5429	99.3092	100.4953	117.1176	127.8430	138.8292 (45)
Energy content (annual)												Total = Sum(45)m = 1382.6620 (45)
Distribution loss (46)m = 0.15 x (45)m												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Water storage loss:	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Heat gains from water heating, kWh/month	30.4624	26.6426	27.4928	23.9689	22.9987	19.8461	18.3904	21.1032	21.3552	24.8875	27.1666	29.5012	29.5012	(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	113.0062	113.0062	113.0062	113.0062	113.0062	113.0062	113.0062	113.0062	113.0062	113.0062	113.0062	113.0062	113.0062	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.7291	15.7468	12.8062	9.6951	7.2472	6.1184	6.6111	8.5934	11.5341	14.6451	17.0930	18.2218	18.2218	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	198.6469	200.7083	195.5138	184.4553	170.4960	157.3762	148.6114	146.5500	151.7445	162.8030	176.7623	189.8821	189.8821	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.3006	34.3006	34.3006	34.3006	34.3006	34.3006	34.3006	34.3006	34.3006	34.3006	34.3006	34.3006	34.3006	(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	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-90.4049	-90.4049	-90.4049	-90.4049	-90.4049	-90.4049	-90.4049	-90.4049	-90.4049	-90.4049	-90.4049	-90.4049	-90.4049	(71)
Water heating gains (Table 5)	40.9441	39.6467	36.9527	33.2901	30.9122	27.5641	24.7182	28.3645	29.6601	33.4509	37.7314	39.6522	39.6522	(72)
Total internal gains	314.2220	313.0037	302.1745	284.3424	265.5573	247.9605	236.8426	240.4098	249.8405	267.8009	288.4886	304.6580	304.6580	(73)

