

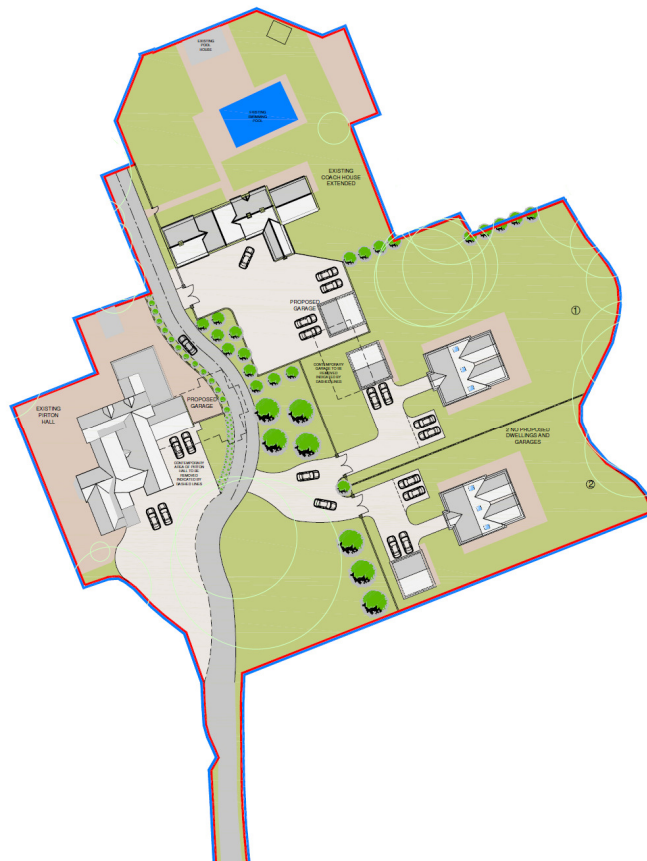
SUSTAINABILITY STATEMENT

Client: Gill Hudson Homes LTD

Site Address: Pirton Hall, Shillington Road, Pirton. SG5 3HB

Local Authority: North Herts District Council

Project Details: 2 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)
SEPTEMBER 2026 REVISION [1]

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BACKGROUND

This Planning Statement has been prepared for Gill Hudson Homes LTD in support of a proposed residential development comprising two new build dwellings, together with associated landscaping, access, infrastructure and other external works, on land associated with Pirton Hall in Shillington.

AIMS & OBJECTIVES

This statement assesses the proposed development against the relevant provisions of Policies D1 and NE12 of the Development Plan, together with the guidance set out in Section 14 of the National Planning Policy Framework (NPPF), and demonstrates how the scheme accords with these requirements.

EXECUTIVE SUMMARY

The proposed development would deliver a reduction of:

	Energy Hierarchy	Building Regulations Part L 2021
CO ₂ emissions	32.6%	75.30%
Energy demand	33.90%	51.80%

This would be achieved through a fabric-first approach, incorporating enhanced thermal performance, renewable heating systems and a 3 kWp solar photovoltaic array.

CO ₂ Emissions at each stage of the energy hierarchy:	
	Regulated CO ₂ emissions (tonnes/year)
Stage 1: 'Be Lean'	2.76
Stage 2: 'Be Clean'	2.68
Stage 3: 'Be Green'	1.86
% reduction	32.6%
Energy demand at each stage of the energy hierarchy:	
	Energy demand (kWh/year)
Stage 1: 'Be Lean'	10,836.6
Stage 2: 'Be Clean'	10,500.8
Stage 3: 'Be Green'	7,163.4
% reduction (rounded)	33.90%
Energy performance summary:	
	% improvement over building regulations
Dwelling emission rate (Tonnes CO ₂ /year)	75.30
Fabric efficiency (kWh/m ² /yr)	6.35
Primary energy rate (kWh/m ² /yr)	51.80

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

New build plot No	Type	Area (m ²)
1	6 Bed	289.33
2	6 Bed	289.33
	Total	578.66



<u>'BE LEAN' SPECIFICATION</u>	
Key design features:	
Wall U-value	0.18W/m ² k
Floor U-value	0.12W/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

To demonstrate compliance with the Council's sustainability policies, detailed energy calculations have been undertaken by suitably qualified energy assessors using government-approved software and the planning-stage drawings.

A representative worst-case dwelling (Plot 2) has been assessed, with its calculated energy demand extrapolated across the total number of new build dwellings to provide a conservative development-wide estimate. The assessment will be reviewed and updated before construction to reflect the detailed design.

Worst case Unit (Plot 2)	Space heating kwh/yr	Water heating kwh/yr	Pumps & fans kwh/yr	Lighting kwh/yr	Energy saving (PV)	Sub total kwh/yr
Plot	3,808.3	1,135.6	0.00	474.40	0.00	5,418.3
Total development	7,616.6	2,271.2	0.00	948.78	0.00	10,836.6
<i>Note: Energy demand taken from calculated SAP calculation using section 12a and rounded to 2sf</i>						



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

<u>'BE CLEAN' SPECIFICATION</u>	
Key design features:	
Wall U-value	0.17W/m ² k
Floor U-value	0.10W/m ² k
Roof U-value	0.12W/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 2)	Space heating kwh/yr	Water heating kwh/yr	Pumps & fans kwh/yr	Lighting kwh/yr	Energy saving (PV)	Sub total kwh/yr
Plot	3,640.4	1,136.6	0.00	474.40	0.00	5,250.4
Total development	7,280.8	2,271.2	0.00	948.78	0.00	10,500.8

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



Low and Zero-Carbon Technologies

Following recent changes to the Building Regulations, the scope for achieving further practical improvements to the thermal fabric of new-build dwellings is limited. Accordingly, the energy strategy focuses on low- and zero-carbon (LZC) heating and cooling technologies, energy-efficient lighting and enhanced air tightness.

The following LZC technologies have been considered:

1. Solar photovoltaic panels

Solar photovoltaic (PV) panels convert sunlight into electricity, which can be used to meet a proportion of the development's operational energy requirements, including lighting and building services.

2. Solar thermal water heating

Solar thermal panels capture energy from the sun and use it to supplement the generation of domestic hot water, thereby reducing demand on the primary heating system.

3. Ground-source heat pumps

Ground-source heat pumps (GSHPs) circulate a mixture of water and antifreeze through a buried pipework loop. Heat absorbed from the ground is transferred to the heat pump, where it is raised to a temperature suitable for space heating and domestic hot-water production. GSHPs typically achieve a coefficient of performance (COP) of 4 or greater, producing approximately four units of heat for each unit of electricity consumed.

4. Air-source heat pumps

Air-source heat pumps (ASHPs) extract heat from the ambient air and raise it to a temperature suitable for space heating and domestic hot-water production. As they do not require extensive groundworks, ASHPs are generally less costly and easier to install than ground-source systems. Certain systems may also provide cooling where required. ASHPs typically achieve a COP of 3 or greater, producing approximately three units of heat for each unit of electricity consumed.

5. Biomass boilers

Biomass heating systems generally use wood pellets, chips or logs to provide space heating and domestic hot water. Although alternative biomass fuels are available, wood pellets and chips are commonly used because of their comparatively high energy density. However, biomass systems require regular fuel deliveries and associated storage facilities. The resulting vehicle movements and site requirements are considered unsuitable for the proposed development.

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.

<u>'BE GREEN' SPECIFICATION</u>	
Key design features:	
Wall U-value	0.17W/m ² k
Floor U-value	0.12W/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	3.50 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	1.5kWp solar PV per plot (3.0kW total)

'BE GREEN' ENERGY PERFORMANCE

Worst case Unit (Plot 2)	Space heating kwh/yr	Water heating kwh/yr	Pumps & fans kwh/yr	Lighting kwh/yr	Energy saving (PV)	Sub total kwh/yr
Plot	12,273.4	1,135.9	993.45	474.39	1,295.4	3,581.7
Total development	4,546.8	2,271.8	1,986.9	948.8	2,590.8	7,163.4

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 02 Sep 2026 15:42:40

Project Information			
Assessed By	Paul Allen	Building Type	House, Detached
OCDEA Registration	EES/017061	Assessment Date	2026-09-02

Dwelling Details			
Assessment Type	As designed	Total Floor Area	297 m ²
Site Reference	GREEN	Plot Reference	LEAN
Address	Pirton Hall Shillington Road, Pirton, SG5 3HB		

Client Details	
Name	James A Keaney
Company	James A Keaney Associates
Address	307, Sharpenhoe Road, Streatley, LU3 3PP

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	7.53 kgCO ₂ /m ²		
Dwelling carbon dioxide emission rate	1.86 kgCO ₂ /m ²		OK

1b Target primary energy rate and dwelling primary energy			
Target primary energy	39.78 kWh _{PE} /m ²		
Dwelling primary energy	19.18 kWh _{PE} /m ²		OK

1c Target fabric energy efficiency and dwelling fabric energy efficiency			
Target fabric energy efficiency	39.6 kWh/m ²		
Dwelling fabric energy efficiency	37.1 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	0.12	Heatloss Floor 1 (0.12)	OK
Roofs	0.16	0.1	Roof (2) (0.13)	OK
Windows, doors, and roof windows	1.6	1.2	RW REAR (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)	195.57	0.17	
Exposed wall: Walls (2)	32.9	0.15	
Ground floor: Heatloss Floor 1, Heatloss Floor 1	128.74	0.12	
Exposed roof: Roof (1)	98.74	0.09 (!)	
Exposed roof: Roof (2)	28.01	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	West	N/A	1.1 (!)
WDW FR, WINDOW	19.4	West	0.7	1.2
WDW RR, WINDOW	32.94	East	0.7	1.2
WDW RH, WINDOW	3.96	South	0.7	1.2
WDW LH, WINDOW	6.19	North	0.7	1.2
RW REAR, ROOF WINDOW	2.29	East	0.7	1.3
DOOR RH, SOLID DOOR	1.95	South	N/A	1.1 (!)

