



Development at Webbs Court, 8 Holmes Road, Reading, RG6 7BH

Energy Statement

Rev A

For

Mr James Talfourd-Cook

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Low Carbon Consultants have the expertise and necessary qualifications to offer advice in a professional capacity on matters relating to Part L of the Building Regulations and sustainability within the construction sector.

This document contains the following information:

- Energy Statement, SAP Calculations

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1. Executive Summary

1.1 Overview

The Energy Statement provides a clear assessment of the proposed development's overall energy requirements and subsequent CO₂ emissions.

In formulating designed energy and carbon emissions Elmhurst's SAP10 software has been used to calculate the estimated CO₂ reductions.

The Energy Strategy provides information on proposed energy efficiency measures and other carbon reductions. It also provides a summary of proposed major fabric building materials, waste management and water management. It considers how the development maintains a balance of environmental, economic, and social issues. Steps taken to promote an effective energy hierarchy are detailed.

1.2 Key Findings

While this development is a proposed conversion from non-residential to residential, it is proposed by the client that carrying out a BREEAM assessment would not be a cost-effective method of demonstrating the proposed reductions in carbon emissions, therefore the new build policy has been adopted. The Energy Statement concludes that a minimum 19% reduction in carbon emissions over a Part L 2021 compliant dwelling can be provided

from on-site renewable energy and energy efficient measures. To demonstrate this low u-values and an air pressure test have been proposed, the SAP calculations suggest that this will be sufficient to meet the necessary requirements.

1.3 DER Comparison

	Result (kgCO ₂ /m ² /yr)
Baseline DER (Dwelling Emission Rate)	30.52
Proposed DER (Dwelling Emission Rate)	24.69
Reduction	5.83
% Reduction	19.1%

2. Introduction

2.1 Background

This Statement has been prepared by Melin Consultants considering *Reading Borough Councils Local Plan*.

It is intended to provide a clear and straightforward assessment of the proposed development's energy requirements and subsequent CO₂ emissions.

The *Reading Borough Councils Local Plan* requires developments to provide sufficient renewable energy generation and/or energy

efficient measures to reduce the carbon emissions from the building by 19%.

This Statement assesses expected energy demand at the site, showing how carbon dioxide emissions will be reduced through designing for minimum energy use and installing on-site renewable energy.

2.2 Policy Requirements

In writing, this report the following policies and guidance have been adopted.

2.2.1 Reading Borough Councils Local Plan (Adopted November 2019)

Policies CC2 & H5 (Standards for new housing)

CC2: SUSTAINABLE DESIGN AND CONSTRUCTION

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

To meet these requirements:

- All major non-residential developments or conversions to residential are required to meet the most up-to-date BREEAM 'Excellent' standards, where possible.
- All minor non-residential developments or conversions to residential are required to meet the most up-to-date BREEAM 'Very Good' standard as a minimum.
- All non-residential development or conversions to residential should incorporate water conservation measures so that predicted per capita consumption does not exceed the appropriate levels set out in the applicable BREEAM standard. Both residential and non-residential development should include recycling greywater and rainwater harvesting where systems are energy and cost effective.

H5: STANDARDS FOR NEW HOUSING

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

- a) All new build housing outside the Central Area as defined on the Proposals Map will comply with the nationally described space standard.

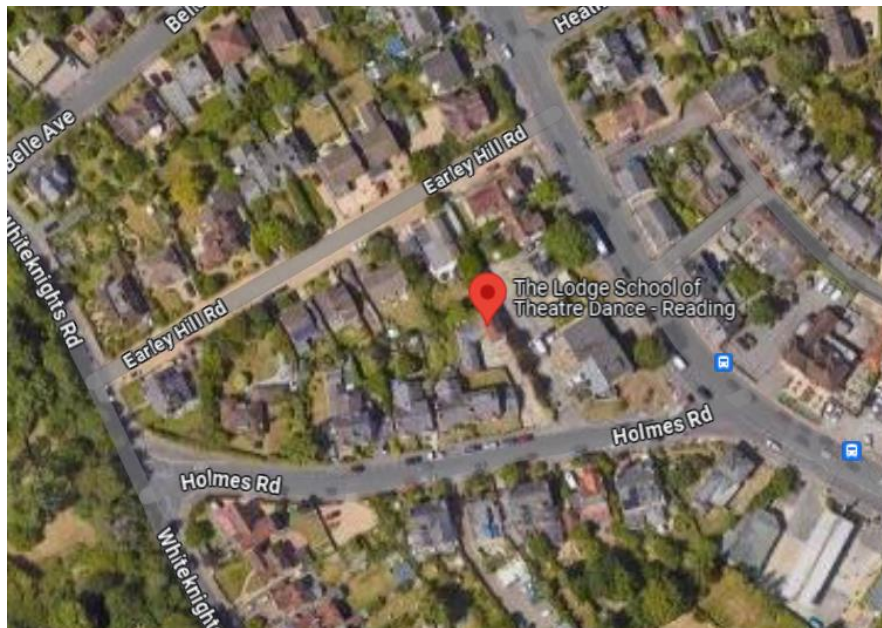
- b) All new build housing will be built to the higher water efficiency standard under Regulation 36(3) of the Building Regulations 79.
- c) All major new-build residential development should be designed to achieve zero carbon homes.
- d) All other new build housing will achieve at a minimum a 19% improvement in the dwelling emission rate over the target emission rate, as defined in the 2013 Building Regulations.
- e) All new build housing will be accessible and adaptable in line with M4(2) of the Building Regulations, unless it is built in line with M4(3) (see below).
- f) On developments of 20 or more new build dwellings, at least 5% of dwellings will be wheelchair user dwellings in line with M4(3) of the Building Regulations. Any market homes provided to meet this requirement will be 'wheelchair adaptable' as defined in part M, whilst homes where the Council is responsible for allocating or nominating an individual may be 'wheelchair accessible'.