6. Solar gains

[Jan]	Area		Solar flux		Specific data		FF		Access		Gains			
	Jan	Feb	Table 6a	Table 6a	or Table 6b	or Table 6b	or Table 6c	or Table 6c	Table 6d	Table 6d	W	W		
Southeast			9.2700	36.7938	0.5000	0.5000	0.7500	0.7500	0.7700	0.7700	88.6379	88.6379	(77)	
Northwest			4.9500	11.2829	0.5000	0.5000	0.7500	0.7500	0.7700	0.7700	14.5142	14.5142	(81)	
Solar gains	103.1520	180.5271	259.8105	343.3818	404.2075	409.9021	391.6031	344.9069	288.5444	202.9736	124.4303	87.7085	87.7085	(83)
Total gains	417.3740	493.5308	561.9850	627.7242	669.7648	657.8626	628.4457	585.3167	538.3849	470.7745	412.9189	392.3665	392.3665	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, T _{hl} (C)														
Utilisation factor for gains for living area, n _{il,m} (see Table 9a)														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
tau	51.1048	51.1772	51.2483	51.5850	51.6485	51.9461	51.9461	52.0016	51.8311	51.6485	51.5202	51.3868	51.3868	(85)
alpha	4.4070	4.4118	4.4166	4.4390	4.4432	4.4631	4.4631	4.4668	4.4554	4.4432	4.4347	4.4258	4.4258	
util living area	0.9980	0.9955	0.9889	0.9679	0.9090	0.7803	0.6213	0.6784	0.8857	0.9801	0.9961	0.9985	0.9985	(86)
MIT	19.4808	19.6528	19.9340	20.3035	20.6482	20.8835	20.9682	20.9530	20.7741	20.3247	19.8299	19.4461	19.4461	(87)
Th 2	19.7950	19.7965	19.7980	19.8048	19.8061	19.8121	19.8121	19.8132	19.8098	19.8061	19.8035	19.8008	19.8008	(88)
util rest of house	0.9973	0.9939	0.9847	0.9544	0.8680	0.6828	0.4724	0.5319	0.8179	0.9694	0.9944	0.9980	0.9980	(89)
MIT 2	18.4236	18.5961	18.8764	19.2434	19.5646	19.7573	19.8041	19.7998	19.6817	19.2698	18.7786	18.3934	18.3934	(90)
Living area fraction	fLA = Living area / (4) =													
MIT	18.7138	18.8861	19.1666	19.5343	19.8620	20.0664	20.1236	20.1163	19.9815	19.5593	19.0671	18.6823	18.6823	(92)
Temperature adjustment	0.0000													
adjusted MIT	18.7138	18.8861	19.1666	19.5343	19.8620	20.0664	20.1236	20.1163	19.9815	19.5593	19.0671	18.6823	18.6823	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9964	0.9923	0.9817	0.9505	0.8703	0.7063	0.5140	0.5726	0.8297	0.9664	0.9929	0.9973	(94)
Useful gains	415.8847	489.7059	551.6920	596.6554	582.8859	464.6394	323.0461	335.1694	446.7084	454.9436	409.9769	391.2953	(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	1382.4020	1339.4882	1211.4384	1010.4263	774.5638	515.7817	332.4704	350.2780	556.1782	850.2307	1138.4970	1381.3561	(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	719.0889	571.0537	490.8513	297.9151	142.6083	0.0000	0.0000	0.0000	0.0000	294.0936	524.5344	736.6052	(98)
Space heating												3776.7505	(98)
Space heating per m2												53.5102	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	886.9396	698.2291	716.3349	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8006	0.8747	0.8442	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	710.0987	610.7711	604.7370	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	852.8795	816.7953	767.7407	0.0000	0.0000	0.0000	0.0000	(103)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000 (103a)
Space cooling kWh												
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	102.8094	153.2820	121.2748	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling Cooled fraction												377.3661 (104)
Intermittency factor (Table 10b)									fC = cooled area / (4) =			1.0000 (105)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling												94.3415 (107)
Space cooling per m2												1.3367 (108)
Energy for space heating												53.5102 (99)
Energy for space cooling												1.3367 (108)
Total												54.8469 (109)
Dwelling Fabric Energy Efficiency (DFEE)												54.8 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	20.4000 (1b)	3.3800 (2b)	68.9520 (1b) - (3b)
First floor	50.1800 (1c)	2.8700 (2c)	144.0166 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.5800		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 212.9686 (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				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) =	0.1409 (8)							
Pressure test					Yes							
Measured/design AP50					5.0000							
Infiltration rate					0.3909 (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) =	0.3322 (21)							
Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 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 infiltr rate	0.4236	0.4153	0.4070	0.3655	0.3572	0.3156	0.3156	0.3073	0.3322	0.3572	0.3738	0.3904 (22b)
Effective ac	0.5897	0.5862	0.5828	0.5668	0.5638	0.5498	0.5498	0.5472	0.5552	0.5638	0.5699	0.5762 (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			3.1400	1.0000	3.1400		(26)					
TER Opening Type (Uw = 1.40)			14.2200	1.3258	18.8523		(27)					
Ground Floor			20.4000	0.1300	2.6520		(28a)					
Exposed Floor 1F			36.2900	0.1300	4.7177		(28b)					
External Wall GF	27.6800	7.4800	20.2000	0.1800	3.6360		(29a)					
External Wall 1F	17.7900	9.8800	7.9100	0.1800	1.4238		(29a)					
Exposed Roof GF	6.4600		6.4600	0.1300	0.8398		(30)					
Roof	50.1800		50.1800	0.1300	6.5234		(30)					
Total net area of external elements Aum(A, m2)			158.8000				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =		41.7850 (32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							16.3607 (36)					
