

SUSTAINABILITY STATEMENT

Client: Peter George Town Planning

Site Address: Slip End Farm, Slip End, Baldock. SG7 6SG

Local Authority: North Herts District Council

Project Details: 9 New dwellings



PREPARED BY: AP CONSULTING ENGINEERS LTD
ELMHURST ACCREDITED ENERGY ASSESSOR 8075-0001
STROMA ON CONSTRUCTION ENERGY ASSESSOR STRO006128
BRE CODE FOR SUSTAINABLE HOMES ASSESSOR
AUTHOR: PAUL ALLEN BEng (HONS)
MARCH 2026 REVISION [1]

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BACKGROUND

This statement has been prepared on behalf of Peter George Town Planning in support of a residential development comprising 9 new dwellings and associated external works on land at Slip End Farm, Baldock.

AIMS & OBJECTIVES

This statement will demonstrate how the proposed development complies with Council policies D1, NE12 & NPPF section 14.

EXECUTIVE SUMMARY

The proposed development would achieve a 27.4% reduction in CO₂ emissions and a 27.5% reduction in energy demand above the requirements set in Building Regulations part L 2021 by incorporating a high level of thermal fabric performance; a renewable heating system and 4kWp solar PV array.

CO₂ Emissions at each stage of the energy hierarchy:

	Regulated CO ₂ emissions (tonnes/year)
Stage 1: Part L 2021 baseline	3.18
Stage 2: 'Be lean'	3.13
Stage 3: 'Be green'	2.31
% reduction	27.4%

Energy demand at each stage of the energy hierarchy:

	Energy demand (kWh/year)
Stage 1: Part L 2021 baseline	33,108.5
Stage 2: 'Be lean'	32,566.2
Stage 3: 'Be green'	23,990.6
% reduction (rounded)	27.5%

Energy performance summary:

	% improvement over building regulations
Dwelling emission rate (Tonnes CO ₂ /year)	74.53
Fabric efficiency (kWh/m ² /yr)	4.64
Primary energy rate (kWh/m ² /yr)	48.26

This statement and associated energy and water calculation checklists demonstrate that the proposed development meets the requirements of the Council's policies.

DEVELOPMENT STRATEGY

The development will follow the well established energy hierarchy



ACCOMODATION SCHEDULE

Plot No	Type	Area (m ²)
1	3 Bed	165
2	3 Bed	130
3	3 Bed	140
4	4 Bed	180
5	4 Bed	152
6	4 Bed	180
7	4 Bed	180
8	4 Bed	215
9	4 Bed	215
Total		1557

BASELINE SPECIFICATION

Key design features:	
Wall U-value	0.17W/m ² k
Floor U-value	0.11W/m ² k
Roof U-value	0.12W/m ² k
Window U-value	1.40W/m ² k
Door U-value	1.40W/m ² k
Air Permeability	4.00 m ³ /hr/m ² at Δ50Pa
Primary heating	Air source heat pump COP >3.5
Ventilation	Natural
Thermal bridging	Registered details
Mechanical cooling	None
Renewables	None

BASELINE ENERGY PERFORMANCE

In order to demonstrate compliance with the Councils sustainability policy, government approved software and energy assessors have been used to generate detailed energy calculations based on the planning stage drawings. The worst case unit (flat 11) has been assessed and the energy demand multiplied by the total number of flats. The process will be repeated prior to construction.

Worst case Unit (Plot 3)	Space heating kwh/yr	Water heating kwh/yr	Pumps & fans kwh/yr	Lighting kwh/yr	Energy saving (PV)	Sub total kwh/yr
Plot	1,887.1	1,016.5	0.00	307.3	0.00	3,211
Total development	19,458.4	10,481.4	0.00	3,168.7	0.00	33,108.5

Note: Energy demand taken from calculated SAP calculation using section 12a and rounded to 2sf



To reduce energy demand for space heating, the external fabric and thermal bridging of the apartments will be improved as per the table below.

'BE LEAN' SPECIFICATION

Key design features:	
Wall U-value	0.17W/m ² k
Floor U-value	0.10W/m ² k
Roof U-value	0.09W/m ² k
Window U-value	1.30W/m ² k
Door U-value	1.20W/m ² k
Air Permeability	4.00 m ³ /hr/m ² at Δ50Pa
Primary heating	Air source heat pump COP >3.5
Ventilation	Natural
Thermal bridging	Registered details
Mechanical cooling	None
Renewables	None

'BE LEAN' ENERGY PERFORMANCE

Worst case Unit (Plot 3)	Space heating kwh/yr	Water heating kwh/yr	Pumps & fans kwh/yr	Lighting kwh/yr	Energy saving (PV)	Sub total kwh/yr
Plot	1,834	1,017	0.00	307.3	0.00	3,158.3
Total development	18,910.9	10,486.6	0.00	3,168.7	0.00	32,566.2

Note: Energy demand taken from calculated SAP calculation using section 12a and rounded to 2sf



Due to the recent changes in building regulations there are limited practical improvements that can be made to the thermal fabric of the new build dwellings we have therefore concentrated on low and zero carbon heating and cooling technologies (LZC), low energy light and air tightness. LZC technologies are considered to be renewables the options that will be considered for use are:

- Solar Photovoltaic's
 - Solar thermal hot water
 - Ground source heat pumps
 - Air source heat pumps
 - Biomass boilers
1. Photovoltaic (PV) panels use sunlight to produce electricity; the cells convert the sunlight into electricity which can be used to run plant and lighting.
 2. Solar thermal hot water (SHW) uses solar energy via solar thermal panels for the generation of hot water; solar water heating systems use heat from the sun to warm hot water systems.
 3. Ground source heat pumps (GSHP) circulate a mixture of water and antifreeze around a loop of a pipe which is buried externally. Heat from the ground is absorbed into this fluid and is pumped through a heat exchanger in the heat pump. Low grade heat passes through the heat pump compressor and is concentrated into a higher temperature; this useful heat is capable of providing water for the heating and hot water circuits of the unit. GSHP units generally provide a COP of 4 or greater (4 units of heat per 1 unit of energy (electricity))
 4. Air source heat pumps (ASHP) reclaim the heat available in ambient air and convert it to higher temperatures to heat the unit. As with ground source heat pumps, they use electricity to distribute heat. ASHP systems do not require ground works and are therefore less costly than ground source systems. ASHP systems can be used to both heat and cool retail spaces. ASHP units generally provide a COP of 3 or greater (3 units of heat per 1 unit of energy (electricity))
 5. Biomass fuelled heating systems generally burn wood pellets, chips or logs to power space heating and hot water boilers. Other fuel types are available but the energy density of wood chips or pellets means it is typically the most appropriate. Deliveries of fuel which would result in unacceptable volumes of traffic around the site.

LZC SELECTION

LZC option	Type	Suitability	Justification
1	Solar PV	Yes	Suitable roof area available & low visual impact
2	Solar hot water	No	Hot water demand of residential units is relatively low
3	GSHP	No	Limited space for ground source loops or boreholes
4	ASHP	Yes	Site suitable for heating plant
5	Biomass	No	Limited storage area for biomass fuels.

LZC CONCLUSIONS

Based on the above analysis the most suitable method of achieving the required energy contribution from renewable technologies for this development would be air source heating and solar PV.

'BE GREEN' SPECIFICATION

Key design features:	
Wall U-value	0.17W/m ² k
Floor U-value	0.10W/m ² k
Roof U-value	0.09W/m ² k
Window U-value	1.20W/m ² k
Door U-value	1.20W/m ² k
Air Permeability	3.00 m ³ /hr/m ² at Δ50Pa
Primary heating	Air source heat pump COP >3.5
Ventilation	Mechanical ventilation with heat recovery
Thermal bridging	Registered details
Mechanical cooling	None
Renewables	0.5kWp solar PV per plot (4.5kW total)

'BE GREEN' ENERGY PERFORMANCE

Worst case Unit (Plot 3)	Space heating kwh/yr	Water heating kwh/yr	Pumps & fans kwh/yr	Lighting kwh/yr	Energy saving (PV)	Sub total kwh/yr
Plot	1,084.2	1,003	343.8	307.3	411	2,326.6
Total development	11,179.5	10,342.2	3,545.0	3,168.7	4244.8	23,990.6

Note: Energy demand taken from calculated SAP calculation using section 12a and rounded to 2sf

WATER CONSUMPTION STRATEGY

Internal water usage for each dwelling will be limited to 110L per person/day. This will be achieved by specifying the following:

Outlet	Target capacity
Toilet	Dual flush 6/3 L
Basin tap	5.00L/min
Kitchen/Utility tap	9.70L/min
Bath	170 L to overflow
Shower	9.00L/min
Washing machine	5.00L per kg dry load
Dishwasher	0.75L per place setting

17. K COMPLIANCE		
EXTERNAL WATER USE	(litres / person / day)	5.00
TOTAL WATER CONSUMPTION	(litres / person / day)	107.8
17. K COMPLIANCE?		Yes

Building Regulations England Part L (BREL) Compliance Report

Approved Document L1 2021 Edition, England assessed by Array SAP 10 program, Array

Date: Wed 04 Mar 2026 15:31:10

Project Information			
Assessed By	Paul Allen	Building Type	House, Detached
OCDEA Registration	EES/017061	Assessment Date	2026-03-04

Dwelling Details			
Assessment Type	As designed	Total Floor Area	151 m ²
Site Reference	GREEN	Plot Reference	GREEN
Address	Slip End Farm Slip End, Baldock, SG7 6SG		

Client Details	
Name	AP
Company	AP CONSULTING ENGINEERS LTD
Address	3 Amherst Rise, Maulden, Bedford, MK45 2RF

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

1a Target emission rate and dwelling emission rate			
Fuel for main heating system	Electricity		
Target carbon dioxide emission rate	9.07 kgCO ₂ /m ²		
Dwelling carbon dioxide emission rate	2.31 kgCO ₂ /m ²		OK
1b Target primary energy rate and dwelling primary energy			
Target primary energy	47.63 kWh _{PE} /m ²		
Dwelling primary energy	24.64 kWh _{PE} /m ²		OK
1c Target fabric energy efficiency and dwelling fabric energy efficiency			
Target fabric energy efficiency	40.9 kWh/m ²		
Dwelling fabric energy efficiency	39.0 kWh/m ²		OK

2a Fabric U-values				
Element	Maximum permitted average U-Value [W/m ² K]	Dwelling average U-Value [W/m ² K]	Element with highest individual U-Value	
External walls	0.26	0.17	Walls (1) (0.17)	OK
Party walls	0.2	N/A	N/A	N/A
Curtain walls	1.6	N/A	N/A	N/A
Floors	0.18	0.1	Heatloss Floor 1 (0.1)	OK
Roofs	0.16	0.12	Roof (2) (0.13)	OK
Windows, doors, and roof windows	1.6	1.28	WDW FR (1.3)	OK
Rooflights	2.2	N/A	N/A	N/A

2b Envelope elements (better than typically expected values are flagged with a subsequent (!))			
Name	Net area [m ²]	U-Value [W/m ² K]	
Exposed wall: Walls (1)	160.33	0.17	
Ground floor: Heatloss Floor 1, Heatloss Floor 1	83.61	0.1 (!)	
Exposed roof: Roof (1)	70	0.12	
Exposed roof: Roof (2)	18	0.13	

2c Openings (better than typically expected values are flagged with a subsequent (!))				
Name	Area [m ²]	Orientation	Frame factor	U-Value [W/m ² K]
DOOR FR, SOLID DOOR	2.1	South West	N/A	1.1 (!)
WDW FR, WINDOW	7.58	South West	0.7	1.3
WDW RR, WINDOW	15.24	North East	0.7	1.3
WDW RH, WINDOW	1.5	South East	0.7	1.3

2d Thermal bridging (better than typically expected values are flagged with a subsequent (!))				
Building part 1: Thermal bridging calculated from linear thermal transmittances for each junction				
Main element	Junction detail	Source	Psi value [W/mK]	Drawing / reference
External wall	E3: Sill	Calculated by person with suitable expertise	0.022 (!)	RCD_MFF-150-e3-01
External wall	E4: Jamb	Calculated by person with suitable expertise	0.017 (!)	RCD_MFF-150-e4-01