3. Site Analysis

3.1 Location

The proposed development is located at the rear of 8 Holmes Road in Reading. Figure 1 below highlights the area of the development.

Figure 1 - Map highlighting the location of the site and its surroundings.



The closest train station is Earley Station, which is approximately 0.8 miles from the development site by road. This train station provides services to London Waterloo, and Reading.

There are several bus stops located on Wokingham Road less than 100m from the development site.

3.2 The Development

The proposed development will consist of the conversion of an existing dance school to create a new 3 bedroomed dwelling.

Figure 2: Proposed site plan

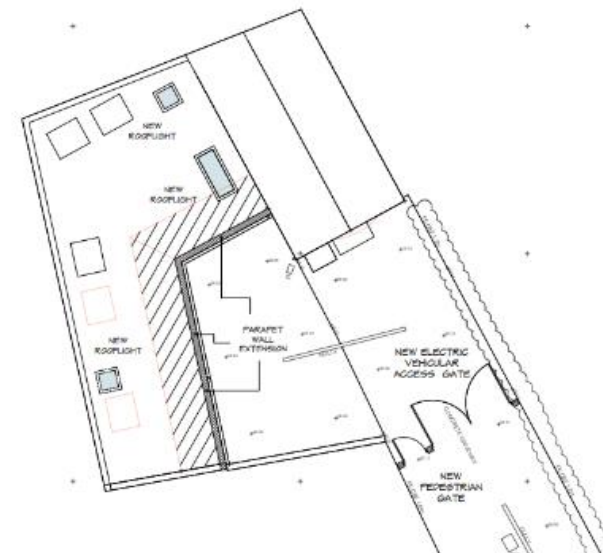
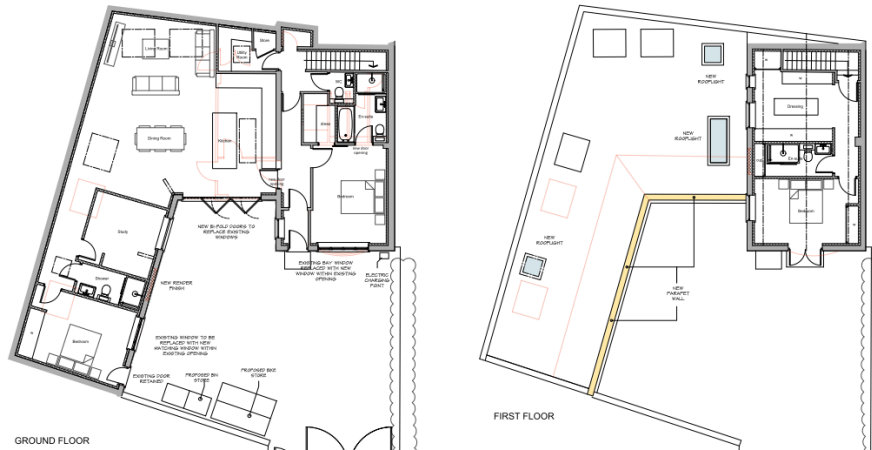


Figure 3: Proposed plans



4. Energy Efficient Design Measures

To supplement Reading Council's requirements for sustainable construction the design team have considered the three issues that contribute to the proposed developments overall sustainability. These are environmental, economic, and social.

4.1 Solar/Daylighting

The proposed development will make good use of glazing to all elevations to help reduce internal lighting loads.

4.2 Lighting

It has been assumed within the calculations that all internal lighting will be low energy fittings. To be classified as a low energy light fitting under the Domestic Building Services Guide the fitting must have an efficacy of 75 lumens per circuit watt or higher.

In addition, all external security and safety lighting will be fitted with daylight and movement sensors.

4.3 Heating, cooling & DHW strategy

The proposed heating and domestic hot water strategy is likely to be from a mains gas combi boiler. A SAP default gas combi boiler has therefore been used for the purposes of this report. A new boiler is likely to be significantly more efficient than the default used in the calculations.

4.4 Ventilation strategy

A natural ventilation system has been specified to provide ventilation for the whole dwelling. Intermittent mechanical extract fans have been proposed for the kitchen, shower/bath rooms, en-suites, WC and utility room. These will meet the current requirements of Part F of the Building Regulations.

4.5 Water use

In order to meet Building Regulations requirements, water usage must not exceed 110 Litres/person/day in line with Enhanced Building Regulations Part G criteria. To achieve this the following fittings will be required:

- WCs – dual flush 4 (full flush), 2.6 (part flush)
- Kitchen taps – 6 litres per minute
- Basin taps – 6 litres per minute
- Baths – 180 litre capacity
- Showers – 8 litres per minute

4.6 Materials

Where possible, it is proposed that construction materials will be purchased from sources that minimise carbon emissions and/or come from sustainable sources. The environmental policy and sustainability policy for each manufacturer shall be carefully considered before orders are placed.

Where possible, timber should be sourced that has Forest Stewardship Council (FSC) or Programme for the Endorsement of Forest Certification PEFC) certification. This is to ensure that the timber is legally and sustainably sourced.

4.7 Energy Efficiency Measures

To reduce the energy demand within the dwelling, low U values, and an air permeability figure has been used. The U values we have used are as follows:

- External Wall – 0.18 W/m²K
- Plane Roof – 0.11 W/m²K
- New Doors – 1.20 W/m²K
- New Windows – 1.20 W/m²K
- New Rooflight – 1.20 W/m²K
- An air test figure of 8.00 m³/h/m² at 50Pa has been used.
- Delayed start thermostat on heating system.
- Showers – 8 litres per minute

4.8 Reducing surface water run-off

All development shall minimise the impact of surface water runoff from the development in the design of the drainage system, and where possible incorporate mitigation and resilience measures for any increases in river flooding levels as a result of climate change.