Total fabric heat loss							(33) + (36) = 58.1457 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 41.4452	Feb 41.2004	Mar 40.9604	Apr 39.8331	May 39.6222	Jun 38.6404	Jul 38.6404	Aug 38.4586	Sep 39.0186	Oct 39.6222	Nov 40.0489	Dec 40.4949 (38)
Heat transfer coeff	99.5909	99.3461	99.1061	97.9788	97.7679	96.7861	96.7861	96.6043	97.1643	97.7679	98.1945	98.6406 (39)
Average = Sum(39)m / 12 =												97.9778 (39)
HLP	Jan 1.4110	Feb 1.4076	Mar 1.4042	Apr 1.3882	May 1.3852	Jun 1.3713	Jul 1.3713	Aug 1.3687	Sep 1.3767	Oct 1.3852	Nov 1.3913	Dec 1.3976 (40)
HLP (average)												1.3882 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.2601 (42)
Average daily hot water use (litres/day)												87.8779 (43)
Daily hot water use	96.6657	93.1506	89.6355	86.1204	82.6053	79.0901	79.0901	82.6053	86.1204	89.6355	93.1506	96.6657 (44)
Energy conte	143.3525	125.3770	129.3778	112.7947	108.2292	93.3936	86.5429	99.3092	100.4953	117.1176	127.8430	138.8292 (45)
Energy content (annual)												Total = Sum(45)m = 1382.6620 (45)
Distribution loss (46)m = 0.15 x (45)m												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Heat gains from water heating, kWh/month	30.4624	26.6426	27.4928	23.9689	22.9987	19.8461	18.3904	21.1032	21.3552	24.8875	27.1666	29.5012	29.5012	(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	113.0062	113.0062	113.0062	113.0062	113.0062	113.0062	113.0062	113.0062	113.0062	113.0062	113.0062	113.0062	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.8209	15.8284	12.8725	9.7453	7.2847	6.1501	6.6454	8.6379	11.5938	14.7210	17.1816	18.3162	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	198.6469	200.7083	195.5138	184.4553	170.4960	157.3762	148.6114	146.5500	151.7445	162.8030	176.7623	189.8821	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.3006	34.3006	34.3006	34.3006	34.3006	34.3006	34.3006	34.3006	34.3006	34.3006	34.3006	34.3006	(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)	-90.4049	-90.4049	-90.4049	-90.4049	-90.4049	-90.4049	-90.4049	-90.4049	-90.4049	-90.4049	-90.4049	-90.4049	(71)
Water heating gains (Table 5)	40.9441	39.6467	36.9527	33.2901	30.9122	27.5641	24.7182	28.3645	29.6601	33.4509	37.7314	39.6522	(72)
Total internal gains	314.3138	313.0853	302.2408	284.3926	265.5948	247.9922	236.8768	240.4543	249.9002	267.8768	288.5772	304.7523	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	g Specific data or Table 6c	FF Specific data or Table 6c	Access factor Table 6d	Gains W						
Southeast	9.2700	36.7938	0.6300	0.7000	0.7700	104.2381	(77)						
Northwest	4.9500	11.2829	0.6300	0.7000	0.7700	17.0687	(81)						
Solar gains	121.3068	212.2998	305.5372	403.8170	475.3480	482.0448	460.5252	405.6105	339.3283	238.6969	146.3300	103.1452	(83)
Total gains	435.6206	525.3851	607.7780	688.2096	740.9429	730.0370	697.4021	646.0648	589.2285	506.5737	434.9072	407.8976	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (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	49.2152	49.3365	49.4560	50.0250	50.1329	50.6415	50.6415	50.7368	50.4444	50.1329	49.9151	49.6894		
alpha	4.2810	4.2891	4.2971	4.3350	4.3422	4.3761	4.3761	4.3825	4.3630	4.3422	4.3277	4.3126		
util living area	0.9976	0.9943	0.9855	0.9580	0.8856	0.7417	0.5811	0.6398	0.8620	0.9750	0.9952	0.9982	(86)	
MIT	19.4394	19.6310	19.9342	20.3289	20.6771	20.9003	20.9736	20.9603	20.7923	20.3329	19.8119	19.4085	(87)	
Th 2	19.7549	19.7575	19.7601	19.7724	19.7747	19.7854	19.7854	19.7874	19.7813	19.7747	19.7700	19.7652	(88)	
util rest of house	0.9968	0.9923	0.9801	0.9410	0.8376	0.6394	0.4351	0.4935	0.7861	0.9618	0.9931	0.9976	(89)	
MIT 2	18.3513	18.5441	18.8464	19.2398	19.5593	19.7405	19.7791	19.7766	19.6678	19.2518	18.7348	18.3284	(90)	
Living area fraction									FLA = Living area / (4) =			0.2744	(91)	
MIT	18.6499	18.8424	19.1450	19.5387	19.8661	20.0588	20.1070	20.1015	19.9764	19.5485	19.0304	18.6248	(92)	
Temperature adjustment												0.0000		
adjusted MIT	18.6499	18.8424	19.1450	19.5387	19.8661	20.0588	20.1070	20.1015	19.9764	19.5485	19.0304	18.6248	(93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9957	0.9902	0.9765	0.9369	0.8418	0.6648	0.4758	0.5342	0.8005	0.9585	0.9913	0.9967	(94)
Useful gains	433.7448	520.2543	593.5016	644.8079	623.7515	485.3140	331.8104	345.1120	471.6852	485.5561	431.1340	406.5662	(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	1429.1235	1385.1230	1253.1915	1042.3623	798.3782	528.3349	339.4256	357.5777	570.9735	874.8765	1171.4982	1422.8751	(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	740.5618	581.1918	490.8092	286.2392	129.9223	0.0000	0.0000	0.0000	0.0000	289.6544	533.0622	756.1339	(98)
Space heating												3807.5747	(98)
Space heating per m2												53.9469	(99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	909.7891	716.2169	734.1923	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8259	0.8929	0.8641	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	751.3960	639.5048	634.3938	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	937.2815	897.4393	838.8043	0.0000	0.0000	0.0000	0.0000	(103)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	(103a)
Space cooling kWh													