Main element	Junction detail	Source	Psi value [W/mK]	Drawing / reference
External wall	E5: Ground floor (normal)	Calculated by person with suitable expertise	0.074	RCD_MFF-150-e5-01
External wall	E11: Eaves (insulation at rafter level)	Calculated by person with suitable expertise	0.008 (!)	SUPERGLASS E-13
External wall	E13: Gable (insulation at rafter level)	Calculated by person with suitable expertise	0.056	RCD_MFF-150-e13-01
External wall	E16: Corner (normal)	Calculated by person with suitable expertise	0.046	RCD_MFF-150-e16-01
External wall	E1: Steel lintel with perforated steel base plate	Calculated by person with suitable expertise	0.268	RCD_MFF-150-e1-01
External wall	E17: Corner (inverted - internal area greater than external area)	Calculated by person with suitable expertise	-0.001 (!)	
External wall	E6: Intermediate floor within a dwelling	Calculated by person with suitable expertise	0.001 (!)	RCD_MFF-150-e6-01

3 Air permeability (better than typically expected values are flagged with a subsequent (!))

Maximum permitted air permeability at 50Pa	8 m ³ /hm ²		
Dwelling air permeability at 50Pa	3 m ³ /hm ² , Design value (!)		
Air permeability test certificate reference	OK		

4 Space heating

Main heating system 1: Heat pump with radiators or underfloor heating - Electricity

Efficiency	312.3%
Emitter type	Both radiators and underfloor
Flow temperature	35°C
System type	Heat Pump
Manufacturer	Mitsubishi Electric Europe B.V.
Model	PUZ-WZ60VAA
Commissioning	

Secondary heating system: N/A

Fuel	N/A
Efficiency	N/A
Commissioning	

5 Hot water

Cylinder/store - type: Cylinder

Capacity	150 litres
Declared heat loss	1.4 kWh/day
Primary pipework insulated	Yes
Manufacturer	
Model	
Commissioning	

Waste water heat recovery system 1 - type: N/A

Efficiency	
Manufacturer	
Model	

6 Controls

Main heating 1 - type: Time and temperature zone control by arrangement of plumbing and electrical services

Function	
Ecodesign class	
Manufacturer	
Model	

Water heating - type: Cylinder thermostat and HW separately timed

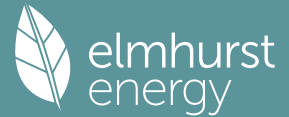
Manufacturer	
Model	

7 Lighting

Minimum permitted light source efficacy	75 lm/W		
Lowest light source efficacy	94.82 lm/W		
External lights control	N/A		

8 Mechanical ventilation		
System type: Balanced whole-house mechanical ventilation with heat recovery		
Maximum permitted specific fan power	1.5 W/(l/s)	
Specific fan power	0.53 W/(l/s)	OK
Minimum permitted heat recovery efficiency	73%	
Heat recovery efficiency	94%	OK
Manufacturer/Model	Kinetic Plus E	
Commissioning		
9 Local generation		
Technology type: Photovoltaic system (1)		
Peak power	0.5 kWp	
Orientation	South West	
Pitch	30°	
Overshading	None or very little	
Manufacturer		
MCS certificate		
10 Heat networks		
N/A		
11 Supporting documentary evidence		
N/A		
12 Declarations		
a. Assessor Declaration		
This declaration by the assessor is confirmation that the contents of this BREL Compliance Report are a true and accurate reflection based upon the design information submitted for this dwelling for the purpose of carrying out the "As designed" assessment, and that the supporting documentary evidence (SAP Conventions, Appendix 1 (documentary evidence) schedules the minimum documentary evidence required) has been reviewed in the course of preparing this BREL Compliance Report.		
Signed:	Assessor ID:	
Name:		
	Date:	
b. Client Declaration		
N/A		

Full SAP Calculation Printout



Plot Reference	LEAN			Issued on Date	04/03/2026
Assessment Reference	LEAN	Plot Type Ref			
Plot Address	Slip End Farm, Slip End, Baldock, Hertfordshire, SG7 6SG			SAP Version	10.2
SAP Rating	85 B	DER	3.18	TER	9.07
Environmental	97 A	% DER < TER			64.94
CO ₂ Emissions (t/year)	0.46	DFEE	40.58	TFEE	40.86
Compliance Check	See BREL	% DFEE < TFEE			0.68
% DPER < TPER	30.74	DPER	32.99	TPER	47.63
Assessor Details	Mr. Paul Allen			Assessor ID	8075-0001
Client	APC, AP				

SAP 10 WORKSHEET FOR New Build (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)
Main dwelling			
Ground floor	83.6100 (1b)	x 2.4000 (2b)	= 200.6640 (1b) - (3b)
First floor	67.6000 (1c)	x 2.6500 (2c)	= 179.1400 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	151.2100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	379.8040 (5)

2. Ventilation rate

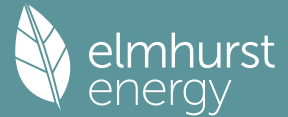
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.1053 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3053 (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) = 0.2595 (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	0.3309	0.3244	0.3179	0.2855	0.2790	0.2465	0.2465	0.2401	0.2595	0.2790	0.2920	0.3049 (22b)
Effective ac	0.5547	0.5526	0.5505	0.5407	0.5389	0.5304	0.5304	0.5288	0.5337	0.5389	0.5426	0.5465 (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
Main dwelling							
WINDOW			24.3200	1.3258	32.2424		(27)
SOLID DOOR			2.1000	1.1000	2.3100		(26)
Heatloss Floor 1			83.6100	0.1100	9.1971	75.0000	6270.7500 (28a)
MASONRY	186.7500	26.4200	160.3300	0.1700	27.2561	70.0000	11223.1000 (29a)
BARREL	70.0000		70.0000	0.1200	8.4000	9.0000	630.0000 (30)
SLOPE	18.0000		18.0000	0.1300	2.3400	9.0000	162.0000 (30)
Total net area of external elements Aum(A, m ²)			358.3600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	81.7456		(33)
Main dwelling							
Internal Wall 1			116.3800			9.0000	1047.4200 (32c)
Internal Floor 1			67.6000			18.0000	1216.8000 (32d)
Internal Ceiling 1			67.6000			9.0000	608.4000 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	21158.4700 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							139.9277 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E3 Sill				16.4000	0.0220	0.3608	
E4 Jamb				37.3000	0.0170	0.6341	

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E5 Ground floor (normal)	40.8000	0.0740	3.0192
E11 Eaves (insulation at rafter level)	24.4000	0.0080	0.1952
E13 Gable (insulation at rafter level)	21.5000	0.0560	1.2040
E16 Corner (normal)	22.6000	0.0460	1.0396
E1 Steel lintel with perforated steel base plate	17.4000	0.2680	4.6632
E17 Corner (inverted - internal area greater than external area)	2.4000	-0.0010	-0.0024
E6 Intermediate floor within a dwelling	33.5200	0.0010	0.0335
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			11.1472 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	92.8928 (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	69.5289	69.2625	69.0014	67.7747	67.5452	66.4768	66.4768	66.2790	66.8884	67.5452	68.0095	68.4949
Average = Sum(39)m / 12 =	162.4218	162.1554	161.8942	160.6676	160.4381	159.3697	159.3697	159.1718	159.7812	160.4381	160.9023	161.3877
												160.6665
HLP	1.0741	1.0724	1.0707	1.0625	1.0610	1.0540	1.0540	1.0527	1.0567	1.0610	1.0641	1.0673
HLP (average)												1.0625
Days in month	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.9361 (42)
Hot water usage for mixer showers	82.6289	81.3872	79.5777	76.1156	73.5606	70.7114	69.0919	70.8876	72.8562	75.9154	79.4519	82.3123
Hot water usage for baths	31.7082	31.2373	30.5742	29.3515	28.4359	27.4207	26.8723	27.5308	28.2478	29.3341	30.5820	31.6010
Hot water usage for other uses	44.6982	43.0728	41.4474	39.8220	38.1966	36.5713	36.5713	38.1966	39.8220	41.4474	43.0728	44.6982
Average daily hot water use (litres/day)												146.2143
Daily hot water use	159.0353	155.6973	151.5993	145.2891	140.1932	134.7033	132.5355	136.6151	140.9260	146.6969	153.1067	158.6116
Energy content (annual)	251.8731	221.7109	233.0025	198.8935	188.7270	165.6335	160.2901	169.1581	173.7759	199.0664	218.1286	248.3474
Distribution loss (46)m = 0.15 x (45)m	37.7810	33.2566	34.9504	29.8340	28.3090	24.8450	24.0435	25.3737	26.0664	29.8600	32.7193	37.2521
Water storage loss (or HIU loss):												150.0000
Store volume												1.4000
a) If manufacturer declared loss factor is known (kWh/day):												0.5400
Temperature factor from Table 2b												0.7560
Enter (49) or (54) in (55)												
Total storage loss	23.4360	21.1680	23.4360	22.6800	23.4360	22.6800	23.4360	23.4360	22.6800	23.4360	22.6800	23.4360
If cylinder contains dedicated solar storage	23.4360	21.1680	23.4360	22.6800	23.4360	22.6800	23.4360	23.4360	22.6800	23.4360	22.6800	23.4360
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
Combi 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
Total heat required for water heating calculated for each month	298.5715	263.8901	279.7009	244.0855	235.4254	210.8255	206.9885	215.8565	218.9679	245.7648	263.3206	295.0458
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	298.5715	263.8901	279.7009	244.0855	235.4254	210.8255	206.9885	215.8565	218.9679	245.7648	263.3206	295.0458
12Total per year (kWh/year)												2978.4428
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
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000
Heat gains from water heating, kWh/month	121.1065	107.4622	114.8320	102.2857	100.1104	91.2267	90.6552	93.6038	93.9341	103.5483	108.6813	119.9342

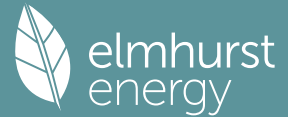
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
(66)m	146.8030	146.8030	146.8030	146.8030	146.8030	146.8030	146.8030	146.8030	146.8030	146.8030	146.8030	146.8030
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	169.1812	187.3078	169.1812	174.8206	169.1812	174.8206	169.1812	169.1812	174.8206	169.1812	174.8206	169.1812
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	321.8356	325.1753	316.7595	298.8432	276.2272	254.9713	240.7711	237.4314	245.8472	263.7635	286.3795	307.6354
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.6803	37.6803	37.6803	37.6803	37.6803	37.6803	37.6803	37.6803	37.6803	37.6803	37.6803	37.6803
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)	-117.4424	-117.4424	-117.4424	-117.4424	-117.4424	-117.4424	-117.4424	-117.4424	-117.4424	-117.4424	-117.4424	-117.4424
Water heating gains (Table 5)	162.7776	159.9140	154.3441	142.0634	134.5570	126.7038	121.8484	125.8115	130.4640	139.1778	150.9463	161.2019
Total internal gains	720.8354	739.4380	707.3258	682.7682	647.0064	623.5366	598.8416	599.4651	618.1727	639.1634	679.1873	705.0594

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				15.2400	11.2829	0.5500	0.7000	0.7700		45.8777 (75)		
Southeast				1.5000	36.7938	0.5500	0.7000	0.7700		14.7252 (77)		
Southwest				7.5800	36.7938	0.5500	0.7000	0.7700		74.4112 (79)		
Solar gains	135.0140	245.2175	375.9940	533.7200	659.7368	682.2051	646.3828	548.2042	429.9582	281.9311	164.4908	113.7481 (83)
Total gains	855.8494	984.6555	1083.3198	1216.4882	1306.7432	1305.7417	1245.2244	1147.6693	1048.1309	921.0945	843.6781	818.8076 (84)