4.9 Renewable technologies

Several low carbon and renewable technologies have been considered for the proposed scheme.

A summary of the suitability of each technology is listed in the following table.

Table 4 – Summary of renewable technology

Solar PV
Solar PV lends itself to the proposed development with minimal obstruction and a significant available installation area. The electricity demand of the proposed building is not going to be significant during period of occupation and a 19% reduction in carbon emissions is achievable by using this technology on its own.
Solar thermal
The proposed development would have low to medium hot water demand which, if sized correctly, lends itself too solar thermal. It is unlikely that the full 19% reduction in carbon emissions could be achieved with this system alone as a large area of solar thermal panels would be required to achieve this.
Air source heat pumps
Air source technology is a potential technology that could be used on the proposed development. It would require wall or roof mounted plant which may present visual issues. It is likely that the

full 19% reduction in carbon emissions could be achieved with this system alone

Biomass

Biomass is a potential technology for the site however, space for fuel storage could be an issue within the development. Biomass boilers do not modulate as well as a conventional fuel boiler and would therefore require a constant heat demand to be sized correctly. It is unlikely that the full 19% reduction in carbon emissions could be achieved with this system alone

Ground source heat pumps

The energy demand of the proposed development would be suitable for ground source technology. Further investigation would be required into the area required for the external works and whether the Geology of the site is suitable. It is likely that the full 19% reduction in carbon emissions could be achieved with this system alone

Water source heat pump

The energy demand of the proposed development would be suitable for water source technology. Further investigation would be required into the area required for the external works and whether the Geology of the site is suitable. It is likely that the full 19% reduction in carbon emissions could be achieved with this system alone

Wind

The estimated wind speed for the location and surrounding obstructions do not lend itself to this technology.

CHP

Low electricity demand makes CHP an unviable option for this development.

5. Baseline Energy Demand and CO₂ Emissions

5.1 Energy Benchmarks

Energy performance benchmarks for the proposed development are taken from 'Energy efficiency in buildings' CIBSE Guide F (2012) and where appropriate data from relevant design team members and thermal modelling calculations.

To demonstrate how the development has reduced carbon emissions by a prescribed amount, technical calculations (SAP10.2) provide baseline CO₂ emissions for a building that is compliant with Part L 2021 (baseline buildings with conventional gas boiler), followed by a final set of calculations that provide the dwelling CO₂ emissions (DER) for a building with renewable technologies and energy efficient measures.

5.2 Baseline calculations

The u-values used to achieve a compliant baseline dwelling are as follows:

- External Wall – 0.30 W/m²K
- Ground Floor – 0.25 W/m²K
- Slope Roof – 0.16 W/m²K
- Flat Roof – 0.16 W/m²K
- Plane Roof – 0.16 W/m²K
- New Flat Roof – 0.15 W/m²K

- New Doors – 1.40 W/m²K
- New Windows – 1.40 W/m²K
- New Rooflights – 1.40 W/m²K
- An air test figure of 15.00 m³/h/m² at 50Pa has been used.
- SAP Default gas combi boiler feeding radiators
- Showers – 11 litres per minute

5.3 Reduction in energy usage through on-site renewable technology and energy efficient measures

In order to achieve the 19% reduction in carbon emissions, several renewable technologies have been considered for the proposed development (Solar Thermal, Solar PV, Wind, ASHP, GSHP, WSHP, CHP and Biomass). Energy efficient measures were considered the most appropriate in this development.

5.4 Regulated Energy

All our calculations have been based on regulated energy, which includes all energy used for space and water heating, electricity for lighting and all other fixed items such as pumps and fans.

6. Energy Statement for the Chosen Technology

Based on the information provided in the above report, below is a summary of the savings:

	CO ₂ emissions (kg/m ² pa)
Baseline DER (Dwelling Emission Rate)	30.52
Proposed DER (Dwelling Emission Rate)	24.69
Reduction in emissions from the use of renewable sources & energy efficient measures	5.83
Percentage reduction from the use of renewable sources & energy efficient measures	19.1%

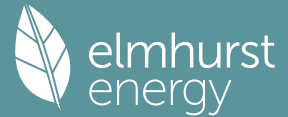
7. Conclusion

With the inclusion of energy efficient measures including low U values and air test figure, the proposed development can demonstrate a potential to reduce carbon emissions by greater than 19% over a Part L Building Regulations 2021 compliant dwelling emissions rate as outlined in the table above.

Appendix A:

Software Outputs

Full SAP Calculation Printout



Property Reference	304746 - Baseline			Issued on Date	15/08/2024
Assessment Reference	304746	Prop Type Ref	304746		
Property	Dance studio-Dwelling, 8 Holmes Road, Reading, RG6 7BH				
SAP Rating	71 C	DER	30.52	TER	
Environmental	67 D	% DER < TER			N/A
CO ₂ Emissions (t/year)	4.93	DFEE	104.99	TFEE	
Compliance Check	See BREL	% DFEE < TFEE			
% DPER < TPER		DPER	166.04	TPER	
Assessor Details	Mr. David Anslow			Assessor ID	AV54-0001
Client	Mr James Talfourd-Cook, Mr James Talfourd-Cook				