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
External wall	E5: Ground floor (normal)	Calculated by person with suitable expertise	0.04	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	0.041	RCD_MFF-150-e16-01
External wall	E1: Steel lintel with perforated steel base plate	Calculated by person with suitable expertise	0.158	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
External wall	E12: Gable (insulation at ceiling level)	Calculated by person with suitable expertise	0.055	CBA310
Roof	R1: Head of roof window	Calculated by person with suitable expertise	0.15	
Roof	R2: Sill of roof window	SAP table default	0.24	
Roof	R3: Jamb of roof window	Calculated by person with suitable expertise	-0.073	
Roof	R6: Flat ceiling	Calculated by person with suitable expertise	-0.072	
External wall	E1: Steel lintel with perforated steel base plate	Calculated by person with suitable expertise	0.25	
External wall	E10: Eaves (insulation at ceiling level)	Calculated by person with suitable expertise	0.008 (!)	SUPERGLASS

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	3.5 m ³ /hm ² , Design value (!)	OK
Air permeability test certificate reference		

4 Space heating

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

Efficiency	327.9%
Emitter type	Both radiator and underfloor
Flow temperature	35°C
System type	Heat Pump
Manufacturer	Samsung Electronics Air Conditioner Europe B.V.
Model	AE050RXYDEG
Commissioning	

Secondary heating system: N/A

Fuel	N/A
Efficiency	N/A
Commissioning	

5 Hot water

Cylinder/store - type: Cylinder

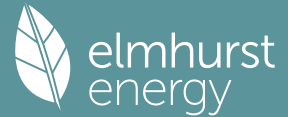
Capacity	250 litres
Declared heat loss	1.4 kWh/day
Primary pipework insulated	Yes
Manufacturer	
Model	
Commissioning	

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	OK
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	0.78 W/(l/s)	OK
Minimum permitted heat recovery efficiency	73%	
Heat recovery efficiency	93%	OK
Manufacturer/Model	Kinetic Plus E	
Commissioning		
9 Local generation		
Technology type: Photovoltaic system (1)		
Peak power	1.5 kWp	
Orientation	South	
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	02/09/2026
Assessment Reference	LEAN	Plot Type Ref			
Plot Address	Pirton Hall, Shillington Road, Pirton, Hertfordshire, SG5 3HB			SAP Version	10.2
SAP Rating	85 B	DER	2.76	TER	7.53
Environmental	97 A	% DER < TER			63.35
CO ₂ Emissions (t/year)	0.75	DFEE	39.48	TFEE	39.61
Compliance Check	See BREL	% DFEE < TFEE			0.32
% DPER < TPER	28.48	DPER	28.45	TPER	39.78
Assessor Details	Mr. Paul Allen			Assessor ID	8075-0001
Client	Gill Hudson Homes LTD				

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	128.7400 (1b)	x 2.4000 (2b)	= 308.9760 (1b) - (3b)
First floor	128.7400 (1c)	x 2.7000 (2c)	= 347.5980 (1c) - (3c)
Second floor	39.7900 (1d)	x 2.2400 (2d)	= 89.1296 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	297.2700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 745.7036 (5)

2. Ventilation rate

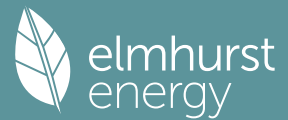
	m ³ per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	7 * 10 =	70.0000 (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) =	70.0000 / (5) =	0.0939 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	4.0000	(17)
Infiltration rate	0.2939	(18)
Number of sides sheltered	1	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2718 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infiltr rate	0.3466	0.3398	0.3330	0.2990	0.2922	0.2582	0.2582	0.2514	0.2718	0.2922	0.3058	0.3194 (22b)
Effective ac	0.5601	0.5577	0.5554	0.5447	0.5427	0.5333	0.5333	0.5316	0.5369	0.5427	0.5468	0.5510 (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			62.4900	1.3258	82.8466		(27)
ROOF WINDOW			2.2900	1.2357	2.8298		(27a)
SOLID DOOR			4.0500	1.1000	4.4550		(26)
Heatloss Floor 1			128.7400	0.1200	15.4488	75.0000	9655.5000 (28a)
MASONRY	262.1100	66.5400	195.5700	0.1800	35.2026	70.0000	13689.9000 (29a)
S.EXP	32.9000		32.9000	0.1500	4.9350	9.0000	296.1000 (29a)
PLANE	98.7400		98.7400	0.0900	8.8866	9.0000	888.6600 (30)
SLOPE	30.3000	2.2900	28.0100	0.1300	3.6413	9.0000	252.0900 (30)
Total net area of external elements A _{um} (A, m ²)			552.7900				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	158.2457			(33)
Main dwelling							
Internal Wall 1			116.3800			9.0000	1047.4200 (32c)
Internal Floor 1			128.7400			18.0000	2317.3200 (32d)
Internal Floor 2			39.7800			18.0000	716.0400 (32d)
Internal Ceiling 1			96.7900			9.0000	871.1100 (32e)
Heat capacity C _m = Sum(A x k)			(28)...(30) + (32) + (32a)...(32e) =	29734.1400			(34)
Thermal mass parameter (TMP = C _m / TFA) in kJ/m ² K				100.0240			(35)

Full SAP Calculation Printout



List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E3 Sill	31.1800	0.0220	0.6860
E4 Jamb	66.0200	0.0170	1.1223
E5 Ground floor (normal)	47.9400	0.0400	1.9176
E11 Eaves (insulation at rafter level)	12.0000	0.0080	0.0960
E13 Gable (insulation at rafter level)	18.0000	0.0560	1.0080
E16 Corner (normal)	39.2000	0.0410	1.6072
E1 Steel lintel with perforated steel base plate	26.8800	0.1580	4.2470
E17 Corner (inverted - internal area greater than external area)	19.6000	-0.0010	-0.0196
E6 Intermediate floor within a dwelling	76.0800	-0.0010	-0.0761
E12 Gable (insulation at ceiling level)	11.0000	0.0550	0.6050
R1 Head of roof window	2.3400	0.1500	0.3510
R2 Sill of roof window	2.3400	0.2400	0.5616
R3 Jamb of roof window	5.8800	-0.0730	-0.4292
R6 Flat ceiling	17.6200	-0.0720	-1.2686
E1 Steel lintel with perforated steel base plate	8.6000	0.2500	2.1500
E10 Eaves (insulation at ceiling level)	17.9600	0.0080	0.1437
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			12.7019 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss		(33) + (36) + (36a) =	170.9476 (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	137.8209	137.2469	136.6844	134.0421	133.5477	131.2464	131.2464	130.8202	132.1328	133.5477	134.5478	135.5934	(38)
Heat transfer coeff	308.7685	308.1945	307.6320	304.9897	304.4953	302.1940	302.1940	301.7678	303.0804	304.4953	305.4954	306.5410	(39)
Average = Sum(39)m / 12 =												304.9873	
HLP	1.0387	1.0367	1.0349	1.0260	1.0243	1.0166	1.0166	1.0151	1.0195	1.0243	1.0277	1.0312	(40)
HLP (average)												1.0260	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													3.1284 (42)
Hot water usage for mixer showers													
86.2566	84.9604	83.0714	79.4573	76.7902	73.8159	72.1253	73.9999	76.0548	79.2484	82.9401	85.9261	85.9261	(42a)
Hot water usage for baths													
33.0949	32.6034	31.9113	30.6351	29.6795	28.6199	28.0475	28.7349	29.4832	30.6170	31.9195	32.9830	32.9830	(42b)
Hot water usage for other uses													
46.6677	44.9707	43.2737	41.5767	39.8797	38.1827	38.1827	39.8797	41.5767	43.2737	44.9707	46.6677	46.6677	(42c)
Average daily hot water use (litres/day)												152.6352	(43)
Daily hot water use													
166.0193	162.5345	158.2565	151.6692	146.3494	140.6185	138.3555	142.6144	147.1147	153.1391	159.8303	165.5769	165.5769	(44)
Energy conte	262.9340	231.4470	243.2343	207.6275	197.0145	172.9068	167.3290	176.5865	181.4072	207.8083	227.7076	259.2535	(45)
Energy content (annual)												2535.2561	
Distribution loss (46)m = 0.15 x (45)m													
39.4401	34.7171	36.4851	31.1441	29.5522	25.9360	25.0993	26.4880	27.2111	31.1712	34.1561	38.8880	38.8880	(46)
Water storage loss (or HIU loss):													
Store volume												250.0000	(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	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	23.4360	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	(59)
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													
309.6324	273.6262	289.9327	252.8195	243.7129	218.0988	214.0274	223.2849	226.5992	254.5067	272.8996	305.9519	305.9519	(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													
309.6324	273.6262	289.9327	252.8195	243.7129	218.0988	214.0274	223.2849	226.5992	254.5067	272.8996	305.9519	305.9519	(64)
12Total per year (kWh/year)												3085.0921	(64)
Electric shower(s)												3085	(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	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													
124.7843	110.6995	118.2341	105.1897	102.8660	93.6451	92.9956	96.0737	96.4715	106.4550	111.8664	123.5605	123.5605	(65)

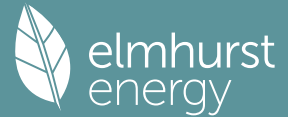
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
(66)m	156.4190	156.4190	156.4190	156.4190	156.4190	156.4190	156.4190	156.4190	156.4190	156.4190	156.4190	156.4190	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
230.1215	254.7774	230.1215	237.7923	230.1215	237.7923	230.1215	237.7923	230.1215	237.7923	230.1215	237.7923	230.1215	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
456.0501	460.7825	448.8571	423.4692	391.4217	361.3015	341.1793	336.4470	348.3724	373.7602	405.8078	435.9280	435.9280	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
38.6419	38.6419	38.6419	38.6419	38.6419	38.6419	38.6419	38.6419	38.6419	38.6419	38.6419	38.6419	38.6419	(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)													
-125.1352	-125.1352	-125.1352	-125.1352	-125.1352	-125.1352	-125.1352	-125.1352	-125.1352	-125.1352	-125.1352	-125.1352	-125.1352	(71)
Water heating gains (Table 5)													
167.7208	164.7314	158.9168	146.0969	138.2608	130.0627	124.9941	129.1313	133.9882	143.0847	155.3700	166.0759	166.0759	(72)
Total internal gains													
923.8182	950.2170	907.8211	877.2841	829.7297	799.0821	766.2207	765.6256	790.0785	816.8921	868.8957	902.0512	902.0512	(73)

6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains
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	m2	Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	factor Table 6d	W
North	6.1900	10.6334	0.5500	0.7000	0.7700	17.5613 (74)
East	32.9400	19.6403	0.5500	0.7000	0.7700	172.6096 (76)
South	3.9600	46.7521	0.5500	0.7000	0.7700	49.3958 (78)
West	19.4000	19.6403	0.5500	0.7000	0.7700	101.6583 (80)
East	2.2900	26.2379	0.6300	0.7000	1.0000	23.8477 (82)