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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	36.1857	36.2452	36.3037	36.5808	36.6332	36.8787	36.8787	36.9246	36.7838	36.6332	36.5275	36.4176
alpha	3.4124	3.4163	3.4202	3.4387	3.4422	3.4586	3.4586	3.4616	3.4523	3.4422	3.4352	3.4278
util living area	0.9866	0.9774	0.9605	0.9147	0.8233	0.6721	0.5265	0.5817	0.7946	0.9376	0.9778	0.9884 (86)
Living	19.3532	19.5358	19.8199	20.2155	20.5624	20.7917	20.8728	20.8568	20.6850	20.2373	19.7308	19.3223
Non living	18.0763	18.3094	18.6701	19.1677	19.5822	19.8338	19.9045	19.8951	19.7307	19.2037	18.5644	18.0409
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10
MIT	20.1576	19.5358	19.8199	20.2155	20.5624	20.7917	20.8728	20.8568	20.6850	20.2373	19.7308	19.5570 (87)
Th 2	20.0220	20.0234	20.0249	20.0315	20.0328	20.0386	20.0386	20.0397	20.0364	20.0328	20.0303	20.0276 (88)
util rest of house	0.9839	0.9730	0.9524	0.8963	0.7836	0.5993	0.4253	0.4802	0.7352	0.9204	0.9727	0.9862 (89)
MIT 2	19.2463	18.3094	18.6701	19.1677	19.5822	19.8338	19.9045	19.8951	19.7307	19.2037	18.5644	18.3989 (90)
Living area fraction									fLA =	Living area / (4) =		0.1967 (91)
MIT	19.4256	18.5506	18.8963	19.3737	19.7750	20.0222	20.0950	20.0843	19.9184	19.4070	18.7938	18.6267 (92)
Temperature adjustment												0.0000
adjusted MIT	19.4256	18.5506	18.8963	19.3737	19.7750	20.0222	20.0950	20.0843	19.9184	19.4070	18.7938	18.6267 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9820	0.9641	0.9402	0.8810	0.7715	0.5980	0.4316	0.4852	0.7268	0.9062	0.9639	0.9818 (94)
Useful gains	840.4384	949.3250	1018.5591	1071.7622	1008.2025	780.8095	537.3994	556.8937	761.8085	834.6642	813.2159	803.8969 (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	2456.7189	2213.5163	2006.8819	1682.7916	1295.5370	864.1384	556.9926	586.4344	929.6724	1412.9718	1881.5587	2328.2924 (97)
Space heating kWh	1202.5127	849.5365	735.3122	439.9412	213.7769	0.0000	0.0000	0.0000	0.0000	430.2608	769.2068	1134.1503 (98a)
Space heating requirement - total per year (kWh/year)												5774.6973
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	1202.5127	849.5365	735.3122	439.9412	213.7769	0.0000	0.0000	0.0000	0.0000	430.2608	769.2068	1134.1503 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5774.6973
Space heating per m2										(98c) / (4) =		38.1899 (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 %)												306.0007 (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	1202.5127	849.5365	735.3122	439.9412	213.7769	0.0000	0.0000	0.0000	0.0000	430.2608	769.2068	1134.1503 (98)
Space heating efficiency (main heating system 1)	306.0007	306.0007	306.0007	306.0007	306.0007	0.0000	0.0000	0.0000	0.0000	306.0007	306.0007	306.0007 (210)
Space heating fuel (main heating system)	392.9771	277.6257	240.2975	143.7713	69.8616	0.0000	0.0000	0.0000	0.0000	140.6078	251.3742	370.6365 (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	298.5715	263.8901	279.7009	244.0855	235.4254	210.8255	206.9885	215.8565	218.9679	245.7648	263.3206	295.0458 (64)
Efficiency of water heater (217)m	293.0078	293.0078	293.0078	293.0078	293.0078	293.0078	293.0078	293.0078	293.0078	293.0078	293.0078	293.0078 (216)
Fuel for water heating, kWh/month	101.8988	90.0625	95.4585	83.3034	80.3478	71.9522	70.6427	73.6692	74.7311	83.8765	89.8681	100.6955 (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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	38.0745	30.5447	27.5022	20.1493	15.5639	12.7158	14.1979	18.4549	23.9711	31.4514	35.5243	39.1327 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)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 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)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 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)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 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)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 (235c)
Electricity generated by PVs (Appendix M) (negative quantity) (233b)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 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234b)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 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235b)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 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235d)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 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												1887.1517 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												293.0078
Water heating fuel used												1016.5064 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												

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Total electricity for the above, kWh/year	0.0000 (231)
Electricity for lighting (calculated in Appendix L)	307.2827 (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)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	3210.9408 (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	1887.1517	0.1550	292.5158 (261)
Total CO2 associated with community systems			0.0000 (273)
Water heating (other fuel)	1016.5064	0.1410	143.3774 (264)
Space and water heating			435.8932 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	307.2827	0.1443	44.3504 (268)
Total CO2, kg/year			480.2436 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.1800 (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	1887.1517	1.5738	2970.0639 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1016.5064	1.5216	1546.6715 (278)
Space and water heating			4516.7354 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	307.2827	1.5338	471.3205 (282)
Total Primary energy kWh/year			4988.0559 (286)
Dwelling Primary energy Rate (DPER)			32.9900 (287)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022) CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	83.6100 (1b)	x 2.4000 (2b)	= 200.6640 (1b) - (3b)
First floor	67.6000 (1c)	x 2.6500 (2c)	= 179.1400 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	151.2100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	379.8040 (5)

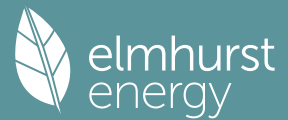
2. Ventilation rate

	m3 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	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.1053 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3553 (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) = 0.3020 (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	0.3851	0.3775	0.3700	0.3322	0.3247	0.2869	0.2869	0.2794	0.3020	0.3247	0.3398	0.3549 (22b)
Effective ac	0.5741	0.5713	0.5684	0.5552	0.5527	0.5412	0.5412	0.5390	0.5456	0.5527	0.5577	0.5630 (25)

3. Heat losses and heat loss parameter

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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
Main dwelling							
TER Opaque door			2.1000	1.0000	2.1000		(26)
TER Opening Type			24.3200	1.1450	27.8473		(27)
Heatloss Floor 1			83.6100	0.1300	10.8693		(28a)
MASONRY	186.7500	26.4200	160.3300	0.1800	28.8594		(29a)
BARREL	70.0000		70.0000	0.1100	7.7000		(30)
SLOPE	18.0000		18.0000	0.1100	1.9800		(30)
Total net area of external elements Aum(A, m2)			358.3600				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		79.3560		(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 139.9277 (35)

List of Thermal Bridges	Length	Psi-value	Total
K1 Element	16.4000	0.0500	0.8200
E3 Sill	37.3000	0.0500	1.8650
E4 Jamb	40.8000	0.1600	6.5280
E5 Ground floor (normal)	24.4000	0.0400	0.9760
E11 Eaves (insulation at rafter level)	21.5000	0.0800	1.7200
E13 Gable (insulation at rafter level)	22.6000	0.0900	2.0340
E16 Corner (normal)	17.4000	0.0500	0.8700
E1 Steel lintel with perforated steel base plate	2.4000	-0.0900	-0.2160
E17 Corner (inverted - internal area greater than external area)	33.5200	0.0000	0.0000
E6 Intermediate floor within a dwelling			

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 14.5970 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 93.9530 (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	71.9602	71.5994	71.2457	69.5844	69.2736	67.8266	67.8266	67.5587	68.3840	69.2736	69.9023	70.5597
Average = Sum(39)m / 12 =	165.9132	165.5524	165.1987	163.5374	163.2266	161.7796	161.7796	161.5117	162.3370	163.2266	163.8554	164.5127
												163.5359

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0972	1.0949	1.0925	1.0815	1.0795	1.0699	1.0699	1.0681	1.0736	1.0795	1.0836	1.0880
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.9361 (42)
Hot water usage for mixer showers												
Hot water usage for baths												
Hot water usage for other uses												
Average daily hot water use (litres/day)												137.7498 (43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	149.8544	146.6543	142.7573	136.8318	132.0198	126.8465	124.8586	128.7387	132.8309	138.2619	144.2787	149.4658
Energy content (annual)	237.3327	208.8337	219.4127	187.3159	177.7240	155.9726	151.0056	159.4054	163.7938	187.6201	205.5515	234.0272
Distribution loss (46)m = 0.15 x (45)m												
Water storage loss (or HIU loss):	35.5999	31.3251	32.9119	28.0974	26.6586	23.3959	22.6508	23.9108	24.5691	28.1430	30.8327	35.1041
Store volume												150.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day): 1.3938 (48)

Temperature factor from Table 2b 0.5400 (49)

Enter (49) or (54) in (55) 0.7527 (55)

Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325

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
Combi 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

Total heat required for water heating calculated for each month	283.9276	250.9195	266.0076	232.4077	224.3189	201.0644	197.6005	206.0003	208.8856	234.2150	250.6433	280.6221
WWHRS	-33.5773	-29.6961	-31.0960	-25.7487	-23.9969	-20.5343	-19.2476	-20.4679	-21.2456	-25.0462	-28.3743	-32.9555

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	250.3502	221.2234	234.9116	206.6590	200.3220	180.5301	178.3529	185.5324	187.6400	209.1688	222.2690	247.6666

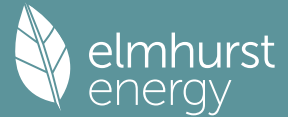
12Total per year (kWh/year)												2524.6262 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Heat gains from water heating, kWh/month	116.1890	103.1058	110.2306	98.3560	96.3692	87.9344	87.4853	90.2782	90.5349	99.6596	104.4193	115.0900
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												2525 (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	146.8030	146.8030	146.8030	146.8030	146.8030	146.8030	146.8030	146.8030	146.8030	146.8030	146.8030	146.8030
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	169.1812	187.3078	169.1812	174.8206	169.1812	174.8206	169.1812	169.1812	174.8206	169.1812	174.8206	169.1812
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	321.8356	325.1753	316.7595	298.8432	276.2272	254.9713	240.7711	237.4314	245.8472	263.7635	286.3795	307.6354
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.6803	37.6803	37.6803	37.6803	37.6803	37.6803	37.6803	37.6803	37.6803	37.6803	37.6803	37.6803
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)	-117.4424	-117.4424	-117.4424	-117.4424	-117.4424	-117.4424	-117.4424	-117.4424	-117.4424	-117.4424	-117.4424	-117.4424
Water heating gains (Table 5)	156.1681	153.4312	148.1595	136.6056	129.5284	122.1311	117.5878	121.3417	125.7429	133.9511	145.0269	154.6908
Total internal gains	717.2258	735.9552	704.1411	680.3103	644.9778	618.9639	594.5810	594.9953	613.4516	636.9367	676.2679	701.5484

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6. Solar gains

[Jan]	Area m2				Solar flux Table 6a W/m2	Specific data or Table 6b	g	Specific data or Table 6c	FF or Table 6c	Access factor Table 6d	Gains W
Northeast	15.2400				11.2829		0.6300		0.7000	0.7700	52.5508 (75)
Southeast	1.5000				36.7938		0.6300		0.7000	0.7700	16.8670 (77)
Southwest	7.5800				36.7938		0.6300		0.7000	0.7700	85.2346 (79)
Solar gains	154.6524	280.8855	430.6841	611.3520	755.6985	781.4349	740.4021	627.9430	492.4976	322.9393	130.2933 (83)
Total gains	871.8782	1016.8407	1134.8251	1291.6623	1400.6763	1400.3988	1334.9831	1222.9383	1105.9492	959.8760	831.8417 (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
alpha	35.4243	35.5015	35.5775	35.9389	36.0073	36.3294	36.3294	36.3896	36.2046	36.0073	35.8691
util living area	3.3616	3.3668	3.3718	3.3959	3.4005	3.4220	3.4220	3.4260	3.4136	3.4005	3.3913
	0.9859	0.9755	0.9559	0.9037	0.8028	0.6463	0.5024	0.5589	0.7783	0.9319	0.9764
MIT	18.8906	19.1518	19.5516	20.1003	20.5634	20.8551	20.9542	20.9339	20.7118	20.1092	19.4120
Th 2	20.0031	20.0050	20.0070	20.0159	20.0176	20.0255	20.0255	20.0269	20.0225	20.0176	20.0142
util rest of house	0.9831	0.9707	0.9470	0.8833	0.7606	0.5726	0.4029	0.4582	0.7166	0.9134	0.9710
MIT 2	17.5272	17.8600	18.3666	19.0530	19.6015	19.9172	20.0022	19.9905	19.7816	19.0775	18.1995
Living area fraction	17.7953	18.1141	18.5997	19.2590	19.7907	20.1017	20.1894	20.1761	19.9645	19.2804	18.4379
MIT	17.7953	18.1141	18.5997	19.2590	19.7907	20.1017	20.1894	20.1761	19.9645	19.2804	18.4379
Temperature adjustment											
adjusted MIT	17.7953	18.1141	18.5997	19.2590	19.7907	20.1017	20.1894	20.1761	19.9645	19.2804	18.4379