SAP 10 WORKSHEET FOR Conversion (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	151.7000 (1b)	x 2.4100 (2b)	= 365.5970 (1b) - (3b)
First floor	41.5600 (1c)	x 2.5300 (2c)	= 105.1468 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	193.2600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 470.7438 (5)

2. Ventilation rate

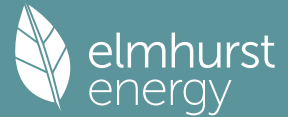
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	6 * 10 = 60.0000 (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)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	Air changes per hour 60.0000 / (5) = 0.1275 (8)
Pressure test	No
Pressure Test Method	Blower Door
Measured/design AP50	15.0000 (17)
Infiltration rate	0.8775 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.8775 (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	1.1188	1.0968	1.0749	0.9652	0.9433	0.8336	0.8336	0.8116	0.8775	0.9433	0.9871	1.0310 (22b)
Effective ac	1.1188	1.0968	1.0749	0.9658	0.9449	0.8474	0.8474	0.8294	0.8850	0.9449	0.9872	1.0310 (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
Existing Solid Door			4.0000	3.0000	12.0000		(26)
Existing Glazed Door (Uw = 2.70)			3.3600	2.4368	8.1877		(27)
Existing Window (Uw = 2.70)			5.2200	2.4368	12.7202		(27)
New Glazed Door (Uw = 1.40)			7.9200	1.3258	10.5000		(27)
New Window (Uw = 1.40)			4.7600	1.3258	6.3106		(27)
Horizontal			5.6300	2.8369	15.9716		(27a)
New Horizontal			2.6300	1.3258	3.4867		(27a)
Ground Floor			151.7000	0.2500	37.9250		(28a)
External Wall	216.6300	25.2600	191.3700	0.3000	57.4110	110.0000	16687.0000 (29a)
Flat Roof	81.8400	8.2600	73.5800	0.1600	11.7728	9.0000	662.2200 (30)
Slope Roof	12.3300		12.3300	0.1600	1.9728	9.0000	110.9700 (30)
Plane Roof	32.3800		32.3800	0.1600	5.1808	9.0000	291.4200 (30)
New Flat Roof	28.3000		28.3000	0.1500	4.2450	9.0000	254.7000 (30)
Total net area of external elements A _{um} (A, m ²)			523.1800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	187.6843		(33)
Internal Wall			335.2700			100.0000	33527.0000 (32c)
Internal Floor			41.5600			18.0000	748.0800 (32d)
Internal Ceiling			41.5600			9.0000	374.0400 (32e)

Full SAP Calculation Printout



Heat capacity $C_m = \text{Sum}(A \times k)$
Thermal mass parameter ($\text{TMP} = C_m / \text{TFA}$) in $\text{kJ/m}^2\text{K}$
Thermal bridges (Default value $0.200 \times \text{total exposed area}$)
Point Thermal bridges
Total fabric heat loss

(28)...(30) + (32) + (32a)...(32e) = 73706.1300 (34)
381.3833 (35)
104.6360 (36)
(36a) = 0.0000
(33) + (36) + (36a) = 292.3203 (37)

Ventilation heat loss calculated monthly (38)m = $0.33 \times (25)\text{m} \times (5)$												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	173.7941	170.3864	166.9786	150.0340	146.7823	131.6447	131.6447	128.8414	137.4755	146.7823	153.3606	160.1632 (38)
Average = $\text{Sum}(39)\text{m} / 12 =$	466.1144	462.7067	459.2990	442.3544	439.1026	423.9650	423.9650	421.1618	429.7958	439.1026	445.6809	452.4835 (39)
												442.1443
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	2.4119	2.3942	2.3766	2.2889	2.2721	2.1938	2.1938	2.1792	2.2239	2.2721	2.3061	2.3413 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.9931 (42)											
Hot water usage for mixer showers	74.4051 73.2869 71.6575 68.5400 66.2393 63.6736 62.2153 63.8324 65.6050 68.3597 71.5442 74.1200 (42a)											
Hot water usage for baths	32.1198 31.6428 30.9711 29.7325 28.8050 27.7766 27.2212 27.8882 28.6145 29.7149 30.9790 32.0112 (42b)											
Hot water usage for other uses	45.2828 43.6361 41.9895 40.3429 38.6962 37.0496 37.0496 38.6962 40.3429 41.9895 43.6361 45.2828 (42c)											
Average daily hot water use (litres/day)	139.5453 (43)											
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	151.8077	148.5658	144.6181	138.6153	133.7405	128.4998	126.4860	130.4168	134.5623	140.0641	146.1594	151.4140 (44)
Energy content (annual)	240.4263	211.5558	222.2726	189.7574	180.0405	158.0056	152.9739	161.4832	165.9288	190.0657	208.2308	237.0778 (45)
Distribution loss (46)m = $0.15 \times (45)\text{m}$	Total = $\text{Sum}(45)\text{m} = 2317.8182$											
Water storage loss:	36.0639	31.7334	33.3409	28.4636	27.0061	23.7008	22.9461	24.2225	24.8893	28.5099	31.2346	35.5617 (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)
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)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month	291.3852	257.5832	273.2315	239.0725	230.9994	207.3206	203.9328	212.4421	215.2439	241.0246	257.5459	288.0367 (62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63b)
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 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	291.3852	257.5832	273.2315	239.0725	230.9994	207.3206	203.9328	212.4421	215.2439	241.0246	257.5459	288.0367 (64)
12Total per year (kWh/year)	Total per year (kWh/year) = $\text{Sum}(64)\text{m} = 2917.8182$ (64)											
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
	Total Energy used by instantaneous electric shower(s) (kWh/year) = $\text{Sum}(64a)\text{m} = 0.0000$ (64a)											
Heat gains from water heating, kWh/month	92.6815	81.8491	86.6454	75.4231	72.6032	64.8656	63.6035	66.4329	67.5001	75.9366	81.5655	91.5681 (65)