Solar gains	365.0727	698.8535	1125.5896	1621.1801	1981.0681	2028.3189	1930.7080	1660.1400	1300.7509	821.4474	452.1470	302.3405 (83)
Total gains	1288.8909	1649.0705	2033.4107	2498.4642	2810.7978	2827.4010	2696.9287	2425.7655	2090.8294	1638.3395	1321.0427	1204.3917 (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	26.7498	26.7996	26.8486	27.0812	27.1252	27.3317	27.3317	27.3703	27.2518	27.1252	27.0364	26.9441
alpha	2.7833	2.7866	2.7899	2.8054	2.8083	2.8221	2.8221	2.8247	2.8168	2.8083	2.8024	2.7963
util living area	0.9841	0.9685	0.9359	0.8602	0.7402	0.5874	0.4566	0.5149	0.7381	0.9175	0.9736	0.9868 (86)
Living	18.8096	19.0884	19.5198	20.0623	20.4867	20.7440	20.8384	20.8163	20.5959	19.9961	19.3004	18.7651
Non living	17.4395	17.7950	18.3412	19.0185	19.5235	19.8103	19.8984	19.8835	19.6635	18.9520	18.0730	17.3868
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	31	0	0	0	0	0	0	0	0	0	0	24
16 / 9	0	28	31	0	0	0	0	0	0	0	27	7
MIT	21.0000	19.9173	20.1617	20.0623	20.4867	20.7440	20.8384	20.8163	20.5959	19.9961	19.9637	20.7142 (87)
Th 2	20.0512	20.0528	20.0544	20.0617	20.0631	20.0696	20.0696	20.0707	20.0671	20.0631	20.0603	20.0574 (88)
util rest of house	0.9816	0.9637	0.9260	0.8385	0.7000	0.5233	0.3718	0.4281	0.6824	0.9000	0.9688	0.9847 (89)
MIT 2	20.0512	19.0563	19.2982	19.0185	19.5235	19.8103	19.8984	19.8835	19.6635	18.9520	19.0721	19.7913 (90)
Living area fraction									fLA = Living area / (4) =			0.2315 (91)
MIT	20.2709	19.2557	19.4982	19.2602	19.7465	20.0265	20.1161	20.0995	19.8794	19.1938	19.2786	20.0049 (92)
Temperature adjustment												0.0000
adjusted MIT	20.2709	19.2557	19.4982	19.2602	19.7465	20.0265	20.1161	20.0995	19.8794	19.1938	19.2786	20.0049 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9823	0.9589	0.9193	0.8167	0.6849	0.5202	0.3762	0.4310	0.6697	0.8793	0.9639	0.9846 (94)
Useful gains	1266.0141	1581.3391	1869.2757	2040.4636	1925.1875	1470.7124	1014.7016	1045.4439	1400.2164	1440.6500	1273.3143	1185.8365 (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	4931.3116	4424.3342	3998.6491	3159.7557	2450.1266	1639.8445	1062.5361	1116.3913	1751.6165	2616.7580	3720.4955	4844.8643 (97)
Space heating kWh	2726.9814	1910.4927	1584.2538	805.8903	390.5547	0.0000	0.0000	0.0000	0.0000	875.0244	1761.9705	2722.3167 (98a)
Space heating requirement - total per year (kWh/year)												12777.4844
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	2726.9814	1910.4927	1584.2538	805.8903	390.5547	0.0000	0.0000	0.0000	0.0000	875.0244	1761.9705	2722.3167 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												12777.4844
Space heating per m2										(98c) / (4) =		42.9828 (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 %)												335.5144 (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	2726.9814	1910.4927	1584.2538	805.8903	390.5547	0.0000	0.0000	0.0000	0.0000	875.0244	1761.9705	2722.3167 (98)
Space heating efficiency (main heating system 1)	335.5144	335.5144	335.5144	335.5144	335.5144	0.0000	0.0000	0.0000	0.0000	335.5144	335.5144	335.5144 (210)
Space heating fuel (main heating system)	812.7763	569.4220	472.1865	240.1955	116.4048	0.0000	0.0000	0.0000	0.0000	260.8009	525.1550	811.3860 (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	309.6324	273.6262	289.9327	252.8195	243.7129	218.0988	214.0274	223.2849	226.5992	254.5067	272.8996	305.9519 (64)
Efficiency of water heater	271.6749	271.6749	271.6749	271.6749	271.6749	271.6749	271.6749	271.6749	271.6749	271.6749	271.6749	271.6749 (216)
Fuel for water heating, kWh/month	113.9717	100.7183	106.7205	93.0596	89.7075	80.2794	78.7807	82.1883	83.4082	93.6806	100.4508	112.6169 (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	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	58.7805	47.1559	42.4586	31.1070	24.0280	19.6310	21.9191	28.4913	37.0074	48.5557	54.8435	60.4142 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)

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

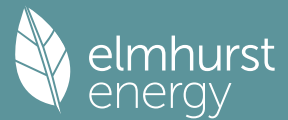
13a. Primary energy - Individual heating systems including micro-CHP

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)

		Area (m ²)		Storey height (m)		Volume (m ³)	
Main dwelling							
Ground floor		128.7400 (1b)	x	2.4000 (2b)	=	308.9760 (1b)	- (3b)
First floor		128.7400 (1c)	x	2.7000 (2c)	=	347.5980 (1c)	- (3c)
Second floor		39.7900 (1d)	x	2.2400 (2d)	=	89.1296 (1d)	- (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)... (1n)	297.2700						(4)
Dwelling volume						(3a)+(3b)+(3c)+(3d)+(3e)... (3n) =	745.7036 (5)

		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)
		Air changes per hour
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.0536 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3036 (18)
Number of sides sheltered		1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2809 (21)

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Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Effective ac	0.3581	0.3511	0.3441	0.3090	0.3019	0.2668	0.2668	0.2598	0.2809	0.3019	0.3160	0.3300	(22b)
	0.5641	0.5616	0.5592	0.5477	0.5456	0.5356	0.5356	0.5337	0.5394	0.5456	0.5499	0.5545	(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			4.0500	1.0000	4.0500			(26)
TER Opening Type			62.4900	1.1450	71.5534			(27)
TER Roof Window			2.2900	1.1450	3.4436			(27a)
Heatloss Floor 1			128.7400	0.1300	16.7362			(28a)
MASONRY	262.1100	66.5400	195.5700	0.1800	35.2026			(29a)
S.EXP	32.9000		32.9000	0.1800	5.9220			(29a)
PLANE	98.7400		98.7400	0.1100	10.8614			(30)
SLOPE	30.3000	2.2900	28.0100	0.1100	3.0811			(30)
Total net area of external elements Aum(A, m2)			552.7900					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	150.8503		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							100.0240	(35)

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

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E3 Sill	31.1800	0.0500	1.5590	
E4 Jamb	66.0200	0.0500	3.3010	
E5 Ground floor (normal)	47.9400	0.1600	7.6704	
E11 Eaves (insulation at rafter level)	12.0000	0.0400	0.4800	
E13 Gable (insulation at rafter level)	18.0000	0.0800	1.4400	
E16 Corner (normal)	39.2000	0.0900	3.5280	
E1 Steel lintel with perforated steel base plate	26.8800	0.0500	1.3440	
E17 Corner (inverted - internal area greater than external area)	19.6000	-0.0900	-1.7640	
E6 Intermediate floor within a dwelling	76.0800	0.0000	0.0000	
E12 Gable (insulation at ceiling level)	11.0000	0.0600	0.6600	
R1 Head of roof window	2.3400	0.0800	0.1872	
R2 Sill of roof window	2.3400	0.0600	0.1404	
R3 Jamb of roof window	5.8800	0.0800	0.4704	
R6 Flat ceiling	17.6200	0.0600	1.0572	
E1 Steel lintel with perforated steel base plate	8.6000	0.0500	0.4300	
E10 Eaves (insulation at ceiling level)	17.9600	0.0600	1.0776	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				21.5812 (36)
Point Thermal bridges			(36a) =	0.0000
Total fabric heat loss			(33) + (36) + (36a) =	172.4315 (37)

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

Point Thermal bridges

Total fabric heat loss

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	138.8199	138.2072	137.6066	134.7857	134.2579	131.8010	131.8010	131.3460	132.7474	134.2579	135.3256	136.4418	(38)
Average = Sum(39)m / 12 =	311.2514	310.6387	310.0381	307.2173	306.6895	304.2326	304.2326	303.7776	305.1789	306.6895	307.7572	308.8734	(39)
												307.2147	

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.0470	1.0450	1.0430	1.0335	1.0317	1.0234	1.0234	1.0219	1.0266	1.0317	1.0353	1.0390	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	
												1.0335	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													3.1284	(42)
Hot water usage for mixer showers														
	76.6726	75.5203	73.8413	70.6287	68.2580	65.6141	64.1113	65.7777	67.6043	70.4430	73.7245	76.3788	(42a)	
Hot water usage for baths														
	33.0949	32.6034	31.9113	30.6351	29.6795	28.6199	28.0475	28.7349	29.4832	30.6170	31.9195	32.9830	(42b)	
Hot water usage for other uses														
	46.6677	44.9707	43.2737	41.5767	39.8797	38.1827	38.1827	39.8797	41.5767	43.2737	44.9707	46.6677	(42c)	
Average daily hot water use (litres/day)													143.7990	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Energy content	156.4352	153.0945	149.0263	142.8406	137.8172	132.4167	130.3416	134.3922	138.6642	144.3337	150.6147	156.0296	(44)	
Energy content (annual)	247.7552	218.0045	229.0479	195.5416	185.5284	162.8218	157.6369	166.4057	170.9868	195.8595	214.5783	244.3046	(45)	
Distribution loss (46)m = 0.15 x (45)m														
	37.1633	32.7007	34.3572	29.3312	27.8293	24.4233	23.6455	24.9608	25.6480	29.3789	32.1867	36.6457	(46)	
Water storage loss (or HIU loss):														
Store volume													250.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):													1.8903	(48)
Temperature factor from Table 2b													0.5400	(49)
Enter (49) or (54) in (55)													1.0208	(55)
Total storage loss														
	31.6444	28.5820	31.6444	30.6236	31.6444	30.6236	31.6444	31.6444	30.6236	31.6444	30.6236	31.6444	(56)	
If cylinder contains dedicated solar storage														
	31.6444	28.5820	31.6444	30.6236	31.6444	30.6236	31.6444	31.6444	30.6236	31.6444	30.6236	31.6444	(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														
	302.6620	267.5977	283.9547	248.6772	240.4352	215.9574	212.5437	221.3124	224.1224	250.7663	267.7139	299.2114	(62)	
WWHRS	-35.0515	-30.9998	-32.4612	-26.8792	-25.0504	-21.4358	-20.0927	-21.3665	-22.1783	-26.1458	-29.6200	-34.4024	(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														
	267.6105	236.5979	251.4934	221.7980	215.3848	194.5216	192.4510	199.9459	201.9441	224.6205	238.0939	264.8090	(64)	
12Total per year (kWh/year)													2709.2705	(64)
Electric shower(s)													2709	(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														
	126.3040	112.1611	120.0838	107.5261	105.6136	96.6467	96.3397	99.2553	99.3616	109.0487	113.8558	125.1567	(65)	

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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	156.4190	156.4190	156.4190	156.4190	156.4190	156.4190	156.4190	156.4190	156.4190	156.4190	156.4190	156.4190	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	230.1215	254.7774	230.1215	237.7923	230.1215	237.7923	230.1215	230.1215	237.7923	230.1215	237.7923	230.1215	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	456.0501	460.7825	448.8571	423.4692	391.4217	361.3015	341.1793	336.4470	348.3724	373.7602	405.8078	435.9280	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	38.6419	38.6419	38.6419	38.6419	38.6419	38.6419	38.6419	38.6419	38.6419	38.6419	38.6419	38.6419	(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)	-125.1352	-125.1352	-125.1352	-125.1352	-125.1352	-125.1352	-125.1352	-125.1352	-125.1352	-125.1352	-125.1352	-125.1352	(71)
Water heating gains (Table 5)	169.7635	166.9064	161.4030	149.3418	141.9538	134.2316	129.4888	133.4077	138.0022	146.5709	158.1330	168.2214	(72)
Total internal gains	928.8608	955.3920	913.3073	883.5290	836.4227	803.2510	770.7154	769.9019	794.0926	823.3783	874.6588	907.1966	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d			Gains W
North					6.1900	10.6334	0.6300	0.7000			0.7700			20.1157 (74)
East					32.9400	19.6403	0.6300	0.7000			0.7700			197.7164 (76)
South					3.9600	46.7521	0.6300	0.7000			0.7700			56.5806 (78)
West					19.4000	19.6403	0.6300	0.7000			0.7700			116.4450 (80)
East					2.2900	26.2379	0.6300	0.7000			1.0000			23.8477 (82)
Solar gains	414.7054	793.5421	1277.3945	1838.8850	2246.3849	2299.6764	2189.1226	1882.7990	1475.8571	932.5512	513.5572	343.4848 (83)		
Total gains	1343.5663	1748.9341	2190.7019	2722.4139	3082.8076	3102.9274	2959.8381	2652.7009	2269.9497	1755.9295	1388.2160	1250.6814 (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	26.5364	26.5887	26.6402	26.8848	26.9311	27.1486	27.1486	27.1892	27.0644	26.9311	26.8377	26.7407	
alpha	2.7691	2.7726	2.7760	2.7923	2.7954	2.8099	2.8099	2.8126	2.8043	2.7954	2.7892	2.7827	
util living area	0.9824	0.9640	0.9254	0.8382	0.7073	0.5515	0.4243	0.4818	0.7089	0.9055	0.9703	0.9855	(86)
MIT	18.2418	18.6402	19.2418	19.9740	20.5195	20.8309	20.9405	20.9143	20.6442	19.8559	18.9066	18.1778	(87)
Th 2	20.0443	20.0460	20.0477	20.0555	20.0570	20.0639	20.0639	20.0651	20.0612	20.0570	20.0540	20.0509	(88)
util rest of house	0.9797	0.9586	0.9141	0.8143	0.6653	0.4883	0.3432	0.3977	0.6511	0.8860	0.9650	0.9832	(89)
MIT 2	16.7731	17.2800	18.0389	18.9456	19.5872	19.9283	20.0289	20.0114	19.7475	18.8230	17.6279	16.6952	(90)
Living area fraction	17.1132	17.5950	18.3174	19.1837	19.8031	20.1373	20.2400	20.2205	19.9552	19.0622	17.9239	17.0385	(91)
MIT	17.1132	17.5950	18.3174	19.1837	19.8031	20.1373	20.2400	20.2205	19.9552	19.0622	17.9239	17.0385	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.1132	17.5950	18.3174	19.1837	19.8031	20.1373	20.2400	20.2205	19.9552	19.0622	17.9239	17.0385	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9669	0.9387	0.8874	0.7884	0.6530	0.4935	0.3590	0.4124	0.6439	0.8596	0.9473	0.9720	(94)
Useful gains	1299.0341	1641.8051	1944.0480	2146.3767	2012.9946	1531.2653	1062.5777	1093.8907	1461.5984	1509.4561	1315.0855	1215.7194	(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	3988.1217	3943.5462	3663.8550	3159.3303	2485.1358	1684.6253	1107.3930	1160.5716	1786.8686	2595.2615	3331.1462	3965.4623	(97)
Space heating kWh	2000.6812	1546.7701	1279.5365	729.3266	351.2730	0.0000	0.0000	0.0000	0.0000	807.8392	1451.5637	2045.8087	(98a)
Space heating requirement - total per year (kWh/year)												10212.7990	
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	2000.6812	1546.7701	1279.5365	729.3266	351.2730	0.0000	0.0000	0.0000	0.0000	807.8392	1451.5637	2045.8087	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												10212.7990	
Space heating per m2										(98c) / (4) =		34.3553	(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 %)