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9739	0.9579	0.9300	0.8642	0.7495	0.5788	0.4204	0.4745	0.7124	0.8953	0.9586	0.9773 (94)
Useful gains	849.1573	974.0693	1055.4118	1116.2692	1049.8041	810.5653	561.1981	580.3273	787.8635	859.4088	828.8859	812.9947 (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	2239.0544	2187.6190	1998.8489	1694.0783	1320.6118	890.0620	580.6947	609.8798	952.0295	1416.8740	1857.7804	2229.2604 (97)
Space heating kWh	1034.0834	815.5053	701.9172	416.0225	201.4809	0.0000	0.0000	0.0000	0.0000	414.7541	740.8040	1053.7017 (98a)
Space heating requirement - total per year (kWh/year)												5378.2693
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	1034.0834	815.5053	701.9172	416.0225	201.4809	0.0000	0.0000	0.0000	0.0000	414.7541	740.8040	1053.7017 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5378.2693
Space heating per m2										(98c) / (4) =		35.5682 (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 %)												92.3000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	1034.0834	815.5053	701.9172	416.0225	201.4809	0.0000	0.0000	0.0000	0.0000	414.7541	740.8040	1053.7017 (98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000 (210)
Space heating fuel (main heating system)	1120.3504	883.5377	760.4737	450.7286	218.2892	0.0000	0.0000	0.0000	0.0000	449.3544	802.6046	1141.6053 (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	250.3502	221.2234	234.9116	206.6590	200.3220	180.5301	178.3529	185.5324	187.6400	209.1688	222.2690	247.6666 (64)
Efficiency of water heater	86.8899	86.7132	86.3578	85.5961	84.0727	79.8000	79.8000	79.8000	79.8000	85.5648	86.5473	79.8000 (216)
Fuel for water heating, kWh/month	288.1234	255.1209	272.0213	241.4351	238.2723	226.2282	223.4999	232.4967	235.1379	244.4566	256.8181	284.8902 (219)
Space cooling fuel 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 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	35.1525	28.2007	25.3916	18.6029	14.3695	11.7400	13.1083	17.0387	22.1315	29.0378	32.7981	36.1295 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-70.7676	-96.1790	-133.2793	-144.2127	-150.7991	-138.9581	-137.0734	-131.5618	-121.3480	-107.0871	-76.4427	-61.5980 (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)	-51.6540	-107.0807	-210.0560	-311.6315	-408.4970	-409.3004	-404.6264	-344.3280	-254.6115	-151.9933	-68.5668	-40.9814 (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)

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Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)														
(235d)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	0.0000	(235d)
Annual totals kWh/year														
Space heating fuel - main system 1													5826.9439	(211)
Space heating fuel - main system 2													0.0000	(213)
Space heating fuel - secondary													0.0000	(215)
Efficiency of water heater													79.8000	
Water heating fuel used													2998.5007	(219)
Space cooling fuel													0.0000	(221)

Electricity for pumps and fans:														
Total electricity for the above, kWh/year													86.0000	(231)
Electricity for lighting (calculated in Appendix L)													283.7009	(232)
Energy saving/generation technologies (Appendices M ,N and Q)														
PV generation													-4132.6337	(233)
Wind generation													0.0000	(234)
Hydro-electric generation (Appendix N)													0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)													0.0000	(235)
Appendix Q - special features														
Energy saved or generated													-0.0000	(236)
Energy used													0.0000	(237)
Total delivered energy for all uses													5062.5118	(238)

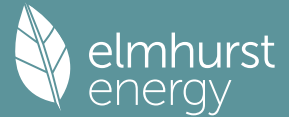
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	5826.9439	0.2100	1223.6582 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2998.5007	0.2100	629.6851 (264)
Space and water heating			1853.3434 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	283.7009	0.1443	40.9468 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1369.3067	0.1354	-185.4200
PV Unit electricity exported	-2763.3270	0.1263	-348.8825
Total			-534.3025 (269)
Total CO2, kg/year			1371.9169 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.0700 (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	5826.9439	1.1300	6584.4467 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2998.5007	1.1300	3388.3058 (278)
Space and water heating			9972.7524 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	283.7009	1.5338	435.1500 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1369.3067	1.5005	-2054.6505
PV Unit electricity exported	-2763.3270	0.4635	-1280.6813
Total			-3335.3318 (283)
Total Primary energy kWh/year			7202.6714 (286)
Target Primary Energy Rate (TPER)			47.6300 (287)

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Plot Reference	CLEAN	Issued on Date	04/03/2026
Assessment Reference	CLEAN	Plot Type Ref	
Plot Address	Slip End Farm, Slip End, Baldock, Hertfordshire, SG7 6SG	SAP Version	10.2
SAP Rating	85 B	DER	3.13
Environmental	97 A	% DER < TER	9.07
CO ₂ Emissions (t/year)	0.45	DFEE	65.49
Compliance Check	See BREL	TFEE	40.86
% DPER < TPER	31.76	% DFEE < TFEE	3.17
		TPER	47.63
Assessor Details	Mr. Paul Allen	Assessor ID	8075-0001
Client	APC, AP		

SAP 10 WORKSHEET FOR New Build (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)
Main dwelling			
Ground floor	83.6100 (1b)	x 2.4000 (2b)	= 200.6640 (1b) - (3b)
First floor	67.6000 (1c)	x 2.6500 (2c)	= 179.1400 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	151.2100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 379.8040 (5)

2. Ventilation rate

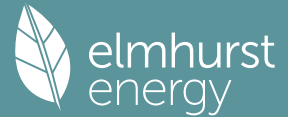
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.1053 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.3053 (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) = 0.2595 (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	0.3309	0.3244	0.3179	0.2855	0.2790	0.2465	0.2465	0.2401	0.2595	0.2790	0.2920	0.3049 (22b)
Effective ac	0.5547	0.5526	0.5505	0.5407	0.5389	0.5304	0.5304	0.5288	0.5337	0.5389	0.5426	0.5465 (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
Main dwelling							
WINDOW			24.3200	1.2357	30.0532		(27)
SOLID DOOR			2.1000	1.1000	2.3100		(26)
Heatloss Floor 1			83.6100	0.1000	8.3610	75.0000	6270.7500 (28a)
MASONRY	186.7500	26.4200	160.3300	0.1700	27.2561	70.0000	11223.1000 (29a)
BARREL	70.0000		70.0000	0.1200	8.4000	9.0000	630.0000 (30)
SLOPE	18.0000		18.0000	0.1300	2.3400	9.0000	162.0000 (30)
Total net area of external elements Aum(A, m ²)			358.3600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	78.7203		(33)
Main dwelling							
Internal Wall 1			116.3800			9.0000	1047.4200 (32c)
Internal Floor 1			67.6000			18.0000	1216.8000 (32d)
Internal Ceiling 1			67.6000			9.0000	608.4000 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	21158.4700 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							139.9277 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E3 Sill				16.4000	0.0220	0.3608	
E4 Jamb				37.3000	0.0170	0.6341	

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E5 Ground floor (normal)	40.8000	0.0740	3.0192
E11 Eaves (insulation at rafter level)	24.4000	0.0080	0.1952
E13 Gable (insulation at rafter level)	21.5000	0.0560	1.2040
E16 Corner (normal)	22.6000	0.0460	1.0396
E1 Steel lintel with perforated steel base plate	17.4000	0.2680	4.6632
E17 Corner (inverted - internal area greater than external area)	2.4000	-0.0010	-0.0024
E6 Intermediate floor within a dwelling	33.5200	0.0010	0.0335
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			11.1472 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	89.8676 (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	69.5289	69.2625	69.0014	67.7747	67.5452	66.4768	66.4768	66.2790	66.8884	67.5452	68.0095	68.4949	(38)
Average = Sum(39)m / 12 =	159.3965	159.1301	158.8689	157.6423	157.4128	156.3444	156.3444	156.1465	156.7559	157.4128	157.8770	158.3624	(39)
												157.6412	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.0541	1.0524	1.0507	1.0425	1.0410	1.0340	1.0340	1.0326	1.0367	1.0410	1.0441	1.0473	(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													2.9361 (42)
Hot water usage for mixer showers	82.6289	81.3872	79.5777	76.1156	73.5606	70.7114	69.0919	70.8876	72.8562	75.9154	79.4519	82.3123	(42a)
Hot water usage for baths	31.7082	31.2373	30.5742	29.3515	28.4359	27.4207	26.8723	27.5308	28.2478	29.3341	30.5820	31.6010	(42b)
Hot water usage for other uses	44.6982	43.0728	41.4474	39.8220	38.1966	36.5713	36.5713	38.1966	39.8220	41.4474	43.0728	44.6982	(42c)
Average daily hot water use (litres/day)												146.2143	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	159.0353	155.6973	151.5993	145.2891	140.1932	134.7033	132.5355	136.6151	140.9260	146.6969	153.1067	158.6116	(44)
Energy content (annual)	251.8731	221.7109	233.0025	198.8935	188.7270	165.6335	160.2901	169.1581	173.7759	199.0664	218.1286	248.3474	(45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		2428.6068	
Water storage loss (or HIU loss):	37.7810	33.2566	34.9504	29.8340	28.3090	24.8450	24.0435	25.3737	26.0664	29.8600	32.7193	37.2521	(46)
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.4000	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7560	(55)
Total storage loss	23.4360	21.1680	23.4360	22.6800	23.4360	22.6800	23.4360	23.4360	22.6800	23.4360	22.6800	23.4360	(56)
If cylinder contains dedicated solar storage	23.4360	21.1680	23.4360	22.6800	23.4360	22.6800	23.4360	23.4360	22.6800	23.4360	22.6800	23.4360	(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)
Combi 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	(61)
Total heat required for water heating calculated for each month	298.5715	263.8901	279.7009	244.0855	235.4254	210.8255	206.9885	215.8565	218.9679	245.7648	263.3206	295.0458	(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	298.5715	263.8901	279.7009	244.0855	235.4254	210.8255	206.9885	215.8565	218.9679	245.7648	263.3206	295.0458	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2978.4428	(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)
Heat gains from water heating, kWh/month	121.1065	107.4622	114.8320	102.2857	100.1104	91.2267	90.6552	93.6038	93.9341	103.5483	108.6813	119.9342	(65)

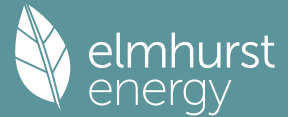
5. Internal gains (see Table 5 and 5a)

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	146.8030	146.8030	146.8030	146.8030	146.8030	146.8030	146.8030	146.8030	146.8030	146.8030	146.8030	146.8030	(66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	169.1812	187.3078	169.1812	174.8206	169.1812	174.8206	169.1812	169.1812	174.8206	169.1812	174.8206	169.1812	(67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	321.8356	325.1753	316.7595	298.8432	276.2272	254.9713	240.7711	237.4314	245.8472	263.7635	286.3795	307.6354	(68)
Pumps, fans	37.6803	37.6803	37.6803	37.6803	37.6803	37.6803	37.6803	37.6803	37.6803	37.6803	37.6803	37.6803	(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)	-117.4424	-117.4424	-117.4424	-117.4424	-117.4424	-117.4424	-117.4424	-117.4424	-117.4424	-117.4424	-117.4424	-117.4424	(71)
Total internal gains	162.7776	159.9140	154.3441	142.0634	134.5570	126.7038	121.8484	125.8115	130.4640	139.1778	150.9463	161.2019	(72)
	720.8354	739.4380	707.3258	682.7682	647.0064	623.5366	598.8416	599.4651	618.1727	639.1634	679.1873	705.0594	(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				15.2400	11.2829	0.5500		0.7000		0.7700	45.8777 (75)	
Southeast				1.5000	36.7938	0.5500		0.7000		0.7700	14.7252 (77)	
Southwest				7.5800	36.7938	0.5500		0.7000		0.7700	74.4112 (79)	
Solar gains	135.0140	245.2175	375.9940	533.7200	659.7368	682.2051	646.3828	548.2042	429.9582	281.9311	164.4908	113.7481 (83)
Total gains	855.8494	984.6555	1083.3198	1216.4882	1306.7432	1305.7417	1245.2244	1147.6693	1048.1309	921.0945	843.6781	818.8076 (84)