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

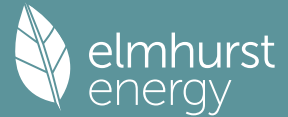
Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	149.6572	149.6572	149.6572	149.6572	149.6572	149.6572	149.6572	149.6572	149.6572	149.6572	149.6572	149.6572 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	191.5034	212.0216	191.5034	197.8869	191.5034	197.8869	191.5034	191.5034	197.8869	191.5034	197.8869	191.5034 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	364.5939	368.3772	358.8433	338.5468	312.9260	288.8461	272.7593	268.9759	278.5098	298.8064	324.4272	348.5070 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.9657	37.9657	37.9657	37.9657	37.9657	37.9657	37.9657	37.9657	37.9657	37.9657	37.9657	37.9657 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-119.7258	-119.7258	-119.7258	-119.7258	-119.7258	-119.7258	-119.7258	-119.7258	-119.7258	-119.7258	-119.7258	-119.7258 (71)
Water heating gains (Table 5)	124.5718	121.7993	116.4588	104.7543	97.5849	90.0911	85.4886	89.2915	93.7501	102.0653	113.2854	123.0754 (72)
Total internal gains	751.5663	773.0954	737.7027	712.0851	672.9115	644.7213	617.6485	617.6681	638.0440	663.2723	706.4966	733.9830 (73)

6. Solar gains

[Jan]						Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
South						3.3600	46.7521	0.7600	0.7000	0.7700	57.9142 (78)	
East						1.6500	19.6403	0.7600	0.7000	0.7700	11.9475 (76)	
West						3.5700	19.6403	0.7600	0.7000	0.7700	25.8500 (80)	
South						5.6300	26.0000	0.7600	0.7000	1.0000	70.0867 (82)	
South						7.9200	46.7521	0.7600	0.7000	0.7700	136.5120 (78)	
East						1.6500	19.6403	0.7600	0.7000	0.7700	11.9475 (76)	
South						3.1100	46.7521	0.7600	0.7000	0.7700	53.6051 (78)	
South						2.6300	26.0000	0.7600	0.7000	1.0000	32.7403 (82)	
Solar gains	400.6033	717.0869	1057.3689	1411.7814	1655.1997	1670.6850	1599.6650	1417.2042	1181.7277	814.6281	486.5391	338.2823 (83)
Total gains	1152.1696	1490.1823	1795.0716	2123.8666	2328.1112	2315.4063	2217.3135	2034.8723	1819.7717	1477.9004	1193.0357	1072.2653 (84)

7. Mean internal temperature (heating season)

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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	43.9247	44.2482	44.5765	46.2840	46.6267	48.2915	48.2915	48.6130	47.6364	46.6267	45.9385	45.2479
alpha	3.9283	3.9499	3.9718	4.0856	4.1084	4.2194	4.2194	4.2409	4.1758	4.1084	4.0626	4.0165
util living area	0.9995	0.9986	0.9960	0.9861	0.9547	0.8666	0.7329	0.7888	0.9454	0.9934	0.9990	0.9997 (86)
MIT	18.7640	18.9863	19.3511	19.8864	20.3627	20.7558	20.9170	20.8850	20.5713	19.9390	19.2933	18.7813 (87)
Th 2	19.0729	19.0835	19.0941	19.1477	19.1581	19.2073	19.2073	19.2165	19.1882	19.1581	19.1371	19.1155 (88)
util rest of house	0.9993	0.9978	0.9934	0.9755	0.9138	0.7342	0.4849	0.5567	0.8730	0.9868	0.9983	0.9995 (89)
MIT 2	17.1396	17.3689	17.7398	18.3064	18.7652	19.1198	19.1969	19.1981	18.9823	18.3707	17.7133	17.1864 (90)
Living area fraction	fLA = Living area / (4) = 0.3545 (91)											
MIT	17.7155	17.9423	18.3111	18.8666	19.3316	19.6998	19.8067	19.7962	19.5456	18.9267	18.2735	17.7519 (92)
Temperature adjustment	0.0000											
adjusted MIT	17.7155	17.9423	18.3111	18.8666	19.3316	19.6998	19.8067	19.7962	19.5456	18.9267	18.2735	17.7519 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9989	0.9970	0.9917	0.9731	0.9190	0.7798	0.5805	0.6473	0.8932	0.9854	0.9977	0.9993 (94)	
Useful gains	1150.9464	1485.7025	1780.1540	2066.7871	2139.6362	1805.4574	1287.1344	1317.2169	1625.3629	1456.3842	1190.3007	1071.4615 (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	6253.1701	6034.7701	5424.8287	4408.7751	3351.0452	2162.1457	1359.5407	1430.3398	2340.5157	3656.2846	4979.8134	6132.0031 (97)	
Space heating kWh	3796.0544	3056.9734	2711.6380	1686.2313	901.2883	0.0000	0.0000	0.0000	0.0000	1636.7259	2728.4491	3765.0429 (98a)	
Space heating requirement - total per year (kWh/year)												20282.4035	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)	
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	3796.0544	3056.9734	2711.6380	1686.2313	901.2883	0.0000	0.0000	0.0000	0.0000	1636.7259	2728.4491	3765.0429 (98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												20282.4035	
Space heating per m2											(98c) / (4) =	104.9488 (99)	