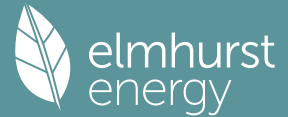
0.0000 (207)

Efficiency of secondary/supplementary heating system, %

0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	2000.6812	1546.7701	1279.5365	729.3266	351.2730	0.0000	0.0000	0.0000	0.0000	807.8392	1451.5637	2045.8087	(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)	2167.5853	1675.8072	1386.2800	790.1696	380.5775	0.0000	0.0000	0.0000	0.0000	875.2321	1572.6584	2216.4775	(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)

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Water heating												
Water heating requirement												
	267.6105	236.5979	251.4934	221.7980	215.3848	194.5216	192.4510	199.9459	201.9441	224.6205	238.0939	264.8090 (64)
Efficiency of water heater												79.8000 (216)
(217)m	87.6340	87.4909	87.1848	86.5244	85.1498	79.8000	79.8000	79.8000	79.8000	86.6733	87.4108	87.6669 (217)
Fuel for water heating, kWh/month												
	305.3731	270.4257	288.4601	256.3416	252.9481	243.7614	241.1666	250.5588	253.0628	259.1576	272.3849	302.0628 (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	7.0685	7.3041	7.0685	7.3041	7.3041 (231)
Lighting	47.8147	38.3587	34.5378	25.3039	19.5454	15.9688	17.8300	23.1761	30.1035	39.4974	44.6122	49.1436 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-105.7488	-142.1782	-194.8892	-208.4325	-215.8417	-197.9758	-195.0793	-188.1205	-175.1257	-156.8430	-113.5703	-92.2160 (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	-82.7519	-170.7945	-333.7675	-493.4618	-645.3445	-646.2151	-639.0128	-544.6393	-403.7646	-242.0806	-109.7108	-65.7325 (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												11064.7876 (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												3195.7034 (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)												385.8921 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-6363.2970 (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												8369.0861 (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	11064.7876	0.2100	2323.6054 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3195.7034	0.2100	671.0977 (264)
Space and water heating			2994.7031 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	385.8921	0.1443	55.6962 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1986.0210	0.1357	-269.4573
PV Unit electricity exported	-4377.2760	0.1264	-553.0798
Total			-822.5371 (269)
Total CO2, kg/year			2239.7914 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			7.5300 (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	11064.7876	1.1300	12503.2100 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3195.7034	1.1300	3611.1449 (278)
Space and water heating			16114.3549 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	385.8921	1.5338	591.8942 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1986.0210	1.5015	-2982.0093
PV Unit electricity exported	-4377.2760	0.4638	-2030.2675
Total			-5012.2768 (283)
Total Primary energy kWh/year			11824.0731 (286)
Target Primary Energy Rate (TPER)			39.7800 (287)

Full SAP Calculation Printout



Plot Reference	CLEAN	Issued on Date	02/09/2026
Assessment Reference	LEAN	Plot Type Ref	
Plot Address	Pirton Hall, Shillington Road, Pirton, Hertfordshire, SG5 3HB	SAP Version	10.2
SAP Rating	86 B	DER	2.68
Environmental	97 A	% DER < TER	64.41
CO ₂ Emissions (t/year)	0.73	DFEE	38.28
Compliance Check	See BREL	% DFEE < TFEE	3.35
% DPER < TPER	30.71	DPER	27.56
		TPER	39.78
Assessor Details	Mr. Paul Allen	Assessor ID	8075-0001
Client	Gill Hudson Homes LTD		

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	128.7400 (1b)	x 2.4000 (2b)	= 308.9760 (1b) - (3b)
First floor	128.7400 (1c)	x 2.7000 (2c)	= 347.5980 (1c) - (3c)
Second floor	39.7900 (1d)	x 2.2400 (2d)	= 89.1296 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	297.2700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 745.7036 (5)

2. Ventilation rate

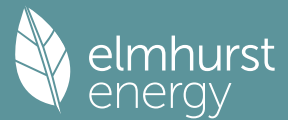
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	7 * 10 = 70.0000 (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)	70.0000 / (5) = 0.0939 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.2939 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2718 (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	0.3466	0.3398	0.3330	0.2990	0.2922	0.2582	0.2582	0.2514	0.2718	0.2922	0.3058	0.3194 (22b)
Effective ac	0.5601	0.5577	0.5554	0.5447	0.5427	0.5333	0.5333	0.5316	0.5369	0.5427	0.5468	0.5510 (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			62.4900	1.2357	77.2215		(27)
ROOF WINDOW			2.2900	1.2357	2.8298		(27a)
SOLID DOOR			4.0500	1.1000	4.4550		(26)
Heatloss Floor 1			128.7400	0.1200	15.4488	75.0000	9655.5000 (28a)
MASONRY	262.1100	66.5400	195.5700	0.1700	33.2469	70.0000	13689.9000 (29a)
S.EXP	32.9000		32.9000	0.1500	4.9350	9.0000	296.1000 (29a)
PLANE	98.7400		98.7400	0.0900	8.8866	9.0000	888.6600 (30)
SLOPE	30.3000	2.2900	28.0100	0.1300	3.6413	9.0000	252.0900 (30)
Total net area of external elements A _{um} (A, m ²)			552.7900				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	150.6649		(33)
Main dwelling							
Internal Wall 1			116.3800			9.0000	1047.4200 (32c)
Internal Floor 1			128.7400			18.0000	2317.3200 (32d)
Internal Floor 2			39.7800			18.0000	716.0400 (32d)
Internal Ceiling 1			96.7900			9.0000	871.1100 (32e)
Heat capacity C _m = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	29734.1400 (34)
Thermal mass parameter (TMP = C _m / TFA) in kJ/m ² K							100.0240 (35)

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List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E3 Sill	31.1800	0.0220	0.6860
E4 Jamb	66.0200	0.0170	1.1223
E5 Ground floor (normal)	47.9400	0.0400	1.9176
E11 Eaves (insulation at rafter level)	12.0000	0.0080	0.0960
E13 Gable (insulation at rafter level)	18.0000	0.0560	1.0080
E16 Corner (normal)	39.2000	0.0410	1.6072
E1 Steel lintel with perforated steel base plate	26.8800	0.1580	4.2470
E17 Corner (inverted - internal area greater than external area)	19.6000	-0.0010	-0.0196
E6 Intermediate floor within a dwelling	76.0800	-0.0010	-0.0761
E12 Gable (insulation at ceiling level)	11.0000	0.0550	0.6050
R1 Head of roof window	2.3400	0.1500	0.3510
R2 Sill of roof window	2.3400	0.2400	0.5616
R3 Jamb of roof window	5.8800	-0.0730	-0.4292
R6 Flat ceiling	17.6200	-0.0720	-1.2686
E1 Steel lintel with perforated steel base plate	8.6000	0.2500	2.1500
E10 Eaves (insulation at ceiling level)	17.9600	0.0080	0.1437
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			12.7019 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss		(33) + (36) + (36a) =	163.3668 (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	137.8209	137.2469	136.6844	134.0421	133.5477	131.2464	131.2464	130.8202	132.1328	133.5477	134.5478	135.5934 (38)
Heat transfer coeff	301.1877	300.6137	300.0512	297.4089	296.9145	294.6132	294.6132	294.1870	295.4996	296.9145	297.9146	298.9602 (39)
Average = Sum(39)m / 12 =												297.4065
HLP	1.0132	1.0112	1.0094	1.0005	0.9988	0.9911	0.9911	0.9896	0.9940	0.9988	1.0022	1.0057 (40)
HLP (average)												1.0005
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy													3.1284 (42)
Hot water usage for mixer showers	86.2566	84.9604	83.0714	79.4573	76.7902	73.8159	72.1253	73.9999	76.0548	79.2484	82.9401	85.9261 (42a)	
Hot water usage for baths	33.0949	32.6034	31.9113	30.6351	29.6795	28.6199	28.0475	28.7349	29.4832	30.6170	31.9195	32.9830 (42b)	
Hot water usage for other uses	46.6677	44.9707	43.2737	41.5767	39.8797	38.1827	38.1827	39.8797	41.5767	43.2737	44.9707	46.6677 (42c)	
Average daily hot water use (litres/day)												152.6352 (43)	
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy content (annual)	166.0193	162.5345	158.2565	151.6692	146.3494	140.6185	138.3555	142.6144	147.1147	153.1391	159.8303	165.5769 (44)	
Distribution loss (46)m = 0.15 x (45)m	262.9340	231.4470	243.2343	207.6275	197.0145	172.9068	167.3290	176.5865	181.4072	207.8083	227.7076	259.2535 (45)	
Water storage loss (or HIU loss):	Total = Sum(45)m =											2535.2561	
Store volume	39.4401	34.7171	36.4851	31.1441	29.5522	25.9360	25.0993	26.4880	27.2111	31.1712	34.1561	38.8880 (46)	
a) If manufacturer declared loss factor is known (kWh/day):												250.0000 (47)	
Temperature factor from Table 2b												1.4000 (48)	
Enter (49) or (54) in (55)												0.5400 (49)	
Total storage loss												0.7560 (55)	
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 (56)	
Primary 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 (57)	
Combi loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)	
Total heat required for water heating calculated for each month	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)	
WWHRS	309.6324	273.6262	289.9327	252.8195	243.7129	218.0988	214.0274	223.2849	226.5992	254.5067	272.8996	305.9519 (62)	
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 (63a)	
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 (63b)	
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 (63c)	
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)	
12Total per year (kWh/year)	309.6324	273.6262	289.9327	252.8195	243.7129	218.0988	214.0274	223.2849	226.5992	254.5067	272.8996	305.9519 (64)	
Electric shower(s)	Total per year (kWh/year) = Sum(64)m =											3085.0921 (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	124.7843	110.6995	118.2341	105.1897	102.8660	93.6451	92.9956	96.0737	96.4715	106.4550	111.8664	123.5605 (65)	

