



**FALCON
ENERGY
LIMITED**

Energy Conservation Specialists

**Flat above 126 High Street
Hurstpierpoint
West Sussex
BN6 9PX**

Energy Statement

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**Flat above 126 High Street Hurstpierpoint, BN6 9PX
Energy Statement**



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Energy/ Sustainability Statement

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Energy/ Sustainability Statement

1. Introduction

Falcon energy has been instructed by Corbil Planning to undertake an energy/ sustainability report as part of a planning submission for the site known as Flat above 126 Highstreet, Hurstpierpoint BN6 9PX. The proposed works are for the conversion the premises on the 1st and second floor from Class E -Commercial, Business and Service to a Class C3 Dwelling house.

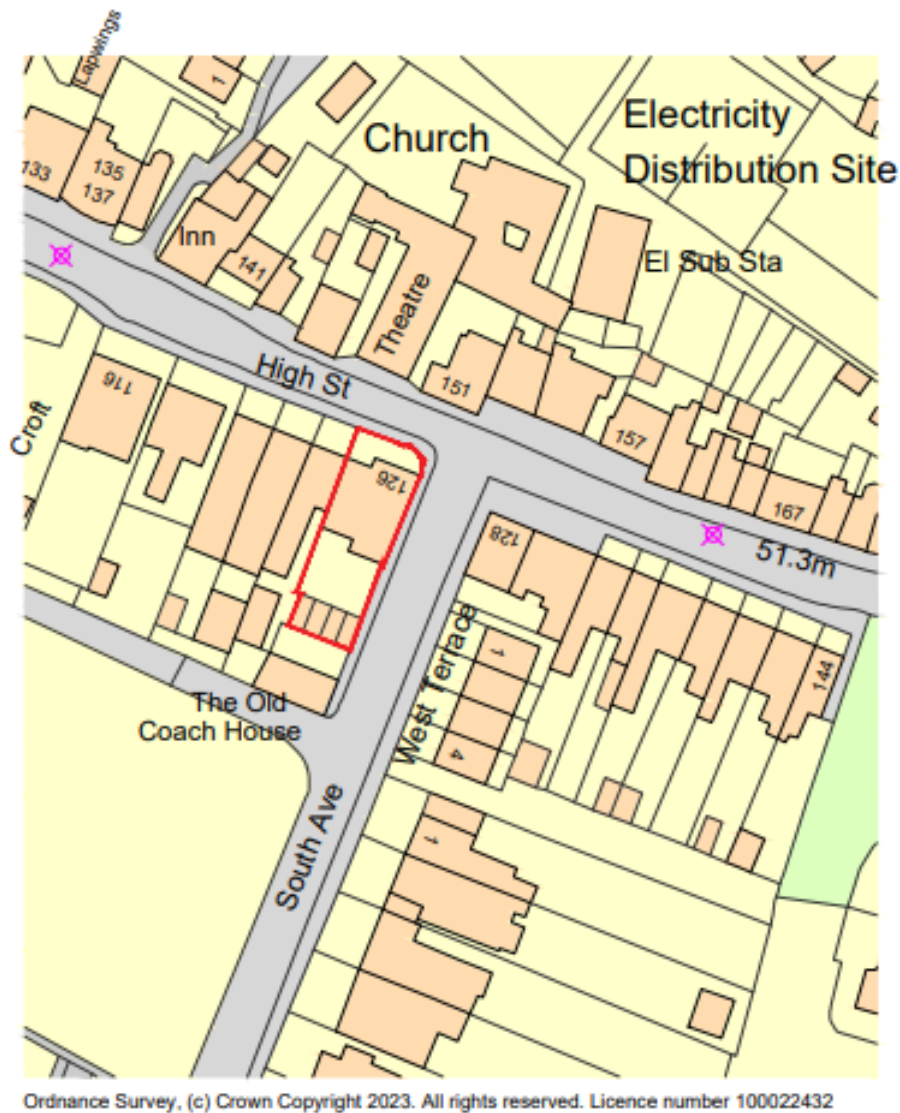


Figure 1, Site Layout

Flat above 126 Highstreet, Hurstpierpoint BN6 9PX

Energy/ Sustainability Statement

1.0 Energy Strategy.

The aim is to achieve a sustainable construction by looking at the following criteria in line with DP39:

- Energy efficient design, insulation and ventilation.
- Energy Efficient fixtures and fittings
- Community heating networks
- Renewable energies
- Innovative waste facilities
- Rainwater harvesting and recycling
- Water saving devices
- Sustainable urban design system
- Biodiversity enhancement
- Sustainable materials and construction
- CO2 reduction calculations

DP39: Sustainable Design and Construction

Strategic Objectives: 1) To promote development that makes the best use of resources and increases the sustainability of communities within Mid Sussex, and its ability to adapt to climate change.

Evidence Base: Gatwick Sub Region Water Cycle Study; West Sussex Sustainable Energy Study, Mid Sussex Sustainable Energy Study.

All development proposals must seek to improve the sustainability of development and should where appropriate and feasible according to the type and size of development and location, incorporate the following measures:

- **Minimise energy use through the design and layout of the scheme including through the use of natural lighting and ventilation;**
- **Explore opportunities for efficient energy supply through the use of communal heating networks where viable and feasible;**
- **Use renewable sources of energy;**
- **Maximise efficient use of resources, including minimising waste and maximising recycling/re-use of materials through both construction and occupation;**
- **Limit water use to 110 litres/person/day in accordance with Policy DP42: Water Infrastructure and the Water Environment;**
- **Demonstrate how the risks associated with future climate change have been planned for as part of the layout of the scheme and design of its buildings to ensure its longer term resilience**



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1.1 Energy efficient design, insulation and ventilation.