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 %)													84.0000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	3796.0544	3056.9734	2711.6380	1686.2313	901.2883	0.0000	0.0000	0.0000	0.0000	1636.7259	2728.4491	3765.0429 (98)	
Space heating efficiency (main heating system 1)	84.0000	84.0000	84.0000	84.0000	84.0000	0.0000	0.0000	0.0000	0.0000	84.0000	84.0000	84.0000 (210)	
Space heating fuel (main heating system)	4519.1124	3639.2541	3228.1405	2007.4182	1072.9623	0.0000	0.0000	0.0000	0.0000	1948.4832	3248.1537	4482.1940 (211)	
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)	
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)	
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)	
Water heating													
Water heating requirement	291.3852	257.5832	273.2315	239.0725	230.9994	207.3206	203.9328	212.4421	215.2439	241.0246	257.5459	288.0367 (64)	
Efficiency of water heater (217)m	83.2875	83.2239	83.0873	82.7667	81.9927	75.0000	75.0000	75.0000	75.0000	82.7258	83.1395	75.0000 (216)	
Fuel for water heating, kWh/month	349.8546	309.5063	328.8486	288.8510	281.7316	276.4275	271.9104	283.2562	286.9918	291.3537	309.7756	345.8250 (219)	
Space cooling fuel requirement													
(221)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 (221)	
Pumps and Fa	3.4822	3.1452	3.4822	3.3699	3.4822	3.3699	3.4822	3.4822	3.3699	3.4822	3.3699	3.4822 (231)	
Lighting	52.2206	41.8933	37.7202	27.6355	21.3464	17.4402	19.4729	25.3117	32.8773	43.1368	48.7230	53.6719 (232)	
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)	
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)	
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)	
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)	
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)	
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)	
Annual totals kWh/year													
Space heating fuel - main system 1												24145.7184 (211)	
Space heating fuel - main system 2												0.0000 (213)	
Space heating fuel - secondary												0.0000 (215)	
Efficiency of water heater												75.0000	
Water heating fuel used												3624.3323 (219)	
Space cooling fuel												0.0000 (221)	
Electricity for pumps and fans:													
central heating pump												41.0000 (230c)	
Total electricity for the above, kWh/year												41.0000 (231)	
Electricity for lighting (calculated in Appendix L)												421.4499 (232)	
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000 (233)	
Wind generation												0.0000 (234)	
Hydro-electric generation (Appendix N)												0.0000 (235a)	
Electricity generated - Micro CHP (Appendix N)												0.0000 (235)	

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Appendix Q - special features

Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	28232.5006 (238)

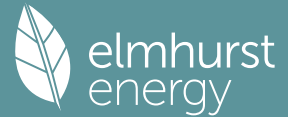
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	24145.7184	0.2100	5070.6009 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3624.3323	0.2100	761.1098 (264)
Space and water heating			5831.7107 (265)
Pumps, fans and electric keep-hot	41.0000	0.1387	5.6872 (267)
Energy for lighting	421.4499	0.1443	60.8282 (268)
Total CO2, kg/year			5898.2261 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			30.5200 (273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	24145.7184	1.1300	27284.6618 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3624.3323	1.1300	4095.4955 (278)
Space and water heating			31380.1573 (279)
Pumps, fans and electric keep-hot	41.0000	1.5128	62.0248 (281)
Energy for lighting	421.4499	1.5338	646.4339 (282)
Total Primary energy kWh/year			32088.6160 (286)
Dwelling Primary energy Rate (DPER)			166.0400 (287)

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Property Reference	304746 - Improved			Issued on Date	15/08/2024
Assessment Reference	304746	Prop Type Ref	304746		
Property	Dance studio-Dwelling, 8 Holmes Road, Reading, RG6 7BH				
SAP Rating	76 C	DER	24.69	TER	
Environmental	74 C	% DER < TER			N/A
CO ₂ Emissions (t/year)	4.09	DFEE	84.10	TFEE	
Compliance Check	See BREL	% DFEE < TFEE			
% DPER < TPER		DPER	134.67	TPER	
Assessor Details	Mr. David Anslow			Assessor ID	AV54-0001
Client	Mr James Talfourd-Cook, Mr James Talfourd-Cook				

SAP 10 WORKSHEET FOR Conversion (As Designed) (Version 10.2, February 2022)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	151.7000 (1b)	x 2.4100 (2b)	= 365.5970 (1b) - (3b)
First floor	41.5600 (1c)	x 2.5300 (2c)	= 105.1468 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	193.2600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 470.7438 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	6 * 10 = 60.0000 (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)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	Air changes per hour 60.0000 / (5) = 0.1275 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	8.0000 (17)
Infiltration rate	0.5275 (18)
Number of sides sheltered	0 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 1.0000 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.5275 (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	0.6725	0.6593	0.6461	0.5802	0.5670	0.5011	0.5011	0.4879	0.5275	0.5670	0.5934	0.6198 (22b)
Effective ac	0.7261	0.7174	0.7087	0.6683	0.6608	0.6255	0.6255	0.6190	0.6391	0.6608	0.6761	0.6921 (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
Existing Solid Door			4.0000	3.0000	12.0000		(26)
Existing Glazed Door (Uw = 2.70)			3.3600	2.4368	8.1877		(27)
Existing Window (Uw = 2.70)			5.2200	2.4368	12.7202		(27)
New Glazed Door (Uw = 1.20)			7.9200	1.1450	9.0687		(27)
New Window (Uw = 1.20)			4.7600	1.1450	5.4504		(27)
Horizontal			5.6300	2.8369	15.9716		(27a)
New Horizontal			2.6300	1.1450	3.0115		(27a)
Ground Floor			151.7000	0.2500	37.9250		(28a)
External Wall	216.6300	25.2600	191.3700	0.1800	34.4466	110.0000	16687.0000 (29a)
Flat Roof	81.8400	8.2600	73.5800	0.1600	11.7728	9.0000	662.2200 (30)
Slope Roof	12.3300		12.3300	0.1600	1.9728	9.0000	110.9700 (30)
Plane Roof	32.3800		32.3800	0.1100	3.5618	9.0000	291.4200 (30)
New Flat Roof	28.3000		28.3000	0.1500	4.2450	9.0000	254.7000 (30)
Total net area of external elements Aum(A, m ²)			523.1800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	160.3341		(33)
Internal Wall			335.2700			100.0000	33527.0000 (32c)
Internal Floor			41.5600			18.0000	748.0800 (32d)
Internal Ceiling			41.5600			9.0000	374.0400 (32e)