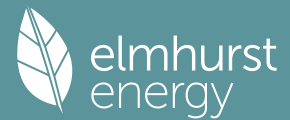
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
(66)m	156.4190	156.4190	156.4190	156.4190	156.4190	156.4190	156.4190	156.4190	156.4190	156.4190	156.4190	156.4190 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	230.1215	254.7774	230.1215	237.7923	230.1215	237.7923	230.1215	230.1215	237.7923	230.1215	237.7923	230.1215 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	456.0501	460.7825	448.8571	423.4692	391.4217	361.3015	341.1793	336.4470	348.3724	373.7602	405.8078	435.9280 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	38.6419	38.6419	38.6419	38.6419	38.6419	38.6419	38.6419	38.6419	38.6419	38.6419	38.6419	38.6419 (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)	-125.1352	-125.1352	-125.1352	-125.1352	-125.1352	-125.1352	-125.1352	-125.1352	-125.1352	-125.1352	-125.1352	-125.1352 (71)
Water heating gains (Table 5)	167.7208	164.7314	158.9168	146.0969	138.2608	130.0627	124.9941	129.1313	133.9882	143.0847	155.3700	166.0759 (72)
Total internal gains	923.8182	950.2170	907.8211	877.2841	829.7297	799.0821	766.2207	765.6256	790.0785	816.8921	868.8957	902.0512 (73)

6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains
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	m2	Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	factor Table 6d	W
North	6.1900	10.6334	0.5500	0.7000	0.7700	17.5613 (74)
East	32.9400	19.6403	0.5500	0.7000	0.7700	172.6096 (76)
South	3.9600	46.7521	0.5500	0.7000	0.7700	49.3958 (78)
West	19.4000	19.6403	0.5500	0.7000	0.7700	101.6583 (80)
East	2.2900	26.2379	0.6300	0.7000	1.0000	23.8477 (82)

Solar gains	365.0727	698.8535	1125.5896	1621.1801	1981.0681	2028.3189	1930.7080	1660.1400	1300.7509	821.4474	452.1470	302.3405 (83)
Total gains	1288.8909	1649.0705	2033.4107	2498.4642	2810.7978	2827.4010	2696.9287	2425.7655	2090.8294	1638.3395	1321.0427	1204.3917 (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	27.4230	27.4754	27.5269	27.7715	27.8177	28.0350	28.0350	28.0756	27.9509	27.8177	27.7243	27.6274
alpha	2.8282	2.8317	2.8351	2.8514	2.8545	2.8690	2.8690	2.8717	2.8634	2.8545	2.8483	2.8418
util living area	0.9841	0.9682	0.9348	0.8569	0.7340	0.5791	0.4482	0.5063	0.7318	0.9158	0.9734	0.9868 (86)
Living	18.8604	19.1391	19.5671	20.1016	20.5135	20.7580	20.8455	20.8251	20.6161	20.0308	19.3443	18.8160
Non living	17.5182	17.8737	18.4153	19.0822	19.5713	19.8435	19.9249	19.9112	19.7032	19.0100	18.1430	17.4658
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	31	0	0	0	0	0	0	0	0	0	0	17
16 / 9	0	28	31	0	0	0	0	0	0	0	23	14
MIT	21.0000	19.9460	20.1884	20.1016	20.5135	20.7580	20.8455	20.8251	20.6161	20.0308	19.8947	20.4414 (87)
Th 2	20.0724	20.0740	20.0755	20.0829	20.0843	20.0908	20.0908	20.0920	20.0883	20.0843	20.0815	20.0786 (88)
util rest of house	0.9817	0.9635	0.9249	0.8352	0.6941	0.5164	0.3661	0.4220	0.6766	0.8983	0.9686	0.9848 (89)
MIT 2	20.0724	19.1028	19.3427	19.0822	19.5713	19.8435	19.9249	19.9112	19.7032	19.0100	18.9732	19.5578 (90)
Living area fraction									fLA = Living area / (4) =			0.2315 (91)
MIT	20.2872	19.2981	19.5385	19.3183	19.7895	20.0552	20.1381	20.1228	19.9145	19.2464	19.1866	19.7624 (92)
Temperature adjustment												0.0000
adjusted MIT	20.2872	19.2981	19.5385	19.3183	19.7895	20.0552	20.1381	20.1228	19.9145	19.2464	19.1866	19.7624 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9823	0.9587	0.9182	0.8140	0.6799	0.5138	0.3706	0.4250	0.6647	0.8780	0.9628	0.9840 (94)
Useful gains	1266.0410	1580.9712	1867.1584	2033.6768	1911.0278	1452.6252	999.4620	1031.0317	1389.8002	1438.4755	1271.9186	1185.1094 (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	4815.1323	4328.2520	3912.2315	3098.4819	2401.8858	1607.1772	1042.3648	1095.2106	1718.1960	2567.2300	3600.7685	4652.5306 (97)
Space heating kWh	2640.5240	1846.1727	1521.5344	766.6597	365.1984	0.0000	0.0000	0.0000	0.0000	839.7933	1676.7719	2579.7614 (98a)
Space heating requirement - total per year (kWh/year)												12236.4157
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	2640.5240	1846.1727	1521.5344	766.6597	365.1984	0.0000	0.0000	0.0000	0.0000	839.7933	1676.7719	2579.7614 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												12236.4157
Space heating per m2										(98c) / (4) =		41.1626 (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 %)												336.1328 (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	2640.5240	1846.1727	1521.5344	766.6597	365.1984	0.0000	0.0000	0.0000	0.0000	839.7933	1676.7719	2579.7614 (98)
Space heating efficiency (main heating system 1)	336.1328	336.1328	336.1328	336.1328	336.1328	0.0000	0.0000	0.0000	0.0000	336.1328	336.1328	336.1328 (210)
Space heating fuel (main heating system)	785.5598	549.2391	452.6587	228.0824	108.6471	0.0000	0.0000	0.0000	0.0000	249.8397	498.8421	767.4828 (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	309.6324	273.6262	289.9327	252.8195	243.7129	218.0988	214.0274	223.2849	226.5992	254.5067	272.8996	305.9519 (64)
Efficiency of water heater	271.6637	271.6637	271.6637	271.6637	271.6637	271.6637	271.6637	271.6637	271.6637	271.6637	271.6637	271.6637 (216)
Fuel for water heating, kWh/month	113.9764	100.7224	106.7248	93.0634	89.7112	80.2826	78.7839	82.1916	83.4116	93.6845	100.4549	112.6215 (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	58.7805	47.1559	42.4586	31.1070	24.0280	19.6310	21.9191	28.4913	37.0074	48.5557	54.8435	60.4142 (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)

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

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

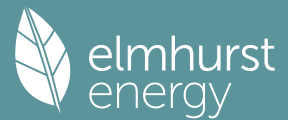
SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022)

1. Overall dwelling characteristics

2. Ventilation rate

Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000	Air changes per hour	
Pressure test		/ (5) =	0.0536	(8)
Pressure Test Method			Yes	
Measured/design AP50			Blower Door	
Infiltration rate			5.0000	(17)
Number of sides sheltered			0.3036	(18)
			1	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.9250	(20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.2809	(21)

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Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Effective ac	0.3581	0.3511	0.3441	0.3090	0.3019	0.2668	0.2668	0.2598	0.2809	0.3019	0.3160	0.3300	(22b)
	0.5641	0.5616	0.5592	0.5477	0.5456	0.5356	0.5356	0.5337	0.5394	0.5456	0.5499	0.5545	(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			4.0500	1.0000	4.0500			(26)
TER Opening Type			62.4900	1.1450	71.5534			(27)
TER Roof Window			2.2900	1.1450	3.4436			(27a)
Heatloss Floor 1			128.7400	0.1300	16.7362			(28a)
MASONRY	262.1100	66.5400	195.5700	0.1800	35.2026			(29a)
S.EXP	32.9000		32.9000	0.1800	5.9220			(29a)
PLANE	98.7400		98.7400	0.1100	10.8614			(30)
SLOPE	30.3000	2.2900	28.0100	0.1100	3.0811			(30)
Total net area of external elements Aum(A, m2)			552.7900					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	150.8503		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							100.0240	(35)

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

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E3 Sill	31.1800	0.0500	1.5590	
E4 Jamb	66.0200	0.0500	3.3010	
E5 Ground floor (normal)	47.9400	0.1600	7.6704	
E11 Eaves (insulation at rafter level)	12.0000	0.0400	0.4800	
E13 Gable (insulation at rafter level)	18.0000	0.0800	1.4400	
E16 Corner (normal)	39.2000	0.0900	3.5280	
E1 Steel lintel with perforated steel base plate	26.8800	0.0500	1.3440	
E17 Corner (inverted - internal area greater than external area)	19.6000	-0.0900	-1.7640	
E6 Intermediate floor within a dwelling	76.0800	0.0000	0.0000	
E12 Gable (insulation at ceiling level)	11.0000	0.0600	0.6600	
R1 Head of roof window	2.3400	0.0800	0.1872	
R2 Sill of roof window	2.3400	0.0600	0.1404	
R3 Jamb of roof window	5.8800	0.0800	0.4704	
R6 Flat ceiling	17.6200	0.0600	1.0572	
E1 Steel lintel with perforated steel base plate	8.6000	0.0500	0.4300	
E10 Eaves (insulation at ceiling level)	17.9600	0.0600	1.0776	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				21.5812 (36)
Point Thermal bridges			(36a) =	0.0000
Total fabric heat loss			(33) + (36) + (36a) =	172.4315 (37)

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

Point Thermal bridges

Total fabric heat loss

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

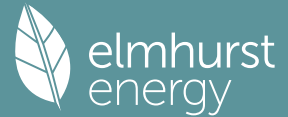
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	138.8199	138.2072	137.6066	134.7857	134.2579	131.8010	131.8010	131.3460	132.7474	134.2579	135.3256	136.4418	(38)
Average = Sum(39)m / 12 =	311.2514	310.6387	310.0381	307.2173	306.6895	304.2326	304.2326	303.7776	305.1789	306.6895	307.7572	308.8734	(39)
												307.2147	