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Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	133.8375	191.9033	152.0813	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction												477.8222 (104)
Intermittency factor (Table 10b)												FC = cooled area / (4) =
	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	1.0000 (105)
Space cooling kWh												0.0000 (106)
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	33.4594	47.9758	38.0203	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling per m2												119.4555 (107)
Energy for space heating												1.6925 (108)
Energy for space cooling												53.9469 (99)
Total												1.6925 (108)
Target Fabric Energy Efficiency (TFEE)												55.6394 (109)
												64.0 (109)

Appendix F

**BRUKL Outputs – Be
Clean/Green**

Project name

Shell and Core

The Hyde - Commercial Unit Be Clean/Green

As designed

Date: Thu Jul 13 10:42:49 2023

Administrative information

Building Details

Address: The Hyde - Commercial Unit, Colindale, London, NW9

Certification tool

Calculation engine: SBEM

Calculation engine version: v5.6.b.0

Interface to calculation engine: DesignBuilder SBEM

Interface to calculation engine version: v6.1.8

BRUKL compliance check version: v5.6.b.0

Certifier details

Name: Nimco Ali

Telephone number: 020 3603 1600

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

Criterion 1: The calculated CO₂ emission rate for the building must not exceed the target

CO ₂ emission rate from the notional building, kgCO ₂ /m ² .annum	20.9
Target CO ₂ emission rate (TER), kgCO ₂ /m ² .annum	20.9
Building CO ₂ emission rate (BER), kgCO ₂ /m ² .annum	15.5
Are emissions from the building less than or equal to the target?	BER =< TER
Are as built details the same as used in the BER calculations?	Separate submission

Criterion 2: The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Values which do not achieve the standards in the Non-Domestic Building Services Compliance Guide and Part L are displayed in red.

Building fabric

Element	U _a -Limit	U _a -Calc	U _i -Calc	Surface where the maximum value occurs*
Wall**	0.35	0.15	0.15	"00 Level - Commercial_P_5"
Floor	0.25	0.2	0.2	"00 Level - Commercial_S_2"
Roof	0.25	0.12	0.12	"00 Level - Commercial_R_4"
Windows***, roof windows, and rooflights	2.2	1.4	1.4	"00 Level - Commercial_G_11"
Personnel doors	2.2	-	-	"No external personnel doors"
Vehicle access & similar large doors	1.5	-	-	"No external vehicle access doors"
High usage entrance doors	3.5	-	-	"No external high usage entrance doors"
U _a -Limit = Limiting area-weighted average U-values [W/(m ² K)]		U _a -Calc = Calculated area-weighted average U-values [W/(m ² K)]		U _i -Calc = Calculated maximum individual element U-values [W/(m ² K)]
* There might be more than one surface where the maximum U-value occurs.				
** 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.				
N.B.: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.				

Air Permeability	Worst acceptable standard	This building
m ³ /(h.m ²) at 50 Pa	10	3

Building services

The standard values listed below are minimum values for efficiencies and maximum values for SFPs. Refer to the Non-Domestic Building Services Compliance Guide for details.

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	NO
Whole building electric power factor achieved by power factor correction	<0.9

1- Project HVAC

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4	3.7	-	-	-
Standard value	2.5*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO

* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps. For types <=12 kW output, refer to EN 14825 for limiting standards.