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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	36.8725	36.9343	36.9950	37.2829	37.3372	37.5923	37.5923	37.6400	37.4937	37.3372	37.2274	37.1133
alpha	3.4582	3.4623	3.4663	3.4855	3.4891	3.5062	3.5062	3.5093	3.4996	3.4891	3.4818	3.4742
util living area	0.9865	0.9772	0.9599	0.9129	0.8192	0.6655	0.5193	0.5744	0.7898	0.9364	0.9776	0.9884 (86)
Living	19.3878	19.5697	19.8511	20.2415	20.5807	20.8012	20.8773	20.8625	20.6982	20.2602	19.7604	19.3570
Non living	18.1321	18.3643	18.7215	19.2123	19.6168	19.8582	19.9243	19.9156	19.7590	19.2442	18.6138	18.0969
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10
MIT	20.1752	19.5697	19.8511	20.2415	20.5807	20.8012	20.8773	20.8625	20.6982	20.2602	19.7604	19.5868 (87)
Th 2	20.0385	20.0399	20.0413	20.0480	20.0493	20.0551	20.0551	20.0562	20.0529	20.0493	20.0468	20.0441 (88)
util rest of house	0.9839	0.9728	0.9517	0.8943	0.7795	0.5935	0.4204	0.4749	0.7306	0.9191	0.9725	0.9861 (89)
MIT 2	19.2784	18.3643	18.7215	19.2123	19.6168	19.8582	19.9243	19.9156	19.7590	19.2442	18.6138	18.4478 (90)
Living area fraction									fLA =	Living area / (4) =		0.1967 (91)
MIT	19.4548	18.6014	18.9436	19.4148	19.8064	20.0436	20.1117	20.1018	19.9437	19.4441	18.8393	18.6718 (92)
Temperature adjustment												0.0000
adjusted MIT	19.4548	18.6014	18.9436	19.4148	19.8064	20.0436	20.1117	20.1018	19.9437	19.4441	18.8393	18.6718 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9820	0.9640	0.9397	0.8794	0.7679	0.5926	0.4266	0.4801	0.7227	0.9051	0.9638	0.9818 (94)
Useful gains	840.4202	949.1930	1018.0008	1069.7464	1003.4669	773.7690	531.2107	550.9523	757.5222	833.6480	813.1061	803.9272 (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	2415.6262	2180.3067	1976.9043	1657.5711	1276.0510	851.0839	549.0394	578.0283	916.0406	1392.1671	1853.3655	2291.7939 (97)
Space heating kWh	1171.9533	827.3084	713.4242	423.2337	202.8026	0.0000	0.0000	0.0000	0.0000	415.5382	748.9867	1106.9729 (98a)
Space heating requirement - total per year (kWh/year)												5610.2201
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	1171.9533	827.3084	713.4242	423.2337	202.8026	0.0000	0.0000	0.0000	0.0000	415.5382	748.9867	1106.9729 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5610.2201
Space heating per m2										(98c) / (4) =		37.1022 (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 %)

304.9203 (206)

Efficiency of main space heating system 2 (in %)

0.0000 (207)

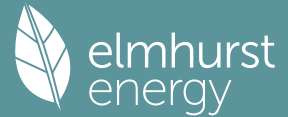
Efficiency of secondary/supplementary heating system, %

0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	1171.9533	827.3084	713.4242	423.2337	202.8026	0.0000	0.0000	0.0000	0.0000	415.5382	748.9867	1106.9729 (98)
Space heating efficiency (main heating system 1)	304.9203	304.9203	304.9203	304.9203	304.9203	0.0000	0.0000	0.0000	0.0000	304.9203	304.9203	304.9203 (210)
Space heating fuel (main heating system)	384.3474	271.3195	233.9707	138.8014	66.5100	0.0000	0.0000	0.0000	0.0000	136.2776	245.6336	363.0368 (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	298.5715	263.8901	279.7009	244.0855	235.4254	210.8255	206.9885	215.8565	218.9679	245.7648	263.3206	295.0458 (64)
Efficiency of water heater (217)m	292.8900	292.8900	292.8900	292.8900	292.8900	292.8900	292.8900	292.8900	292.8900	292.8900	292.8900	292.8900 (216)
Fuel for water heating, kWh/month	101.9398	90.0987	95.4969	83.3369	80.3801	71.9811	70.6711	73.6988	74.7611	83.9103	89.9042	100.7360 (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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (231)
Lighting	38.0745	30.5447	27.5022	20.1493	15.5639	12.7158	14.1979	18.4549	23.9711	31.4514	35.5243	39.1327 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)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 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)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 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)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 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)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 (235c)
Electricity generated by PVs (Appendix M) (negative quantity) (233b)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 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234b)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 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235b)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 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235d)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 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												1839.8971 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												292.8900
Water heating fuel used												1016.9151 (219)
Space cooling fuel												0.0000 (221)

Electricity for pumps and fans:

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Total electricity for the above, kWh/year	0.0000 (231)
Electricity for lighting (calculated in Appendix L)	307.2827 (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)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	3164.0949 (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	1839.8971	0.1551	285.2846 (261)
Total CO2 associated with community systems			0.0000 (273)
Water heating (other fuel)	1016.9151	0.1410	143.4350 (264)
Space and water heating			428.7196 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	307.2827	0.1443	44.3504 (268)
Total CO2, kg/year			473.0700 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.1300 (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	1839.8971	1.5740	2896.0389 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1016.9151	1.5216	1547.2934 (278)
Space and water heating			4443.3323 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	307.2827	1.5338	471.3205 (282)
Total Primary energy kWh/year			4914.6528 (286)
Dwelling Primary energy Rate (DPER)			32.5000 (287)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022) CALCULATION OF TARGET EMISSIONS

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	83.6100 (1b)	x 2.4000 (2b)	= 200.6640 (1b) - (3b)
First floor	67.6000 (1c)	x 2.6500 (2c)	= 179.1400 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	151.2100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	379.8040 (5)

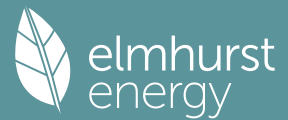
2. Ventilation rate

	m3 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	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.1053 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3553 (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) = 0.3020 (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	0.3851	0.3775	0.3700	0.3322	0.3247	0.2869	0.2869	0.2794	0.3020	0.3247	0.3398	0.3549 (22b)
Effective ac	0.5741	0.5713	0.5684	0.5552	0.5527	0.5412	0.5412	0.5390	0.5456	0.5527	0.5577	0.5630 (25)

3. Heat losses and heat loss parameter

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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
Main dwelling							
TER Opaque door			2.1000	1.0000	2.1000		(26)
TER Opening Type			24.3200	1.1450	27.8473		(27)
Heatloss Floor 1			83.6100	0.1300	10.8693		(28a)
MASONRY	186.7500	26.4200	160.3300	0.1800	28.8594		(29a)
BARREL	70.0000		70.0000	0.1100	7.7000		(30)
SLOPE	18.0000		18.0000	0.1100	1.9800		(30)
Total net area of external elements Aum(A, m2)			358.3600				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		79.3560		(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K

139.9277 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element	16.4000	0.0500	0.8200
E3 Sill	37.3000	0.0500	1.8650
E4 Jamb	40.8000	0.1600	6.5280
E5 Ground floor (normal)	24.4000	0.0400	0.9760
E11 Eaves (insulation at rafter level)	21.5000	0.0800	1.7200
E13 Gable (insulation at rafter level)	22.6000	0.0900	2.0340
E16 Corner (normal)	17.4000	0.0500	0.8700
E1 Steel lintel with perforated steel base plate	2.4000	-0.0900	-0.2160
E17 Corner (inverted - internal area greater than external area)	33.5200	0.0000	0.0000
E6 Intermediate floor within a dwelling			

Thermal bridges (Sum(L x Psi) calculated using Appendix K)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 93.9530 (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
	71.9602	71.5994	71.2457	69.5844	69.2736	67.8266	67.8266	67.5587	68.3840	69.2736	69.9023	70.5597 (38)
Heat transfer coeff	165.9132	165.5524	165.1987	163.5374	163.2266	161.7796	161.7796	161.5117	162.3370	163.2266	163.8554	164.5127 (39)
Average = Sum(39)m / 12 =												163.5359

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0972	1.0949	1.0925	1.0815	1.0795	1.0699	1.0699	1.0681	1.0736	1.0795	1.0836	1.0880 (40)
HLP (average)												1.0815
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

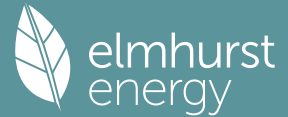
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.9361 (42)
Hot water usage for mixer showers													
73.4479	72.3441	70.7357	67.6583	65.3872	62.8546	61.4150	63.0112	64.7610	67.4803	70.6239	73.1665	(42a)	
Hot water usage for baths													
31.7082	31.2373	30.5742	29.3515	28.4359	27.4207	26.8723	27.5308	28.2478	29.3341	30.5820	31.6010	(42b)	
Hot water usage for other uses													
44.6982	43.0728	41.4474	39.8220	38.1966	36.5713	36.5713	38.1966	39.8220	41.4474	43.0728	44.6982	(42c)	
Average daily hot water use (litres/day)												137.7498 (43)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
149.8544	146.6543	142.7573	136.8318	132.0198	126.8465	124.8586	128.7387	132.8309	138.2619	144.2787	149.4658	(44)	
Energy conte	237.3327	208.8337	219.4127	187.3159	177.7240	155.9726	151.0056	159.4054	163.7938	187.6201	205.5515	234.0272 (45)	
Energy content (annual)										Total = Sum(45)m =		2287.9952	
Distribution loss (46)m = 0.15 x (45)m													
35.5999	31.3251	32.9119	28.0974	26.6586	23.3959	22.6508	23.9108	24.5691	28.1430	30.8327	35.1041	(46)	
Water storage loss (or HIU loss):													
Store volume												150.0000 (47)	
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)	
Temperature factor from Table 2b												0.5400 (49)	
Enter (49) or (54) in (55)												0.7527 (55)	
Total storage loss													
23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)	
If cylinder contains dedicated solar storage													
23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(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)	
Combi 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 (61)	
Total heat required for water heating calculated for each month													
283.9276	250.9195	266.0076	232.4077	224.3189	201.0644	197.6005	206.0003	208.8856	234.2150	250.6433	280.6221 (62)		
WWHRS	-33.5773	-29.6961	-31.0960	-25.7487	-23.9969	-20.5343	-19.2476	-20.4679	-21.2456	-25.0462	-28.3743	-32.9555 (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													
250.3502	221.2234	234.9116	206.6590	200.3220	180.5301	178.3529	185.5324	187.6400	209.1688	222.2690	247.6666 (64)		
12Total per year (kWh/year)												2524.6262 (64)	
Electric shower(s)												2525 (64)	
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) = Sum(64a)m =												0.0000 (64a)	
Heat gains from water heating, kWh/month													
116.1890	103.1058	110.2306	98.3560	96.3692	87.9344	87.4853	90.2782	90.5349	99.6596	104.4193	115.0900 (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	146.8030	146.8030	146.8030	146.8030	146.8030	146.8030	146.8030	146.8030	146.8030	146.8030	146.8030	146.8030 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	169.1812	187.3078	169.1812	174.8206	169.1812	174.8206	169.1812	169.1812	174.8206	169.1812	174.8206	169.1812 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	321.8356	325.1753	316.7595	298.8432	276.2272	254.9713	240.7711	237.4314	245.8472	263.7635	286.3795	307.6354 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.6803	37.6803	37.6803	37.6803	37.6803	37.6803	37.6803	37.6803	37.6803	37.6803	37.6803	37.6803 (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)	-117.4424	-117.4424	-117.4424	-117.4424	-117.4424	-117.4424	-117.4424	-117.4424	-117.4424	-117.4424	-117.4424	-117.4424 (71)
Water heating gains (Table 5)	156.1681	153.4312	148.1595	136.6056	129.5284	122.1311	117.5878	121.3417	125.7429	133.9511	145.0269	154.6908 (72)
Total internal gains	717.2258	735.9552	704.1411	680.3103	644.9778	618.9639	594.5810	594.9953	613.4516	636.9367	676.2679	701.5484 (73)