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Heat capacity $C_m = \text{Sum}(A \times k)$
 Thermal mass parameter ($\text{TMP} = C_m / \text{TFA}$) in $\text{kJ/m}^2\text{K}$
 Thermal bridges (Default value $0.200 \times \text{total exposed area}$)
 Point Thermal bridges
 Total fabric heat loss

$(28) \dots (30) + (32) + (32a) \dots (32e) = 73706.1300$ (34)
 $= 381.3833$ (35)
 $= 104.6360$ (36)
 $(36a) = 0.0000$
 $(33) + (36) + (36a) = 264.9701$ (37)

Ventilation heat loss calculated monthly (38)m = $0.33 \times (25)\text{m} \times (5)$												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	112.8016	111.4375	110.1004	103.8202	102.6452	97.1753	97.1753	96.1623	99.2822	102.6452	105.0222	107.5073
Average = $\text{Sum}(39)\text{m} / 12 =$	377.7717	376.4076	375.0705	368.7903	367.6153	362.1454	362.1454	361.1324	364.2523	367.6153	369.9923	372.4774
												368.7847
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.9547	1.9477	1.9408	1.9083	1.9022	1.8739	1.8739	1.8686	1.8848	1.9022	1.9145	1.9273
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy	2.9931											
Hot water usage for mixer showers	74.4051											
Hot water usage for baths	74.4051	73.2869	71.6575	68.5400	66.2393	63.6736	62.2153	63.8324	65.6050	68.3597	71.5442	74.1200
Hot water usage for other uses	32.1198	31.6428	30.9711	29.7325	28.8050	27.7766	27.2212	27.8882	28.6145	29.7149	30.9790	32.0112
Average daily hot water use (litres/day)	45.2828	43.6361	41.9895	40.3429	38.6962	37.0496	37.0496	38.6962	40.3429	41.9895	43.6361	45.2828
												139.5453
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	151.8077	148.5658	144.6181	138.6153	133.7405	128.4998	126.4860	130.4168	134.5623	140.0641	146.1594	151.4140
Energy content (annual)	240.4263	211.5558	222.2726	189.7574	180.0405	158.0056	152.9739	161.4832	165.9288	190.0657	208.2308	237.0778
Distribution loss (46)m = $0.15 \times (45)\text{m}$	36.0639	31.7334	33.3409	28.4636	27.0061	23.7008	22.9461	24.2225	24.8893	28.5099	31.2346	35.5617
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
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
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
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589
Total heat required for water heating calculated for each month	291.3852	257.5832	273.2315	239.0725	230.9994	207.3206	203.9328	212.4421	215.2439	241.0246	257.5459	288.0367
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
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
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Output from w/h	291.3852	257.5832	273.2315	239.0725	230.9994	207.3206	203.9328	212.4421	215.2439	241.0246	257.5459	288.0367
12Total per year (kWh/year)	2917.8182											
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Heat gains from water heating, kWh/month	92.6815	81.8491	86.6454	75.4231	72.6032	64.8656	63.6035	66.4329	67.5001	75.9366	81.5655	91.5681

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

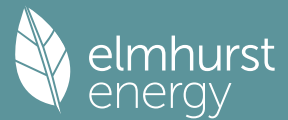
Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	149.6572	149.6572	149.6572	149.6572	149.6572	149.6572	149.6572	149.6572	149.6572	149.6572	149.6572	149.6572
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	191.5034	212.0216	191.5034	197.8869	191.5034	197.8869	191.5034	191.5034	197.8869	191.5034	197.8869	191.5034
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	364.5939	368.3772	358.8433	338.5468	312.9260	288.8461	272.7593	268.9759	278.5098	298.8064	324.4272	348.5070
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.9657	37.9657	37.9657	37.9657	37.9657	37.9657	37.9657	37.9657	37.9657	37.9657	37.9657	37.9657
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000
Losses e.g. evaporation (negative values) (Table 5)	-119.7258	-119.7258	-119.7258	-119.7258	-119.7258	-119.7258	-119.7258	-119.7258	-119.7258	-119.7258	-119.7258	-119.7258
Water heating gains (Table 5)	124.5718	121.7993	116.4588	104.7543	97.5849	90.0911	85.4886	89.2915	93.7501	102.0653	113.2854	123.0754
Total internal gains	751.5663	773.0954	737.7027	712.0851	672.9115	644.7213	617.6485	617.6681	638.0440	663.2723	706.4966	733.9830

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
South	3.3600	46.7521	0.7600	0.7000	0.7700	57.9142
East	1.6500	19.6403	0.7600	0.7000	0.7700	11.9475
West	3.5700	19.6403	0.7600	0.7000	0.7700	25.8500
South	5.6300	26.0000	0.7600	0.7000	1.0000	70.0867
South	7.9200	46.7521	0.7600	0.7000	0.7700	136.5120
East	1.6500	19.6403	0.7600	0.7000	0.7700	11.9475
South	3.1100	46.7521	0.7600	0.7000	0.7700	53.6051
South	2.6300	26.0000	0.7600	0.7000	1.0000	32.7403
Solar gains	400.6033	717.0869	1057.3689	1411.7814	1655.1997	1670.6850
Total gains	1152.1696	1490.1823	1795.0716	2123.8666	2328.1112	2315.4063