1- Project DHW

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

Local mechanical ventilation, exhaust, and terminal units

ID	System type in Non-domestic Building Services Compliance Guide
A	Local supply or extract ventilation units serving a single area
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 supply and extract ventilation units serving a single room or zone with heating and heat recovery
E	Local supply and extract ventilation system serving a single area with heating and heat recovery
F	Other local ventilation units
G	Fan-assisted terminal VAV unit
H	Fan coil units
I	Zonal extract system where the fan is remote from the zone with grease filter

Zone name	SFP [W/(l/s)]										HR efficiency	
	A	B	C	D	E	F	G	H	I	Zone	Standard	
ID of system type												
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1			
00 Level - Commercial	-	-	-	1.3	-	-	-	-	-	0.85	0.5	

Shell and core configuration

Zone	Assumed shell?
00 Level - Commercial	NO

General lighting and display lighting

Zone name	Luminous efficacy [lm/W]			General lighting [W]
	Luminaire	Lamp	Display lamp	
Standard value	60	60	22	
00 Level - Commercial	100	-	-	1182

Criterion 3: The spaces in the building should have appropriate passive control measures to limit solar gains

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
00 Level - Commercial	NO (-50.8%)	NO

Criterion 4: The performance of the building, as built, should be consistent with the calculated BER

Separate submission

Criterion 5: The necessary provisions for enabling energy-efficient operation of the building should be in place

Separate submission

EPBD (Recast): Consideration of 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
Area [m ²]	197.5	197.5
External area [m ²]	473.8	473.8
Weather	LON	LON
Infiltration [m ³ /hm ² @ 50Pa]	3	5
Average conductance [W/K]	164.11	210.22
Average U-value [W/m ² K]	0.35	0.44
Alpha value* [%]	18.51	17.53

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

Building Use

% Area Building Type

	A1/A2 Retail/Financial and Professional services
	A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways
100	B1 Offices and Workshop businesses
	B2 to B7 General Industrial and Special Industrial Groups
	B8 Storage or Distribution
	C1 Hotels
	C2 Residential Institutions: Hospitals and Care Homes
	C2 Residential Institutions: Residential schools
	C2 Residential Institutions: Universities and colleges
	C2A Secure Residential Institutions
	Residential spaces
	D1 Non-residential Institutions: Community/Day Centre
	D1 Non-residential Institutions: Libraries, Museums, and Galleries
	D1 Non-residential Institutions: Education
	D1 Non-residential Institutions: Primary Health Care Building
	D1 Non-residential Institutions: Crown and County Courts
	D2 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	3.93	8
Cooling	5.97	9.99
Auxiliary	3.9	2.7
Lighting	13.12	18.51
Hot water	2.89	3.34
Equipment*	42.19	42.19
TOTAL**	29.8	42.54

* 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

Energy & CO₂ Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m ²]	151.91	199.45
Primary energy* [kWh/m ²]	91.5	121.01
Total emissions [kg/m ²]	15.5	20.9

* Primary energy is net of any electrical energy displaced by CHP generators, if applicable.

HVAC Systems Performance

System Type	Heat dem MJ/m ²	Cool dem MJ/m ²	Heat con kWh/m ²	Cool con kWh/m ²	Aux con kWh/m ²	Heat SSEFF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Split or multi-split system, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity									
Actual	52.7	99.2	3.9	6	3.9	3.73	4.62	4	6.5
Notional	70	129.4	8	10	2.7	2.43	3.6	----	----

Key to terms

Heat dem [MJ/m ²]	= Heating energy demand
Cool dem [MJ/m ²]	= Cooling energy demand
Heat con [kWh/m ²]	= Heating energy consumption
Cool con [kWh/m ²]	= Cooling energy consumption
Aux con [kWh/m ²]	= 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

Key Features

The Building Control Body is advised to give particular attention to items whose specifications are better than typically expected.

Building fabric

Element	U _{i-Typ}	U _{i-Min}	Surface where the minimum value occurs*
Wall	0.23	0.15	"00 Level - Commercial_P_5"
Floor	0.2	0.2	"00 Level - Commercial_S_2"
Roof	0.15	0.12	"00 Level - Commercial_R_4"
Windows, roof windows, and rooflights	1.5	1.4	"00 Level - Commercial_G_11"
Personnel doors	1.5	-	"No external personnel doors"
Vehicle access & similar large doors	1.5	-	"No external vehicle access doors"
High usage entrance doors	1.5	-	"No external high usage entrance doors"
U _{i-Typ} = Typical individual element U-values [W/(m ² K)]		U _{i-Min} = Minimum individual element U-values [W/(m ² K)]	
* There might be more than one surface where the minimum U-value occurs.			

Air Permeability	Typical value	This building
m ³ /(h.m ²) at 50 Pa	5	3