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6. Solar gains

[Jan]	Area m2				Solar flux Table 6a W/m2	Specific data or Table 6b	g	Specific data or Table 6c	FF or Table 6c	Access factor Table 6d	Gains W
Northeast	15.2400				11.2829		0.6300		0.7000	0.7700	52.5508 (75)
Southeast	1.5000				36.7938		0.6300		0.7000	0.7700	16.8670 (77)
Southwest	7.5800				36.7938		0.6300		0.7000	0.7700	85.2346 (79)
Solar gains	154.6524	280.8855	430.6841	611.3520	755.6985	781.4349	740.4021	627.9430	492.4976	322.9393	130.2933 (83)
Total gains	871.8782	1016.8407	1134.8251	1291.6623	1400.6763	1400.3988	1334.9831	1222.9383	1105.9492	959.8760	831.8417 (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	35.4243	35.5015	35.5775	35.9389	36.0073	36.3294	36.3294	36.3896	36.2046	36.0073	35.8691	35.7258
alpha	3.3616	3.3668	3.3718	3.3959	3.4005	3.4220	3.4220	3.4260	3.4136	3.4005	3.3913	3.3817
util living area												
	0.9859	0.9755	0.9559	0.9037	0.8028	0.6463	0.5024	0.5589	0.7783	0.9319	0.9764	0.9879 (86)
MIT	18.8906	19.1518	19.5516	20.1003	20.5634	20.8551	20.9542	20.9339	20.7118	20.1092	19.4120	18.8509 (87)
Th 2	20.0031	20.0050	20.0070	20.0159	20.0176	20.0255	20.0255	20.0269	20.0225	20.0176	20.0142	20.0107 (88)
util rest of house												
	0.9831	0.9707	0.9470	0.8833	0.7606	0.5726	0.4029	0.4582	0.7166	0.9134	0.9710	0.9855 (89)
MIT 2	17.5272	17.8600	18.3666	19.0530	19.6015	19.9172	20.0022	19.9905	19.7816	19.0775	18.1995	17.4813 (90)
Living area fraction												
	17.7953	18.1141	18.5997	19.2590	19.7907	20.1017	20.1894	20.1761	19.9645	19.2804	18.4379	17.7507 (91)
MIT												
Temperature adjustment												
adjusted MIT	17.7953	18.1141	18.5997	19.2590	19.7907	20.1017	20.1894	20.1761	19.9645	19.2804	18.4379	17.7507 (92)
												0.0000
												17.7507 (93)

8. Space heating requirement

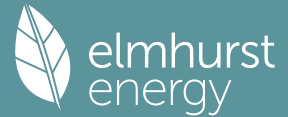
Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9739	0.9579	0.9300	0.8642	0.7495	0.5788	0.4204	0.4745	0.7124	0.8953	0.9586	0.9773 (94)
Ext temp.	849.1573	974.0693	1055.4118	1116.2692	1049.8041	810.5653	561.1981	580.3273	787.8635	859.4088	828.8859	812.9947 (95)
Heat loss rate 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)
Space heating kWh	2239.0544	2187.6190	1998.8489	1694.0783	1320.6118	890.0620	580.6947	609.8798	952.0295	1416.8740	1857.7804	2229.2604 (97)
Space heating requirement - total per year (kWh/year)	1034.0834	815.5053	701.9172	416.0225	201.4809	0.0000	0.0000	0.0000	0.0000	414.7541	740.8040	1053.7017 (98a)
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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	1034.0834	815.5053	701.9172	416.0225	201.4809	0.0000	0.0000	0.0000	0.0000	414.7541	740.8040	1053.7017 (98c)
Space heating per m2	(98c) / (4) =											35.5682 (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 %)												92.3000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating efficiency (main heating system 1)	1034.0834	815.5053	701.9172	416.0225	201.4809	0.0000	0.0000	0.0000	0.0000	414.7541	740.8040	1053.7017 (98)
Space heating fuel (main heating system)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000 (210)
Space heating efficiency (main heating system 2)	1120.3504	883.5377	760.4737	450.7286	218.2892	0.0000	0.0000	0.0000	0.0000	449.3544	802.6046	1141.6053 (211)
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 (212)
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 (213)
Water heating requirement	250.3502	221.2234	234.9116	206.6590	200.3220	180.5301	178.3529	185.5324	187.6400	209.1688	222.2690	247.6666 (64)
Efficiency of water heater (217)m	86.8899	86.7132	86.3578	85.5961	84.0727	79.8000	79.8000	79.8000	79.8000	85.5648	86.5473	79.8000 (216)
Fuel for water heating, kWh/month	288.1234	255.1209	272.0213	241.4351	238.2723	226.2282	223.4999	232.4967	235.1379	244.4566	256.8181	284.8902 (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	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	35.1525	28.2007	25.3916	18.6029	14.3695	11.7400	13.1083	17.0387	22.1315	29.0378	32.7981	36.1295 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-70.7676	-96.1790	-133.2793	-144.2127	-150.7991	-138.9581	-137.0734	-131.5618	-121.3480	-107.0871	-76.4427	-61.5980 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)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 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)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 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)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 (235c)
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	-51.6540	-107.0807	-210.0560	-311.6315	-408.4970	-409.3004	-404.6264	-344.3280	-254.6115	-151.9933	-68.5668	-40.9814 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234b)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 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235b)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 (235b)

13a. Primary energy - Individual heating systems including micro-CHP			
	Energy kWh/year	Primary energy factor kg CO ₂ /kWh	Primary energy kWh/year
Space heating - main system 1	5826.9439	1.1300	6584.4467 (275)
Total CO ₂ associated with community systems			0.0000 (473)
Water heating (other fuel)	2998.5007	1.1300	3388.3058 (278)
Space and water heating			9972.7524 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	283.7009	1.5338	435.1500 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1369.3067	1.5005	-2054.6505
PV Unit electricity exported	-2763.3270	0.4635	-1280.6813
Total			-3335.3318 (283)
Total Primary energy kWh/year			7202.6714 (286)
Target Primary Energy Rate (TPER)			47.6300 (287)

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Plot Reference	GREEN				Issued on Date	04/03/2026	
Assessment Reference	GREEN			Plot Type Ref			
Plot Address	Slip End Farm, Slip End, Baldock, Hertfordshire, SG7 6SG				SAP Version	10.2	
SAP Rating	89 B	DER	2.31	TER	9.07		
Environmental	98 A	% DER < TER				74.53	
CO ₂ Emissions (t/year)	0.32	DFEE	38.97	TFEE	40.86		
Compliance Check	See BREL	% DFEE < TFEE				4.64	
% DPER < TPER	48.26	DPER	24.64	TPER	47.63		
Assessor Details	Mr. Paul Allen				Assessor ID	8075-0001	
Client	APC, AP						

SAP 10 WORKSHEET FOR New Build (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)
Main dwelling			
Ground floor	83.6100 (1b)	x 2.4000 (2b)	= 200.6640 (1b) - (3b)
First floor	67.6000 (1c)	x 2.6500 (2c)	= 179.1400 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	151.2100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 379.8040 (5)

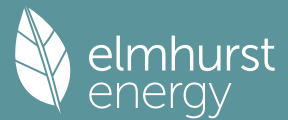
2. Ventilation rate

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	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)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	
Pressure test	0.0000 / (5) =	0.0000 (8)
Pressure Test Method	Yes	
Measured/design AP50	Blower Door	
Infiltration rate		3.0000 (17)
Number of sides sheltered		0.1500 (18)
		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1275 (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 exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)		0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =		84.6000 (23c)
Effective ac	0.2396 0.2364 0.2332 0.2172 0.2141 0.1981 0.1981 0.1949 0.2045 0.2141 0.2204 0.2268	(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
Main dwelling							
WINDOW			24.3200	1.2357	30.0532		(27)
SOLID DOOR			2.1000	1.1000	2.3100		(26)
Heatloss Floor 1			83.6100	0.1000	8.3610	75.0000	(28a)
MASONRY	186.7500	26.4200	160.3300	0.1700	27.2561	70.0000	11223.1000 (29a)
BARREL	70.0000		70.0000	0.1200	8.4000	9.0000	630.0000 (30)
SLOPE	18.0000		18.0000	0.1300	2.3400	9.0000	162.0000 (30)
Total net area of external elements Aum(A, m ²)			358.3600				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		78.7203		(33)
Main dwelling							
Internal Wall 1			116.3800			9.0000	1047.4200 (32c)
Internal Floor 1			67.6000			18.0000	1216.8000 (32d)
Internal Ceiling 1			67.6000			9.0000	608.4000 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	21158.4700 (34)

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Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K

139.9277 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element	16.4000	0.0220	0.3608
E3 Sill	37.3000	0.0170	0.6341
E4 Jamb	40.8000	0.0740	3.0192
E5 Ground floor (normal)	24.4000	0.0080	0.1952
E11 Eaves (insulation at rafter level)	21.5000	0.0560	1.2040
E13 Gable (insulation at rafter level)	22.6000	0.0460	1.0396
E16 Corner (normal)	17.4000	0.2680	4.6632
E1 Steel lintel with perforated steel base plate	2.4000	-0.0010	-0.0024
E17 Corner (inverted - internal area greater than external area)	33.5200	0.0010	0.0335
E6 Intermediate floor within a dwelling			

Thermal bridges (Sum(L x Psi) calculated using Appendix K)

11.1472 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 89.8676 (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	30.0256	29.6261	29.2266	27.2291	26.8296	24.8321	24.8321	24.4326	25.6311	26.8296	27.6286	28.4276 (38)
Average = Sum(39)m / 12 =	119.8932	119.4937	119.0942	117.0967	116.6971	114.6996	114.6996	114.3001	115.4986	116.6971	117.4962	118.2952 (39)
												116.9968

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.7929	0.7902	0.7876	0.7744	0.7718	0.7585	0.7585	0.7559	0.7638	0.7718	0.7770	0.7823 (40)
HLP (average)												0.7737
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy

2.9361 (42)

Hot water usage for mixer showers

82.6289 81.3872 79.5777 76.1156 73.5606 70.7114 69.0919 70.8876 72.8562 75.9154 79.4519 82.3123 (42a)

Hot water usage for baths

31.7082 31.2373 30.5742 29.3515 28.4359 27.4207 26.8723 27.5308 28.2478 29.3341 30.5820 31.6010 (42b)

Hot water usage for other uses

44.6982 43.0728 41.4474 39.8220 38.1966 36.5713 36.5713 38.1966 39.8220 41.4474 43.0728 44.6982 (42c)

Average daily hot water use (litres/day)

146.2143 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	159.0353	155.6973	151.5993	145.2891	140.1932	134.7033	132.5355	136.6151	140.9260	146.6969	153.1067	158.6116 (44)
Energy conte	251.8731	221.7109	233.0025	198.8935	188.7270	165.6335	160.2901	169.1581	173.7759	199.0664	218.1286	248.3474 (45)
Energy content (annual)												2428.6068

Distribution loss (46)m = 0.15 x (45)m

37.7810 33.2566 34.9504 29.8340 28.3090 24.8450 24.0435 25.3737 26.0664 29.8600 32.7193 37.2521 (46)

Water storage loss (or HIU loss):

Store volume

150.0000 (47)

a) If manufacturer declared loss factor is known (kWh/day):

Temperature factor from Table 2b

1.4000 (48)

Enter (49) or (54) in (55)

0.5400 (49)

Total storage loss

0.7560 (55)

23.4360 21.1680 23.4360 22.6800 23.4360 22.6800 23.4360 23.4360 22.6800 23.4360 22.6800 23.4360 (56)

If cylinder contains dedicated solar storage

23.4360 21.1680 23.4360 22.6800 23.4360 22.6800 23.4360 23.4360 22.6800 23.4360 22.6800 23.4360 (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)

Combi 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 (61)

Total heat required for water heating calculated for each month

298.5715 263.8901 279.7009 244.0855 235.4254 210.8255 206.9885 215.8565 218.9679 245.7648 263.3206 295.0458 (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 298.5715 263.8901 279.7009 244.0855 235.4254 210.8255 206.9885 215.8565 218.9679 245.7648 263.3206 295.0458 (64)