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.0470	1.0450	1.0430	1.0335	1.0317	1.0234	1.0234	1.0219	1.0266	1.0317	1.0353	1.0390	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	
												1.0335	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													3.1284	(42)
Hot water usage for mixer showers														
	76.6726	75.5203	73.8413	70.6287	68.2580	65.6141	64.1113	65.7777	67.6043	70.4430	73.7245	76.3788	(42a)	
Hot water usage for baths														
	33.0949	32.6034	31.9113	30.6351	29.6795	28.6199	28.0475	28.7349	29.4832	30.6170	31.9195	32.9830	(42b)	
Hot water usage for other uses														
	46.6677	44.9707	43.2737	41.5767	39.8797	38.1827	38.1827	39.8797	41.5767	43.2737	44.9707	46.6677	(42c)	
Average daily hot water use (litres/day)													143.7990	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	156.4352	153.0945	149.0263	142.8406	137.8172	132.4167	130.3416	134.3922	138.6642	144.3337	150.6147	156.0296	(44)	
Energy content (annual)	247.7552	218.0045	229.0479	195.5416	185.5284	162.8218	157.6369	166.4057	170.9868	195.8595	214.5783	244.3046	(45)	
Distribution loss (46)m = 0.15 x (45)m														
	37.1633	32.7007	34.3572	29.3312	27.8293	24.4233	23.6455	24.9608	25.6480	29.3789	32.1867	36.6457	(46)	
Water storage loss (or HIU loss):														
Store volume													250.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):													1.8903	(48)
Temperature factor from Table 2b													0.5400	(49)
Enter (49) or (54) in (55)													1.0208	(55)
Total storage loss														
	31.6444	28.5820	31.6444	30.6236	31.6444	30.6236	31.6444	31.6444	30.6236	31.6444	30.6236	31.6444	(56)	
If cylinder contains dedicated solar storage														
	31.6444	28.5820	31.6444	30.6236	31.6444	30.6236	31.6444	31.6444	30.6236	31.6444	30.6236	31.6444	(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														
	302.6620	267.5977	283.9547	248.6772	240.4352	215.9574	212.5437	221.3124	224.1224	250.7663	267.7139	299.2114	(62)	
WWHRS	-35.0515	-30.9998	-32.4612	-26.8792	-25.0504	-21.4358	-20.0927	-21.3665	-22.1783	-26.1458	-29.6200	-34.4024	(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														
	267.6105	236.5979	251.4934	221.7980	215.3848	194.5216	192.4510	199.9459	201.9441	224.6205	238.0939	264.8090	(64)	
12Total per year (kWh/year)													2709.2705	(64)
Electric shower(s)													2709	(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														
	126.3040	112.1611	120.0838	107.5261	105.6136	96.6467	96.3397	99.2553	99.3616	109.0487	113.8558	125.1567	(65)	

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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	156.4190	156.4190	156.4190	156.4190	156.4190	156.4190	156.4190	156.4190	156.4190	156.4190	156.4190	156.4190	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	230.1215	254.7774	230.1215	237.7923	230.1215	237.7923	230.1215	230.1215	237.7923	230.1215	237.7923	230.1215	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	456.0501	460.7825	448.8571	423.4692	391.4217	361.3015	341.1793	336.4470	348.3724	373.7602	405.8078	435.9280	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	38.6419	38.6419	38.6419	38.6419	38.6419	38.6419	38.6419	38.6419	38.6419	38.6419	38.6419	38.6419	(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)	-125.1352	-125.1352	-125.1352	-125.1352	-125.1352	-125.1352	-125.1352	-125.1352	-125.1352	-125.1352	-125.1352	-125.1352	(71)
Water heating gains (Table 5)	169.7635	166.9064	161.4030	149.3418	141.9538	134.2316	129.4888	133.4077	138.0022	146.5709	158.1330	168.2214	(72)
Total internal gains	928.8608	955.3920	913.3073	883.5290	836.4227	803.2510	770.7154	769.9019	794.0926	823.3783	874.6588	907.1966	(73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
North				6.1900	10.6334		0.6300		0.7000		0.7700		20.1157 (74)
East				32.9400	19.6403		0.6300		0.7000		0.7700		197.7164 (76)
South				3.9600	46.7521		0.6300		0.7000		0.7700		56.5806 (78)
West				19.4000	19.6403		0.6300		0.7000		0.7700		116.4450 (80)
East				2.2900	26.2379		0.6300		0.7000		1.0000		23.8477 (82)
Solar gains	414.7054	793.5421	1277.3945	1838.8850	2246.3849	2299.6764	2189.1226	1882.7990	1475.8571	932.5512	513.5572	343.4848	(83)
Total gains	1343.5663	1748.9341	2190.7019	2722.4139	3082.8076	3102.9274	2959.8381	2652.7009	2269.9497	1755.9295	1388.2160	1250.6814	(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	26.5364	26.5887	26.6402	26.8848	26.9311	27.1486	27.1486	27.1892	27.0644	26.9311	26.8377	26.7407	
alpha	2.7691	2.7726	2.7760	2.7923	2.7954	2.8099	2.8099	2.8126	2.8043	2.7954	2.7892	2.7827	
util living area	0.9824	0.9640	0.9254	0.8382	0.7073	0.5515	0.4243	0.4818	0.7089	0.9055	0.9703	0.9855	(86)
MIT	18.2418	18.6402	19.2418	19.9740	20.5195	20.8309	20.9405	20.9143	20.6442	19.8559	18.9066	18.1778	(87)
Th 2	20.0443	20.0460	20.0477	20.0555	20.0570	20.0639	20.0639	20.0651	20.0612	20.0570	20.0540	20.0509	(88)
util rest of house	0.9797	0.9586	0.9141	0.8143	0.6653	0.4883	0.3432	0.3977	0.6511	0.8860	0.9650	0.9832	(89)
MIT 2	16.7731	17.2800	18.0389	18.9456	19.5872	19.9283	20.0289	20.0114	19.7475	18.8230	17.6279	16.6952	(90)
Living area fraction	17.1132	17.5950	18.3174	19.1837	19.8031	20.1373	20.2400	20.2205	19.9552	19.0622	17.9239	17.0385	(91)
MIT	17.1132	17.5950	18.3174	19.1837	19.8031	20.1373	20.2400	20.2205	19.9552	19.0622	17.9239	17.0385	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.1132	17.5950	18.3174	19.1837	19.8031	20.1373	20.2400	20.2205	19.9552	19.0622	17.9239	17.0385	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9669	0.9387	0.8874	0.7884	0.6530	0.4935	0.3590	0.4124	0.6439	0.8596	0.9473	0.9720	(94)
Useful gains	1299.0341	1641.8051	1944.0480	2146.3767	2012.9946	1531.2653	1062.5777	1093.8907	1461.5984	1509.4561	1315.0855	1215.7194	(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	3988.1217	3943.5462	3663.8550	3159.3303	2485.1358	1684.6253	1107.3930	1160.5716	1786.8686	2595.2615	3331.1462	3965.4623	(97)
Space heating kWh	2000.6812	1546.7701	1279.5365	729.3266	351.2730	0.0000	0.0000	0.0000	0.0000	807.8392	1451.5637	2045.8087	(98a)
Space heating requirement - total per year (kWh/year)												10212.7990	
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	2000.6812	1546.7701	1279.5365	729.3266	351.2730	0.0000	0.0000	0.0000	0.0000	807.8392	1451.5637	2045.8087	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												10212.7990	
Space heating per m2										(98c) / (4) =		34.3553	(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 %)

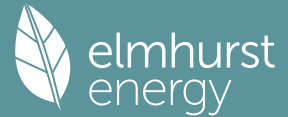
0.0000 (207)

Efficiency of secondary/supplementary heating system, %

0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	2000.6812	1546.7701	1279.5365	729.3266	351.2730	0.0000	0.0000	0.0000	0.0000	807.8392	1451.5637	2045.8087	(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)	2167.5853	1675.8072	1386.2800	790.1696	380.5775	0.0000	0.0000	0.0000	0.0000	875.2321	1572.6584	2216.4775	(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)

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Water heating												
Water heating requirement												
	267.6105	236.5979	251.4934	221.7980	215.3848	194.5216	192.4510	199.9459	201.9441	224.6205	238.0939	264.8090 (64)
Efficiency of water heater												79.8000 (216)
(217)m	87.6340	87.4909	87.1848	86.5244	85.1498	79.8000	79.8000	79.8000	79.8000	86.6733	87.4108	87.6669 (217)
Fuel for water heating, kWh/month												
	305.3731	270.4257	288.4601	256.3416	252.9481	243.7614	241.1666	250.5588	253.0628	259.1576	272.3849	302.0628 (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	7.0685	7.3041	7.0685	7.3041	7.3041 (231)
Lighting	47.8147	38.3587	34.5378	25.3039	19.5454	15.9688	17.8300	23.1761	30.1035	39.4974	44.6122	49.1436 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-105.7488	-142.1782	-194.8892	-208.4325	-215.8417	-197.9758	-195.0793	-188.1205	-175.1257	-156.8430	-113.5703	-92.2160 (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	-82.7519	-170.7945	-333.7675	-493.4618	-645.3445	-646.2151	-639.0128	-544.6393	-403.7646	-242.0806	-109.7108	-65.7325 (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												11064.7876 (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												3195.7034 (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)												385.8921 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-6363.2970 (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												8369.0861 (238)

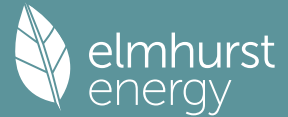
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	11064.7876	0.2100	2323.6054 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3195.7034	0.2100	671.0977 (264)
Space and water heating			2994.7031 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	385.8921	0.1443	55.6962 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1986.0210	0.1357	-269.4573
PV Unit electricity exported	-4377.2760	0.1264	-553.0798
Total			-822.5371 (269)
Total CO2, kg/year			2239.7914 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			7.5300 (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	11064.7876	1.1300	12503.2100 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3195.7034	1.1300	3611.1449 (278)
Space and water heating			16114.3549 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	385.8921	1.5338	591.8942 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1986.0210	1.5015	-2982.0093
PV Unit electricity exported	-4377.2760	0.4638	-2030.2675
Total			-5012.2768 (283)
Total Primary energy kWh/year			11824.0731 (286)
Target Primary Energy Rate (TPER)			39.7800 (287)

Full SAP Calculation Printout



Plot Reference	GREEN			Issued on Date	02/09/2026
Assessment Reference	LEAN	Plot Type Ref			
Plot Address	Pirton Hall, Shillington Road, Pirton, Hertfordshire, SG5 3HB			SAP Version	10.2
SAP Rating	90 B	DER	1.86	TER	7.53
Environmental	98 A	% DER < TER			75.30
CO ₂ Emissions (t/year)	0.48	DFEE	37.09	TFEE	39.61
Compliance Check	See BREL	% DFEE < TFEE			6.35
% DPER < TPER	51.80	DPER	19.18	TPER	39.78
Assessor Details	Mr. Paul Allen			Assessor ID	8075-0001
Client	Gill Hudson Homes LTD				

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	128.7400 (1b)	x	2.4000 (2b)	=	308.9760 (1b)	- (3b)
First floor	128.7400 (1c)	x	2.7000 (2c)	=	347.5980 (1c)	- (3c)
Second floor	39.7900 (1d)	x	2.2400 (2d)	=	89.1296 (1d)	- (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	297.2700					(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	745.7036	(5)

2. Ventilation rate

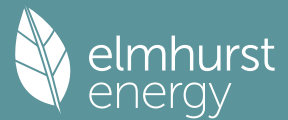
													m ³ per hour
Number of open chimneys													0 * 80 = 0.0000 (6a)
Number of open flues													0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire													0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler													0 * 20 = 0.0000 (6d)
Number of flues attached to other heater													0 * 35 = 0.0000 (6e)
Number of blocked chimneys													0 * 20 = 0.0000 (6f)
Number of intermittent extract fans													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) =													0.0000 / (5) = 0.0000 (8)
Pressure test													Yes
Pressure Test Method													Blower Door
Measured/design AP50													3.5000 (17)
Infiltration rate													0.1750 (18)
Number of sides sheltered													1 (19)
Shelter factor													(20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor													(21) = (18) x (20) = 0.1619 (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	0.2064	0.2023	0.1983	0.1781	0.1740	0.1538	0.1538	0.1497	0.1619	0.1740	0.1821	0.1902	(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) =													83.7000 (23c)
Effective ac	0.2879	0.2838	0.2798	0.2596	0.2555	0.2353	0.2353	0.2312	0.2434	0.2555	0.2636	0.2717	(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			62.4900	1.1450	71.5534			(27)
ROOF WINDOW			2.2900	1.2357	2.8298			(27a)
SOLID DOOR			4.0500	1.1000	4.4550			(26)
Heatloss Floor 1			128.7400	0.1200	15.4488	75.0000	9655.5000	(28a)
MASONRY	262.1100	66.5400	195.5700	0.1700	33.2469	70.0000	13689.9000	(29a)
S.EXP	32.9000		32.9000	0.1500	4.9350	9.0000	296.1000	(29a)
PLANE	98.7400		98.7400	0.0900	8.8866	9.0000	888.6600	(30)
SLOPE	30.3000	2.2900	28.0100	0.1300	3.6413	9.0000	252.0900	(30)
Total net area of external elements Aum(A, m ²)			552.7900					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	144.9969		(33)
Main dwelling								
Internal Wall 1			116.3800			9.0000	1047.4200	(32c)
Internal Floor 1			128.7400			18.0000	2317.3200	(32d)