7. Mean internal temperature (heating season)

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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	54.1966	54.3930	54.5869	55.5164	55.6939	56.5351	56.5351	56.6937	56.2081	55.6939	55.3361	54.9669
alpha	4.6131	4.6262	4.6391	4.7011	4.7129	4.7690	4.7690	4.7796	4.7472	4.7129	4.6891	4.6645
util living area	0.9997	0.9989	0.9961	0.9838	0.9413	0.8271	0.6695	0.7340	0.9294	0.9930	0.9992	0.9998 (86)
MIT	19.1687	19.3753	19.7016	20.1528	20.5615	20.8556	20.9609	20.9399	20.7057	20.1584	19.5904	19.1527 (87)
Th 2	19.3637	19.3684	19.3731	19.3952	19.3993	19.4187	19.4187	19.4223	19.4113	19.3993	19.3910	19.3822 (88)
util rest of house	0.9995	0.9982	0.9936	0.9722	0.8949	0.6938	0.4542	0.5234	0.8503	0.9863	0.9986	0.9997 (89)
MIT 2	17.7519	17.9616	18.2902	18.7505	19.1325	19.3690	19.4138	19.4128	19.2726	18.7644	18.1936	17.7495 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	18.2542	18.4628	18.7906	19.2477	19.6391	19.8961	19.9623	19.9543	19.7807	19.2586	18.6888	18.2470 (92)
Temperature adjustment												
adjusted MIT	18.1042	18.3128	18.6406	19.0977	19.4891	19.7461	19.8123	19.8043	19.6307	19.1086	18.5388	18.0970 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9993	0.9975	0.9919	0.9692	0.8983	0.7268	0.5129	0.5814	0.8652	0.9844	0.9981	0.9995 (94)
Useful gains	1151.3219	1486.4654	1780.5094	2058.3538	2091.4541	1682.7820	1137.1851	1183.1002	1574.4391	1454.8146	1190.7734	1071.7153 (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	5214.8429	5048.6838	4553.5748	3760.8079	2863.3975	1863.6321	1163.3334	1229.3889	2014.5647	3127.9004	4232.2743	5176.3232 (97)
Space heating kWh	3023.2596	2393.8108	2063.1607	1225.7669	574.3259	0.0000	0.0000	0.0000	0.0000	1244.7759	2189.8807	3053.8282 (98a)
Space heating requirement - total per year (kWh/year)												15768.8087
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh	3023.2596	2393.8108	2063.1607	1225.7669	574.3259	0.0000	0.0000	0.0000	0.0000	1244.7759	2189.8807	3053.8282 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												15768.8087
Space heating per m2												(98c) / (4) = 81.5938 (99)

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 %)													84.0000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	3023.2596	2393.8108	2063.1607	1225.7669	574.3259	0.0000	0.0000	0.0000	0.0000	1244.7759	2189.8807	3053.8282	(98)
Space heating efficiency (main heating system 1)	84.0000	84.0000	84.0000	84.0000	84.0000	0.0000	0.0000	0.0000	0.0000	84.0000	84.0000	84.0000	(210)
Space heating fuel (main heating system)	3599.1186	2849.7747	2456.1437	1459.2463	683.7213	0.0000	0.0000	0.0000	0.0000	1481.8760	2607.0008	3635.5098	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	291.3852	257.5832	273.2315	239.0725	230.9994	207.3206	203.9328	212.4421	215.2439	241.0246	257.5459	288.0367	(64)
Efficiency of water heater (217)m	83.1231	83.0320	82.8375	82.3865	81.2049	75.0000	75.0000	75.0000	75.0000	82.3961	82.9525	75.0000	(216)
Fuel for water heating, kWh/month	350.5464	310.2215	329.8403	290.1841	284.4650	276.4275	271.9104	283.2562	286.9918	292.5196	310.4739	346.4474	(219)
Space cooling fuel requirement													
(221)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	(221)
Pumps and Fa	3.4822	3.1452	3.4822	3.3699	3.4822	3.3699	3.4822	3.4822	3.3699	3.4822	3.3699	3.4822	(231)
Lighting	52.2206	41.8933	37.7202	27.6355	21.3464	17.4402	19.4729	25.3117	32.8773	43.1368	48.7230	53.6719	(232)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												18772.3913	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												75.0000	
Water heating fuel used												3633.2841	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
central heating pump												41.0000	(230c)
Total electricity for the above, kWh/year												41.0000	(231)
Electricity for lighting (calculated in Appendix L)												421.4499	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)

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Appendix Q - special features

Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	22868.1253 (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	18772.3913	0.2100	3942.2022 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3633.2841	0.2100	762.9897 (264)
Space and water heating			4705.1918 (265)
Pumps, fans and electric keep-hot	41.0000	0.1387	5.6872 (267)
Energy for lighting	421.4499	0.1443	60.8282 (268)
Total CO2, kg/year			4771.7073 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			24.6900 (273)

13a. Primary energy - Individual heating systems including micro-CHP

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	18772.3913	1.1300	21212.8022 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3633.2841	1.1300	4105.6111 (278)
Space and water heating			25318.4132 (279)
Pumps, fans and electric keep-hot	41.0000	1.5128	62.0248 (281)
Energy for lighting	421.4499	1.5338	646.4339 (282)
Total Primary energy kWh/year			26026.8719 (286)
Dwelling Primary energy Rate (DPER)			134.6700 (287)