Total per year (kWh/year) = Sum(64)m = 2978.4428 (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) = Sum(64a)m = 0.0000 (64a)

Heat gains from water heating, kWh/month 121.1065 107.4622 114.8320 102.2857 100.1104 91.2267 90.6552 93.6038 93.9341 103.5483 108.6813 119.9342 (65)

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

Metabolic gains (Table 5), Watts

(66)m 146.8030 146.8030 146.8030 146.8030 146.8030 146.8030 146.8030 146.8030 146.8030 146.8030 146.8030 146.8030 (66)

Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5

169.1812 187.3078 169.1812 174.8206 169.1812 174.8206 169.1812 169.1812 174.8206 169.1812 174.8206 169.1812 (67)

Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5

321.8356 325.1753 316.7595 298.8432 276.2272 254.9713 240.7711 237.4314 245.8472 263.7635 286.3795 307.6354 (68)

Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5

37.6803 37.6803 37.6803 37.6803 37.6803 37.6803 37.6803 37.6803 37.6803 37.6803 37.6803 37.6803 (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)

-117.4424 -117.4424 -117.4424 -117.4424 -117.4424 -117.4424 -117.4424 -117.4424 -117.4424 -117.4424 -117.4424 -117.4424 (71)

Water heating gains (Table 5)

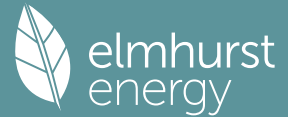
162.7776 159.9140 154.3441 142.0634 134.5570 126.7038 121.8484 125.8115 130.4640 139.1778 150.9463 161.2019 (72)

Total internal gains 720.8354 739.4380 707.3258 682.7682 647.0064 623.5366 598.8416 599.4651 618.1727 639.1634 679.1873 705.0594 (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	15.2400	11.2829	0.5500	0.7000	0.7700	45.8777 (75)
Southeast	1.5000	36.7938	0.5500	0.7000	0.7700	14.7252 (77)
Southwest	7.5800	36.7938	0.5500	0.7000	0.7700	74.4112 (79)

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Solar gains	135.0140	245.2175	375.9940	533.7200	659.7368	682.2051	646.3828	548.2042	429.9582	281.9311	164.4908	113.7481 (83)
Total gains	855.8494	984.6555	1083.3198	1216.4882	1306.7432	1305.7417	1245.2244	1147.6693	1048.1309	921.0945	843.6781	818.8076 (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	49.0216	49.1855	49.3505	50.1923	50.3642	51.2413	51.2413	51.4204	50.8868	50.3642	50.0217	49.6838	
alpha	4.2681	4.2790	4.2900	4.3462	4.3576	4.4161	4.4161	4.4280	4.3925	4.3576	4.3348	4.3123	
util living area	0.9846	0.9714	0.9449	0.8692	0.7311	0.5419	0.4008	0.4502	0.6895	0.9061	0.9716	0.9870 (86)	
Living	19.8771	20.0507	20.2898	20.6013	20.8106	20.9058	20.9248	20.9218	20.8617	20.5834	20.1880	19.8565	
Non living	18.9191	19.1406	19.4429	19.8328	20.0740	20.1812	20.1968	20.1973	20.1378	19.8201	19.3255	18.9001	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.4256	20.0507	20.2898	20.6013	20.8106	20.9058	20.9248	20.9218	20.8617	20.5834	20.1880	20.0165 (87)	
Th 2	20.2595	20.2618	20.2641	20.2756	20.2779	20.2894	20.2894	20.2917	20.2848	20.2779	20.2733	20.2687 (88)	
util rest of house	0.9819	0.9665	0.9354	0.8479	0.6922	0.4878	0.3379	0.3840	0.6354	0.8858	0.9659	0.9848 (89)	
MIT 2	19.7251	19.1406	19.4429	19.8328	20.0740	20.1812	20.1968	20.1973	20.1378	19.8201	19.3255	19.1467 (90)	
Living area fraction									FLA = Living area / (4) =				0.1967 (91)
MIT	19.8629	19.3196	19.6094	19.9840	20.2189	20.3237	20.3400	20.3398	20.2801	19.9702	19.4952	19.3178 (92)	
Temperature adjustment												0.0000	
adjusted MIT	19.8629	19.3196	19.6094	19.9840	20.2189	20.3237	20.3400	20.3398	20.2801	19.9702	19.4952	19.3178 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9802	0.9588	0.9254	0.8383	0.6889	0.4905	0.3424	0.3886	0.6350	0.8758	0.9583	0.9810 (94)
Useful gains	838.9308	944.0427	1002.4819	1019.7712	900.1688	640.4494	426.4214	445.9421	665.6051	806.7136	808.4698	803.2778 (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	1865.8857	1723.0531	1561.2578	1297.8952	994.1261	656.5067	428.9712	450.3149	713.7980	1093.4752	1456.3852	1788.3626 (97)
Space heating kWh	764.0544	523.4950	415.7292	200.2493	69.9042	0.0000	0.0000	0.0000	0.0000	213.3506	466.4991	732.9031 (98a)
Space heating requirement - total per year (kWh/year)												3386.1850
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	764.0544	523.4950	415.7292	200.2493	69.9042	0.0000	0.0000	0.0000	0.0000	213.3506	466.4991	732.9031 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3386.1850
Space heating per m2										(98c) / (4) =		22.3939 (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 %)													312.3093 (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	764.0544	523.4950	415.7292	200.2493	69.9042	0.0000	0.0000	0.0000	0.0000	213.3506	466.4991	732.9031 (98)	
Space heating efficiency (main heating system 1)	312.3093	312.3093	312.3093	312.3093	312.3093	0.0000	0.0000	0.0000	0.0000	312.3093	312.3093	312.3093 (210)	
Space heating fuel (main heating system)	244.6467	167.6207	133.1146	64.1189	22.3830	0.0000	0.0000	0.0000	0.0000	68.3139	149.3709	234.6722 (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	298.5715	263.8901	279.7009	244.0855	235.4254	210.8255	206.9885	215.8565	218.9679	245.7648	263.3206	295.0458 (64)	
Efficiency of water heater (217)m	296.9377	296.9377	296.9377	296.9377	296.9377	296.9377	296.9377	296.9377	296.9377	296.9377	296.9377	296.9377 (216)	
Fuel for water heating, kWh/month	100.5502	88.8705	94.1951	82.2009	79.2844	70.9999	69.7077	72.6942	73.7420	82.7664	88.6787	99.3628 (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	29.2006	26.3748	29.2006	28.2587	29.2006	28.2587	29.2006	29.2006	28.2587	29.2006	28.2587	29.2006 (231)	
Lighting	38.0745	30.5447	27.5022	20.1493	15.5639	12.7158	14.1979	18.4549	23.9711	31.4514	35.5243	39.1327 (232)	
Electricity generated by PVs (Appendix M) (negative quantity)	-9.8147	-15.9772	-26.6058	-34.2286	-40.5200	-38.9838	-38.4143	-34.1753	-27.4129	-19.7453	-11.4246	-8.2193 (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)	-1.2056	-2.9150	-6.6869	-11.6571	-17.0060	-17.8517	-17.5573	-14.2190	-9.6424	-4.7308	-1.7514	-0.9297 (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													1084.2410 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)

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Efficiency of water heater	296.9377	
Water heating fuel used	1003.0529	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans: (BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 0.7420)		
mechanical ventilation fans (SFP = 0.7420)	343.8138	(230a)
Total electricity for the above, kWh/year	343.8138	(231)
Electricity for lighting (calculated in Appendix L)	307.2827	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-411.6747	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2326.7157	(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	1084.2410	0.1561	169.2841 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1003.0529	0.1410	141.4798 (264)
Space and water heating			310.7639 (265)
Pumps, fans and electric keep-hot	343.8138	0.1387	47.6912 (267)
Energy for lighting	307.2827	0.1443	44.3504 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-305.5217	0.1320	-40.3344
PV Unit electricity exported	-106.1529	0.1221	-12.9602
Total			-53.2947 (269)
Total CO2, kg/year			349.5108 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			2.3100 (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	1084.2410	1.5780	1710.9312 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1003.0529	1.5216	1526.2013 (278)
Space and water heating			3237.1325 (279)
Pumps, fans and electric keep-hot	343.8138	1.5128	520.1215 (281)
Energy for lighting	307.2827	1.5338	471.3205 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-305.5217	1.4878	-454.5467
PV Unit electricity exported	-106.1529	0.4480	-47.5518
Total			-502.0985 (283)
Total Primary energy kWh/year			3726.4761 (286)
Dwelling Primary energy Rate (DPER)			24.6400 (287)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022) CALCULATION OF TARGET EMISSIONS

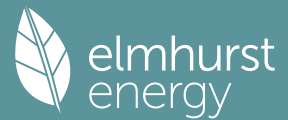
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	83.6100 (1b)	x 2.4000 (2b)	= 200.6640 (1b) - (3b)
First floor	67.6000 (1c)	x 2.6500 (2c)	= 179.1400 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)... (1n)	151.2100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)... (3n)	= 379.8040 (5)

2. Ventilation rate

	m3 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	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	Air changes per hour
Pressure test	40.0000 / (5) = 0.1053 (8)
Pressure Test Method	Yes
Measured/design AP50	Blower Door
Infiltration rate	5.0000 (17)
Number of sides sheltered	0.3553 (18)
	2 (19)

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Shelter factor
Infiltration rate adjusted to include shelter factor

$$(20) = 1 - [0.075 \times (19)] = 0.8500 \quad (20)$$
$$(21) = (18) \times (20) = 0.3020 \quad (21)$$

	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	0.3851	0.3775	0.3700	0.3322	0.3247	0.2869	0.2869	0.2794	0.3020	0.3247	0.3398	0.3549	(22b)
	0.5741	0.5713	0.5684	0.5552	0.5527	0.5412	0.5412	0.5390	0.5456	0.5527	0.5577	0.5630	(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	
Main dwelling								
TER Opaque door			2.1000	1.0000	2.1000			(26)
TER Opening Type			24.3200	1.1450	27.8473			(27)
Heatloss Floor 1			83.6100	0.1300	10.8693			(28a)
MASONRY	186.7500	26.4200	160.3300	0.1800	28.8594			(29a)
BARREL	70.0000		70.0000	0.1100	7.7000			(30)
SLOPE	18.0000		18.0000	0.1100	1.9800			(30)
Total net area of external elements Aum(A, m2)			358.3600					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	79.3560		(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K

139.9277 (35)

List of Thermal Bridges

	Length	Psi-value	Total	
K1 Element	16.4000	0.0500	0.8200	
E3 Sill	37.3000	0.0500	1.8650	
E4 Jamb	40.8000	0.1600	6.5280	
E5 Ground floor (normal)	24.4000	0.0400	0.9760	
E11 Eaves (insulation at rafter level)	21.5000	0.0800	1.7200	
E13 Gable (insulation at rafter level)	22.6000	0.0900	2.0340	
E16 Corner (normal)	17.4000	0.0500	0.8700	
E1 Steel lintel with perforated steel base plate	2.4000	-0.0900	-0.2160	
E17 Corner (inverted - internal area greater than external area)	33.5200	0.0000	0.0000	
E6 Intermediate floor within a dwelling				

Thermal bridges (Sum(L x Psi) calculated using Appendix K)

Point Thermal bridges

(36a) = 14.5970 (36)

Total fabric heat loss

(33) + (36) + (36a) = 93.9530 (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	71.9602	71.5994	71.2457	69.5844	69.2736	67.8266	67.8266	67.5587	68.3840	69.2736	69.9023	70.5597	(38)
Heat transfer coeff	165.9132	165.5524	165.1987	163.5374	163.2266	161.7796	161.7796	161.5117	162.3370	163.2266	163.8554	164.5127	(39)
Average = Sum(39)m / 12 =												163.5359	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0972	1.0949	1.0925	1.0815	1.0795	1.0699	1.0699	1.0681	1.0736	1.0795	1.0836	1.0880	(40)
HLP (average)												1.0815	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