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Internal Floor 2	39.7800										18.0000		716.0400 (32d)		
Internal Ceiling 1	96.7900										9.0000		871.1100 (32e)		
Heat capacity Cm = Sum(A x k)										(28)...(30) + (32) + (32a)...(32e) =				29734.1400 (34)	
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K														100.0240 (35)	
List of Thermal Bridges															
K1 Element											Length	Psi-value	Total		
E3 Sill											31.1800	0.0220	0.6860		
E4 Jamb											66.0200	0.0170	1.1223		
E5 Ground floor (normal)											47.9400	0.0400	1.9176		
E11 Eaves (insulation at rafter level)											12.0000	0.0080	0.0960		
E13 Gable (insulation at rafter level)											18.0000	0.0560	1.0080		
E16 Corner (normal)											39.2000	0.0410	1.6072		
E1 Steel lintel with perforated steel base plate											26.8800	0.1580	4.2470		
E17 Corner (inverted - internal area greater than external area)											19.6000	-0.0010	-0.0196		
E6 Intermediate floor within a dwelling											76.0800	-0.0010	-0.0761		
E12 Gable (insulation at ceiling level)											11.0000	0.0550	0.6050		
R1 Head of roof window											2.3400	0.1500	0.3510		
R2 Sill of roof window											2.3400	0.2400	0.5616		
R3 Jamb of roof window											5.8800	-0.0730	-0.4292		
R6 Flat ceiling											17.6200	-0.0720	-1.2686		
E1 Steel lintel with perforated steel base plate											8.6000	0.2500	2.1500		
E10 Eaves (insulation at ceiling level)											17.9600	0.0080	0.1437		
Thermal bridges (Sum(L x Psi) calculated using Appendix K)										(36a) =				12.7019 (36)	
Point Thermal bridges										(33) + (36) + (36a) =				0.0000	
Total fabric heat loss														157.6987 (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	(38)		
	70.8448	69.8489	68.8530	63.8737	62.8778	57.8985	57.8985	56.9027	59.8903	62.8778	64.8696	66.8613			
Heat transfer coeff	228.5435	227.5476	226.5518	221.5725	220.5766	215.5973	215.5973	214.6014	217.5890	220.5766	222.5683	224.5600	(39)		
Average = Sum(39)m / 12 =													221.3235		
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
	0.7688	0.7655	0.7621	0.7454	0.7420	0.7253	0.7253	0.7219	0.7320	0.7420	0.7487	0.7554	(40)		
HLP (average)													0.7445		
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31			

4. Water heating energy requirements (kWh/year)															

Assumed occupancy												3.1284 (42)			
Hot water usage for mixer showers												85.9261 (42a)			
86.2566 84.9604 83.0714 79.4573 76.7902 73.8159 72.1253 73.9999 76.0548 79.2484 82.9401															
Hot water usage for baths												32.9830 (42b)			
33.0949 32.6034 31.9113 30.6351 29.6795 28.6199 28.0475 28.7349 29.4832 30.6170 31.9195															
Hot water usage for other uses												46.6677 (42c)			
46.6677 44.9707 43.2737 41.5767 39.8797 38.1827 38.1827 39.8797 41.5767 43.2737 44.9707															
Average daily hot water use (litres/day)												152.6352 (43)			
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec															
Daily hot water use												165.5769 (44)			
166.0193 162.5345 158.2565 151.6692 146.3494 140.6185 138.3555 142.6144 147.1147 153.1391 159.8303															
Energy conte												259.2535 (45)			
262.9340 231.4470 243.2343 207.6275 197.0145 172.9068 167.3290 176.5865 181.4072 207.8083 227.7076															
Energy content (annual)												Total = Sum(45)m = 2535.2561			
Distribution loss (46)m = 0.15 x (45)m															
39.4401 34.7171 36.4851 31.1441 29.5522 25.9360 25.0993 26.4880 27.2111 31.1712 34.1561															
Water storage loss (or HIU loss):															
Store volume												250.0000 (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 (59)			
23.2624 21.0112 23.2624 22.5120 23.2624 22.5120 23.2624 23.2624 22.5120 23.2624 22.5120															
Combi loss												0.0000 (61)			
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															
309.6324 273.6262 289.9327 252.8195 243.7129 218.0988 214.0274 223.2849 226.5992 254.5067 272.8996												305.9519 (62)			
FWHRS												0.0000 (63a)			
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 (63b)			
-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 (63c)			
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 (63d)			
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												305.9519 (64)			
309.6324 273.6262 289.9327 252.8195 243.7129 218.0988 214.0274 223.2849 226.5992 254.5067 272.8996															
12Total per year (kWh/year)												Total per year (kWh/year) = Sum(64)m = 3085.0921 (64)			
Electric shower(s)												3085 (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															
124.7843 110.6995 118.2341 105.1897 102.8660 93.6451 92.9956 96.0737 96.4715 106.4550 111.8664 123.5605 (65)															

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6. Solar gains

[Jan]	Area m2		Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W	
North	6.1900		10.6334		0.5500		0.7000		0.7700		17.5613 (74)	
East	32.9400		19.6403		0.5500		0.7000		0.7700		172.6096 (76)	
South	3.9600		46.7521		0.5500		0.7000		0.7700		49.3958 (78)	
West	19.4000		19.6403		0.5500		0.7000		0.7700		101.6583 (80)	
East	2.2900		26.2379		0.6300		0.7000		1.0000		23.8477 (82)	
Solar gains	365.0727	698.8535	1125.5896	1621.1801	1981.0681	2028.3189	1930.7080	1660.1400	1300.7509	821.4474	452.1470	302.3405 (83)
Total gains	1288.8909	1649.0705	2033.4107	2498.4642	2810.7978	2827.4010	2696.9287	2425.7655	2090.8294	1638.3395	1321.0427	1204.3917 (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	36.1397	36.2978	36.4574	37.2767	37.4450	38.3098	38.3098	38.4876	37.9591	37.4450	37.1099	36.7807
alpha	3.4093	3.4199	3.4305	3.4851	3.4963	3.5540	3.5540	3.5658	3.5306	3.4963	3.4740	3.4520
util living area	0.9835	0.9630	0.9165	0.8036	0.6433	0.4677	0.3461	0.3970	0.6371	0.8870	0.9695	0.9867 (86)
Living	19.3989	19.6783	20.0656	20.5088	20.7661	20.8787	20.9042	20.8990	20.8110	20.4082	19.8282	19.3709
Non living	18.3488	18.7054	19.1941	19.7468	20.0460	20.1785	20.2015	20.2008	20.1089	19.6389	18.9093	18.3216
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	11	0	0	0	0	0	0	0	0	0	0	0
16 / 9	20	28	5	0	0	0	0	0	0	0	0	31
MIT	20.4150	20.2514	20.1309	20.5088	20.7661	20.8787	20.9042	20.8990	20.8110	20.4082	19.8282	20.0773 (87)
Th 2	20.2804	20.2834	20.2863	20.3009	20.3039	20.3186	20.3186	20.3215	20.3127	20.3039	20.2980	20.2921 (88)
util rest of house	0.9812	0.9582	0.9059	0.7813	0.6082	0.4229	0.2945	0.3417	0.5897	0.8683	0.9647	0.9849 (89)
MIT 2	19.7304	19.5869	19.2925	19.7468	20.0460	20.1785	20.2015	20.2008	20.1089	19.6389	18.9093	19.4224 (90)
Living area fraction	19.8889	19.7408	19.4866	19.9232	20.2128	20.3406	20.3642	20.3625	20.2715	19.8171	19.1220	19.5740 (92)
MIT	19.8889	19.7408	19.4866	19.9232	20.2128	20.3406	20.3642	20.3625	20.2715	19.8171	19.1220	19.5740 (93)
Temperature adjustment												0.0000
adjusted MIT	19.8889	19.7408	19.4866	19.9232	20.2128	20.3406	20.3642	20.3625	20.2715	19.8171	19.1220	19.5740 (93)

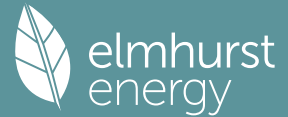
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9798	0.9540	0.8920	0.7681	0.6034	0.4244	0.2980	0.3451	0.5866	0.8530	0.9545	0.9827 (94)
Useful gains	1262.9081	1573.1531	1813.8219	1919.1923	1695.9783	1199.8508	803.5628	837.0928	1226.5819	1397.5787	1260.8811	1183.5153 (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	3562.7420	3376.9804	2942.1443	2442.4478	1877.7186	1237.6631	811.5440	850.3493	1342.8422	2033.0692	2675.7251	3452.3937 (97)
Space heating kWh	1711.0764	1212.1720	839.4718	376.7440	135.2148	0.0000	0.0000	0.0000	0.0000	472.8050	1018.6877	1688.0455 (98a)
Space heating requirement - total per year (kWh/year)												7454.2171
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	1711.0764	1212.1720	839.4718	376.7440	135.2148	0.0000	0.0000	0.0000	0.0000	472.8050	1018.6877	1688.0455 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												7454.2171
Space heating per m2										(98c) / (4) =		25.0756 (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 %)												327.8814 (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	1711.0764	1212.1720	839.4718	376.7440	135.2148	0.0000	0.0000	0.0000	0.0000	472.8050	1018.6877	1688.0455 (98)
Space heating efficiency (main heating system 1)	327.8814	327.8814	327.8814	327.8814	327.8814	0.0000	0.0000	0.0000	0.0000	327.8814	327.8814	327.8814 (210)
Space heating fuel (main heating system)	521.8584	369.6983	256.0291	114.9025	41.2390	0.0000	0.0000	0.0000	0.0000	144.2000	310.6879	514.8343 (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	309.6324	273.6262	289.9327	252.8195	243.7129	218.0988	214.0274	223.2849	226.5992	254.5067	272.8996	305.9519 (64)
Efficiency of water heater (217)m	271.6050	271.6050	271.6050	271.6050	271.6050	271.6050	271.6050	271.6050	271.6050	271.6050	271.6050	271.6050 (217)
Fuel for water heating, kWh/month	114.0010	100.7442	106.7479	93.0835	89.7306	80.3000	78.8010	82.2094	83.4297	93.7047	100.4766	112.6459 (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	84.3757	76.2103	84.3757	81.6539	84.3757	81.6539	84.3757	84.3757	81.6539	84.3757	81.6539	84.3757 (231)
Lighting	58.7805	47.1559	42.4586	31.1070	24.0280	19.6310	21.9191	28.4913	37.0074	48.5557	54.8435	60.4142 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-37.3044	-61.7541	-103.7576	-136.0141	-164.1905	-159.3852	-157.3420	-139.1794	-110.9717	-78.0272	-44.0640	-31.2511 (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)												