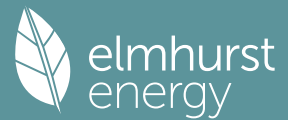
Assumed occupancy												2.9361 (42)
Hot water usage for mixer showers												
73.4479	72.3441	70.7357	67.6583	65.3872	62.8546	61.4150	63.0112	64.7610	67.4803	70.6239	73.1665	(42a)
Hot water usage for baths												
31.7082	31.2373	30.5742	29.3515	28.4359	27.4207	26.8723	27.5308	28.2478	29.3341	30.5820	31.6010	(42b)
Hot water usage for other uses												
44.6982	43.0728	41.4474	39.8220	38.1966	36.5713	36.5713	38.1966	39.8220	41.4474	43.0728	44.6982	(42c)
Average daily hot water use (litres/day)												137.7498 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	149.8544	146.6543	142.7573	136.8318	132.0198	126.8465	124.8586	128.7387	132.8309	138.2619	144.2787	149.4658	(44)
Energy content (annual)	237.3327	208.8337	219.4127	187.3159	177.7240	155.9726	151.0056	159.4054	163.7938	187.6201	205.5515	234.0272	(45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		2287.9952	
	35.5999	31.3251	32.9119	28.0974	26.6586	23.3959	22.6508	23.9108	24.5691	28.1430	30.8327	35.1041	(46)
Water storage loss (or HIU loss):													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.7527	(55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(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)
Combi 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	(61)
Total heat required for water heating calculated for each month													
	283.9276	250.9195	266.0076	232.4077	224.3189	201.0644	197.6005	206.0003	208.8856	234.2150	250.6433	280.6221	(62)
WWHRS	-33.5773	-29.6961	-31.0960	-25.7487	-23.9969	-20.5343	-19.2476	-20.4679	-21.2456	-25.0462	-28.3743	-32.9555	(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	250.3502	221.2234	234.9116	206.6590	200.3220	180.5301	178.3529	185.5324	187.6400	209.1688	222.2690	247.6666	(64)
12Total per year (kWh/year)								Total per year (kWh/year) = Sum(64)m =				2524.6262	(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)
												0.0000	(64a)
Heat gains from water heating, kWh/month	116.1890	103.1058	110.2306	98.3560	96.3692	87.9344	87.4853	90.2782	90.5349	99.6596	104.4193	115.0900	(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
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Full SAP Calculation Printout



(66)m	146.8030	146.8030	146.8030	146.8030	146.8030	146.8030	146.8030	146.8030	146.8030	146.8030	146.8030	146.8030	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	169.1812	169.1812	169.1812	169.1812	169.1812	169.1812	169.1812	169.1812	169.1812	169.1812	169.1812	169.1812	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	321.8356	321.8356	321.8356	321.8356	321.8356	321.8356	321.8356	321.8356	321.8356	321.8356	321.8356	321.8356	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.6803	37.6803	37.6803	37.6803	37.6803	37.6803	37.6803	37.6803	37.6803	37.6803	37.6803	37.6803	(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)	-117.4424	-117.4424	-117.4424	-117.4424	-117.4424	-117.4424	-117.4424	-117.4424	-117.4424	-117.4424	-117.4424	-117.4424	(71)
Water heating gains (Table 5)	156.1681	156.1681	156.1681	156.1681	156.1681	156.1681	156.1681	156.1681	156.1681	156.1681	156.1681	156.1681	(72)
Total internal gains	717.2258	717.2258	717.2258	717.2258	717.2258	717.2258	717.2258	717.2258	717.2258	717.2258	717.2258	717.2258	(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						15.2400	11.2829		0.6300	0.7000	0.7700	52.5508 (75)	
Southeast						1.5000	36.7938		0.6300	0.7000	0.7700	16.8670 (77)	
Southwest						7.5800	36.7938		0.6300	0.7000	0.7700	85.2346 (79)	

Solar gains	154.6524	280.8855	430.6841	611.3520	755.6985	781.4349	740.4021	627.9430	492.4976	322.9393	188.4167	130.2933	(83)
Total gains	871.8782	1016.8407	1134.8251	1291.6623	1400.6763	1400.3988	1334.9831	1222.9383	1105.9492	959.8760	864.6846	831.8417	(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	35.4243	35.5015	35.5775	35.9389	36.0073	36.3294	36.3294	36.3896	36.2046	36.0073	35.8691	35.7258	
alpha	3.3616	3.3668	3.3718	3.3959	3.4005	3.4220	3.4220	3.4260	3.4136	3.4005	3.3913	3.3817	
util living area	0.9859	0.9755	0.9559	0.9037	0.8028	0.6463	0.5024	0.5589	0.7783	0.9319	0.9764	0.9879 (86)	
MIT	18.8906	19.1518	19.5516	20.1003	20.5634	20.8551	20.9542	20.9339	20.7118	20.1092	19.4120	18.8509 (87)	
Th 2	20.0031	20.0050	20.0070	20.0159	20.0176	20.0255	20.0255	20.0269	20.0225	20.0176	20.0142	20.0107 (88)	
util rest of house	0.9831	0.9707	0.9470	0.8833	0.7606	0.5726	0.4029	0.4582	0.7166	0.9134	0.9710	0.9855 (89)	
MIT 2	17.5272	17.8600	18.3666	19.0530	19.6015	19.9172	20.0022	19.9905	19.7816	19.0775	18.1995	17.4813 (90)	
Living area fraction	17.7953	18.1141	18.5997	19.2590	19.7907	20.1017	20.1894	20.1761	19.9645	19.2804	18.4379	17.7507 (92)	
MIT	17.7953	18.1141	18.5997	19.2590	19.7907	20.1017	20.1894	20.1761	19.9645	19.2804	18.4379	17.7507 (93)	
Temperature adjustment												0.0000	
adjusted MIT	17.7953	18.1141	18.5997	19.2590	19.7907	20.1017	20.1894	20.1761	19.9645	19.2804	18.4379	17.7507 (93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9739	0.9579	0.9300	0.8642	0.7495	0.5788	0.4204	0.4745	0.7124	0.8953	0.9586	0.9773 (94)	
Useful gains	849.1573	974.0693	1055.4118	1116.2692	1049.8041	810.5653	561.1981	580.3273	787.8635	859.4088	828.8859	812.9947 (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	2239.0544	2187.6190	1998.8489	1694.0783	1320.6118	890.0620	580.6947	609.8798	952.0295	1416.8740	1857.7804	2229.2604 (97)	
Space heating kWh	1034.0834	815.5053	701.9172	416.0225	201.4809	0.0000	0.0000	0.0000	0.0000	414.7541	740.8040	1053.7017 (98a)	
Space heating requirement - total per year (kWh/year)												5378.2693	
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	1034.0834	815.5053	701.9172	416.0225	201.4809	0.0000	0.0000	0.0000	0.0000	414.7541	740.8040	1053.7017 (98c)	
Space heating requirement after solar contribution - total per year (kWh/year)												5378.2693	
Space heating per m2										(98c) / (4) =		35.5682 (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 %)													92.3000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	1034.0834	815.5053	701.9172	416.0225	201.4809	0.0000	0.0000	0.0000	0.0000	414.7541	740.8040	1053.7017 (98)	
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000 (210)	
Space heating fuel (main heating system)	1120.3504	883.5377	760.4737	450.7286	218.2892	0.0000	0.0000	0.0000	0.0000	449.3544	802.6046	1141.6053 (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	250.3502	221.2234	234.9116	206.6590	200.3220	180.5301	178.3529	185.5324	187.6400	209.1688	222.2690	247.6666 (64)	
Efficiency of water heater	86.8899	86.7132	86.3578	85.5961	84.0727	79.8000	79.8000	79.8000	79.8000	85.5648	86.5473	79.8000 (216)	
Fuel for water heating, kWh/month	288.1234	255.1209	272.0213	241.4351	238.2723	226.2282	223.4999	232.4967	235.1379	244.4566	256.8181	284.8902 (219)	
Space cooling fuel requirement													

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	5826.9439	1.1300	6584.4467	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2998.5007	1.1300	3388.3058	(278)
Space and water heating			9972.7524	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	283.7009	1.5338	435.1500	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1369.3067	1.5005	-2054.6505	
PV Unit electricity exported	-2763.3270	0.4635	-1280.6813	
Total			-3335.3318	(283)
Total Primary energy kWh/year			7202.6714	(286)
Target Primary Energy Rate (TPER)			47.6300	(287)



Job no:	26.060
Date:	04/03/2026
Assessor name:	Paul Allen
Registration no:	APCOE-12
Development name:	SLIP END FARM
Issue Date:	04/03/2026

Rainwater

Greywater

Results

WATER EFFICIENCY CALCULATOR FOR NEW DWELLINGS

(for use with the Code for Sustainable Homes issues Wat 1 for the May 2009 and subsequent versions)

Dwelling Description	ALL PLOTS
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1st step - Select from options below:

Is a Rain and/or Greywater system specified?	No
Is a shower AND bath present?	Yes
Has a washing machine been specified?	Yes
Has a dishwasher been specified?	Yes

2nd step - Build spreadsheet (click button below)

BUILD SPREADSHEET

As soon as this button is pressed the spreadsheet will change according to the options selected previously in the 1st step. Scroll down to see the changes.

3rd step - Enter consumption details for the specified fittings

TAPS (excluding kitchen taps)		Fitting type	Flow rate (litres/min)	Number of fittings
	1	TARGET FLOW RATE	5.00	2
	2			
	3			
	4			
	Proportionate flow rate (litres/min)			3.50
	Consumption / person / day (Litres)			9.48

BATHS		Fitting type	Capacity to overflow (litres)	Number of fittings
	1	TARGET CAPACITY	170.00	1
	2			
	3			
	4			
		Proportionate capacity to overflow (litres)		119.00
	Consumption / person / day (Litres)			18.70

SHOWERS		Fitting type	Flow rate (litres/min)	Number of fittings
	1	TARGET FLOW RATE	9.00	1
	2			
	3			
	4			
		Proportionate flow rate (litres/min)		6.30
	Consumption / person / day (Litres)			39.33

DISHWASHER		Fitting Type	Litres per place setting	Number of fittings
	1	TARGET CONSUMPTION	0.75	1
	2			
	3			
	4			
		Proportionate litres per place setting		0.53
	Consumption / person / day (Litres)			2.70

WASHING MACHINES		Fitting Type	Litres per kilogram of dry load	Number of fittings
	1	TARGET CONSUMPTION	5.00	1
	2			
	3			

4			
Where no washing machines have been specified but plumbing for future supply of grey/rainwater was installed, please enter details:			
	Proportionate of litres/kg of dry load	3.50	
	Consumption / person / day (Litres)	10.50	

WC's	Fitting Type	Flush Type	Volume**	Number of fittings
1	TARGET FLUSH	Full Flush	6.00	2
		Part Flush	3.00	
2		Full Flush		
		Part Flush		
3		Full Flush		
		Part Flush		
4		Full Flush		
		Part Flush		
		Average effective flushing volume (litres)		3.99
		Consumption / person / day (Litres)		17.64

KITCHEN SINK TAPS		Fitting Type	Flow rate (litres/minute)	Number of fittings
	1	TARGET FLOW RATE	9.70	1
	2			
	3			
	4			
		Proportionate flow rate (litres/min)		6.79
		Consumption / person / day (Litres)		14.63

WASTE DISPOSAL UNIT			
Is a waste disposal unit specified for the dwelling?		No	
	Consumption / person / day (Litres)		0.00

WATER SOFTENER	
Water Softener in use?	No
Total capacity used per regeneration (%)	

Water consumed per regeneration (litres)	
Average number of regeneration cycles per day (No.)	
Number of occupants served by the system (No.)	
Water consumed beyond 4% person / day (Litres)	0.00

4th step - Analyse Results[Go to Start](#)**INTERNAL WATER CONSUMPTION**

NET INTERNAL WATER CONSUMPTION	(litres/person/day)	112.98
RAINWATER ONLY COLLECTION SAVING	(litres/person/day)	0.00
GREYWATER ONLY RECYCLING SAVING	(litres/person/day)	0.00
RAIN/GREYWATER COLLECTION SAVING (combined system)	(litres/person/day)	0.00
NORMALISATION FACTOR	(litres/person/day)	0.91
TOTAL WATER CONSUMPTION	(litres/person/day)	102.8
CSH CREDITS ACHIEVED		3
CSH MANDATORY LEVEL:		Level 3/4

17. K COMPLIANCE

EXTERNAL WATER USE	(litres / person / day)	5.00
TOTAL WATER CONSUMPTION	(litres / person / day)	107.8
17. K COMPLIANCE?		Yes

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