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(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	-0.2605	-0.9309	-3.0021	-7.0649	-12.5716	-14.4001	-14.1466	-10.6511	-6.3757	-2.1072	-0.4934	-0.1843	(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												2273.4495	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												271.6050	
Water heating fuel used												1135.8746	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.0920)													
mechanical ventilation fans (SFP = 1.0920)												993.4562	(230a)
Total electricity for the above, kWh/year												993.4562	(231)
Electricity for lighting (calculated in Appendix L)												474.3920	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1295.4295	(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												3581.7427	(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	2273.4495	0.1565	355.7048	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1135.8746	0.1411	160.2349	(264)
Space and water heating			515.9397	(265)
Pumps, fans and electric keep-hot	993.4562	0.1387	137.8046	(267)
Energy for lighting	474.3920	0.1443	68.4694	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1223.2412	0.1316	-161.0365	
PV Unit electricity exported	-72.1883	0.1162	-8.3862	
Total			-169.4227	(269)
Total CO2, kg/year			552.7911	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			1.8600	(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	2273.4495	1.5792	3590.2462	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1135.8746	1.5216	1728.3747	(278)
Space and water heating			5318.6210	(279)
Pumps, fans and electric keep-hot	993.4562	1.5128	1502.9005	(281)
Energy for lighting	474.3920	1.5338	727.6383	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1223.2412	1.4864	-1818.1967	
PV Unit electricity exported	-72.1883	0.4258	-30.7381	
Total			-1848.9348	(283)
Total Primary energy kWh/year			5700.2250	(286)
Dwelling Primary energy Rate (DPER)			19.1800	(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	128.7400 (1b)	x 2.4000 (2b)	= 308.9760 (1b) - (3b)	
First floor	128.7400 (1c)	x 2.7000 (2c)	= 347.5980 (1c) - (3c)	
Second floor	39.7900 (1d)	x 2.2400 (2d)	= 89.1296 (1d) - (3d)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	297.2700		(4)	
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 745.7036 (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)

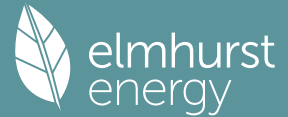
0 * 35 =	0.0000 (6e)
0 * 20 =	0.0000 (6f)
4 * 10 =	40.0000 (7a)
0 * 10 =	0.0000 (7b)
0 * 40 =	0.0000 (7c)

	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												
	0.3581	0.3511	0.3441	0.3090	0.3019	0.2668	0.2668	0.2598	0.2809	0.3019	0.3160	0.3300 (22b)
Effective ac	0.5641	0.5616	0.5592	0.5477	0.5456	0.5356	0.5356	0.5337	0.5394	0.5456	0.5499	0.5545 (25)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0470	1.0450	1.0430	1.0335	1.0317	1.0234	1.0234	1.0219	1.0266	1.0317	1.0353	1.0390 (40)
HLP (average)												1.0335
Days in month	31	28	31	30	31	30	31	31	30	31	30	31

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Total heat required for water heating calculated for each month												
WWHRS	302.6620	267.5977	283.9547	248.6772	240.4352	215.9574	212.5437	221.3124	224.1224	250.7663	267.7139	299.2114 (62)
PV diverter	-35.0515	-30.9998	-32.4612	-26.8792	-25.0504	-21.4358	-20.0927	-21.3665	-22.1783	-26.1458	-29.6200	-34.4024 (63a)
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	267.6105	236.5979	251.4934	221.7980	215.3848	194.5216	192.4510	199.9459	201.9441	224.6205	238.0939	264.8090 (64)
12Total per year (kWh/year)	Total per year (kWh/year) = Sum(64a)m =											2709.2705 (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	126.3040	112.1611	120.0838	107.5261	105.6136	96.6467	96.3397	99.2553	99.3616	109.0487	113.8558	125.1567 (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	156.4190	156.4190	156.4190	156.4190	156.4190	156.4190	156.4190	156.4190	156.4190	156.4190	156.4190	156.4190 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	230.1215	254.7774	230.1215	237.7923	230.1215	237.7923	230.1215	230.1215	237.7923	230.1215	237.7923	230.1215 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	456.0501	460.7825	448.8571	423.4692	391.4217	361.3015	341.1793	336.4470	348.3724	373.7602	405.8078	435.9280 (68)
Pumps, fans	38.6419	38.6419	38.6419	38.6419	38.6419	38.6419	38.6419	38.6419	38.6419	38.6419	38.6419	38.6419 (69)
Losses e.g. evaporation (negative values) (Table 5)	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)
Water heating gains (Table 5)	-125.1352	-125.1352	-125.1352	-125.1352	-125.1352	-125.1352	-125.1352	-125.1352	-125.1352	-125.1352	-125.1352	-125.1352 (71)
Total internal gains	169.7635	166.9064	161.4030	149.3418	141.9538	134.2316	129.4888	133.4077	138.0022	146.5709	158.1330	168.2214 (72)
	928.8608	955.3920	913.3073	883.5290	836.4227	803.2510	770.7154	769.9019	794.0926	823.3783	874.6588	907.1966 (73)

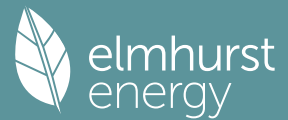
6. Solar gains												
[Jan]	Area	Solar flux	g	FF	Access	Gains						
	m2	Table 6a	Specific data	Specific data	factor	W						
		W/m2	or Table 6b	or Table 6c	Table 6d							
North	6.1900	10.6334	0.6300	0.7000	0.7700	20.1157 (74)						
East	32.9400	19.6403	0.6300	0.7000	0.7700	197.7164 (76)						
South	3.9600	46.7521	0.6300	0.7000	0.7700	56.5806 (78)						
West	19.4000	19.6403	0.6300	0.7000	0.7700	116.4450 (80)						
East	2.2900	26.2379	0.6300	0.7000	1.0000	23.8477 (82)						
Solar gains	414.7054	793.5421	1277.3945	1838.8850	2246.3849	2299.6764	2189.1226	1882.7990	1475.8571	932.5512	513.5572	343.4848 (83)
Total gains	1343.5663	1748.9341	2190.7019	2722.4139	3082.8076	3102.9274	2959.8381	2652.7009	2269.9497	1755.9295	1388.2160	1250.6814 (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	26.5364	26.5887	26.6402	26.8848	26.9311	27.1486	27.1486	27.1892	27.0644	26.9311	26.8377	26.7407
alpha	2.7691	2.7726	2.7760	2.7923	2.7954	2.8099	2.8099	2.8126	2.8043	2.7954	2.7892	2.7827
util living area	0.9824	0.9640	0.9254	0.8382	0.7073	0.5515	0.4243	0.4818	0.7089	0.9055	0.9703	0.9855 (86)
MIT	18.2418	18.6402	19.2418	19.9740	20.5195	20.8309	20.9405	20.9143	20.6442	19.8559	18.9066	18.1778 (87)
Th 2	20.0443	20.0460	20.0477	20.0555	20.0570	20.0639	20.0639	20.0651	20.0612	20.0570	20.0540	20.0509 (88)
util rest of house	0.9797	0.9586	0.9141	0.8143	0.6653	0.4883	0.3432	0.3977	0.6511	0.8860	0.9650	0.9832 (89)
MIT 2	16.7731	17.2800	18.0389	18.9456	19.5872	19.9283	20.0289	20.0114	19.7475	18.8230	17.6279	16.6952 (90)
Living area fraction	17.1132	17.5950	18.3174	19.1837	19.8031	20.1373	20.2400	20.2205	19.9552	19.0622	17.9239	17.0385 (91)
MIT	17.1132	17.5950	18.3174	19.1837	19.8031	20.1373	20.2400	20.2205	19.9552	19.0622	17.9239	17.0385 (92)
Temperature adjustment	17.1132	17.5950	18.3174	19.1837	19.8031	20.1373	20.2400	20.2205	19.9552	19.0622	17.9239	17.0385 (93)
adjusted MIT	17.1132	17.5950	18.3174	19.1837	19.8031	20.1373	20.2400	20.2205	19.9552	19.0622	17.9239	17.0385 (93)

8. Space heating requirement												
Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9669	0.9387	0.8874	0.7884	0.6530	0.4935	0.3590	0.4124	0.6439	0.8596	0.9473	0.9720 (94)
Ext temp.	1299.0341	1641.8051	1944.0480	2146.3767	2012.9946	1531.2653	1062.5777	1093.8907	1461.5984	1509.4561	1315.0855	1215.7194 (95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	14.1000	14.1000	10.6000	7.1000	4.2000 (96)
Space heating kWh	3988.1217	3943.5462	3663.8550	3159.3303	2485.1358	1684.6253	1107.3930	1160.5716	1786.8686	2595.2615	3331.1462	3965.4623 (97)
Space heating requirement - total per year (kWh/year)	2000.6812	1546.7701	1279.5365	729.3266	351.2730	0.0000	0.0000	0.0000	0.0000	807.8392	1451.5637	2045.8087 (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)	2000.6812	1546.7701	1279.5365	729.3266	351.2730	0.0000	0.0000	0.0000	0.0000	807.8392	1451.5637	2045.8087 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	(98c) / (4) =											34.3553 (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)

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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	2000.6812	1546.7701	1279.5365	729.3266	351.2730	0.0000	0.0000	0.0000	0.0000	807.8392	1451.5637	2045.8087 (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)	2167.5853	1675.8072	1386.2800	790.1696	380.5775	0.0000	0.0000	0.0000	0.0000	875.2321	1572.6584	2216.4775 (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 requirement	267.6105	236.5979	251.4934	221.7980	215.3848	194.5216	192.4510	199.9459	201.9441	224.6205	238.0939	264.8090 (64)
Efficiency of water heater (217)m	87.6340	87.4909	87.1848	86.5244	85.1498	79.8000	79.8000	79.8000	79.8000	86.6733	87.4108	79.8000 (216)
Fuel for water heating, kWh/month	305.3731	270.4257	288.4601	256.3416	252.9481	243.7614	241.1666	250.5588	253.0628	259.1576	272.3849	87.6669 (217)
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	302.0628 (219)
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	47.8147	38.3587	34.5378	25.3039	19.5454	15.9688	17.8300	23.1761	30.1035	39.4974	44.6122	49.1436 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-105.7488	-142.1782	-194.8892	-208.4325	-215.8417	-197.9758	-195.0793	-188.1205	-175.1257	-156.8430	-113.5703	-92.2160 (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	-82.7519	-170.7945	-333.7675	-493.4618	-645.3445	-646.2151	-639.0128	-544.6393	-403.7646	-242.0806	-109.7108	-65.7325 (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												11064.7876 (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												3195.7034 (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)												385.8921 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-6363.2970 (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												8369.0861 (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	11064.7876	0.2100	2323.6054 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3195.7034	0.2100	671.0977 (264)
Space and water heating			2994.7031 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	385.8921	0.1443	55.6962 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1986.0210	0.1357	-269.4573
PV Unit electricity exported	-4377.2760	0.1264	-553.0798
Total			-822.5371 (269)
Total CO2, kg/year			2239.7914 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			7.5300 (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	11064.7876	1.1300	12503.2100 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3195.7034	1.1300	3611.1449 (278)
Space and water heating			16114.3549 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	385.8921	1.5338	591.8942 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1986.0210	1.5015	-2982.0093
PV Unit electricity exported	-4377.2760	0.4638	-2030.2675
Total			-5012.2768 (283)
Total Primary energy kWh/year			11824.0731 (286)
Target Primary Energy Rate (TPER)			39.7800 (287)

Job no: 26.255

Date: 02/09/2026

Assessor name: Paul Allen

Registration no: APCOE-12

Development name: PIRTON HALL, SHILLINGTON ROAD

Issue Date: 02/09/2026

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 PLOTS 1 & 2

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	6
	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	4
	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	6
		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	2
	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
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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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