The table below highlights the fabric first approach to the build – see 'Lean' SAP calculation sheet

Construction	'Lean' Reduction Specification (U Value)	Baseline SAP Specification (U Value)
External wall	0.28/0.17	0.3/0.18
Floor	0.25	0.25
Roof	0.16/0.15/0.13	0.16/0.15
Window	1.3	1.4
Door	1	1.4
Boiler	Gas combi boiler	Gas combi Boiler
Lighting	100% low energy	100% low energy

The premises will be insulated with materials that will have a Global Warming Potential (GWP) of less than 5 and an Ozone Depletion Potential (ODP) of zero. This will include all insulation specified within the building elements, hot water stores and piping.

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1.2 Energy Efficient fixtures and fittings.

All internal lights will be 100% low energy.

All external space lighting will be dedicated energy efficient, having a luminous efficacy greater than 40 lumens per circuit watt. Lighting will be controlled either through a time switch and/or PIR.

White goods will be provided. The fridges and freezers will be A+ rated and washing machines and dishwashers will be A rated under the EU Energy Efficiency Labelling Scheme.

1.3 Renewable Energies.

The following technologies were considered:

- **Solar P.V/thermal**
- **Ground source heat pump**
- **Air source heat pump**

Solar P.V/Thermal

This was not felt viable due to the cost and aesthetics.

Ground Source heat pump

A ground sourced heat pump (GSHP) is a device for extracting heat from the ground to provide space heating and domestic hot water for buildings. Water or another fluid is circulated through pipes buried in the ground and passes through a heat exchanger in the heat pump that extracts heat from the fluid. The heat pump then raises the temperature of the fluid via the compression cycle to supply hot water to the building as from a normal boiler.

Ground source needs a large area for the pipes to run, which we do not have on site, and the cost versus savings were not viable.

Air source heat pump

Air Source Heat Pumps extract heat from the outside air using an external condenser unit and transfer it, through refrigeration pipework to the indoor unit which then conveys that heat to the heating emitters and hot water cylinder. This system is capable of providing 100% of heating within a building. Providing air source heat pumps to the building for the space heating would reduce the carbon dioxide emissions from the Lean building. This system would require 1 condenser unit to be located external to the plot. An example unit is the Ultra Quiet Eco-dan air source heat pump 8.5kW with sound levels that are three times quieter than previous models, virtually eliminating planning restrictions. They have been designed specifically for residential applications, these models offer

superb, market-leading energy efficiency and sound levels and enable almost any home to benefit from high performance, renewable heating. The New Ultra Quiet Eco-dan takes this to the next level with low sound and high performance which mean homeowners can now choose the most convenient location for their heat pump, giving complete flexibility on placement and still meeting Permitted Development requirements.

The 8.5kW Ultra Quiet Eco-dan has a sound power level of only 58 dB(A) which is an 8 dB(A) drop over the model it replaces. It also has a sound pressure level of just 45 dB(A) at one metre. Sound power can be thought of as the cause of a noise or the total sound energy emitted by a source in all directions, whereas sound pressure is the effect or the sound we hear and this is determined by the environment and by the distance from the source of sound. We think of this as the intensity or loudness of a sound. An ambulance registers 120 dB(A) whereas a vacuum-cleaner registers around 73 dB(A) and typical room conversation comes in at around 60 dB(A).

“With a sound pressure level of just 45 dB(A), the new Eco-dan is whisper-quiet, with levels just above that of a library, meaning it will pass the Permitted Development requirements easily and can be installed almost anywhere to suit the homeowner.

The ASHP’s will be installed by an MCS accredited installer and designed to be the main heating source. Once full heat loss calculations have been carried out the final design will ensure the system is running to its optimum efficiency.

The developer commits to monitor the performance of the heat pump system post-construction to ensure it is achieving the expected performance approved during planning.

The ASHP will supply Radiators through a 150-litre cylinder.

OUTDOOR UNIT		PUZ-WM50VHA(-BS)
HEAT PUMP SPACE HEATER - 55°C	ErP Rating	A++
	η_s	129%
	SCOP (MCS)	3.22
HEAT PUMP SPACE HEATER - 35°C	ErP Rating	A+++
	η_s	183%
	SCOP (MCS)	4.57
HEAT PUMP COMBINATION HEATER - Large Profile ¹	ErP Rating	A+
	η_{wh}	135%
HEATING ² (A-7/W35)	Capacity (kW)	5.0
	Power Input (kW)	1.67
	COP	3.00
OPERATING AMBIENT TEMPERATURE (°C DB)		-20 ~ +35
SOUND DATA ³	Pressure Level at 1m (dBA)	52
	Power Level (dBA) ⁴	61
WATER DATA	Pipework Size (mm)	22
	Flow Rate (l/min)	14
	Water Pressure Drop (kPa)	12.0
DIMENSIONS (mm)	Width	950
	Depth	330+30 ⁷
	Height	943
WEIGHT (kg)		71
ELECTRICAL DATA	Electrical Supply	220-240v, 50Hz
	Phase	Single
	Nominal Running Current [MAX] (A) ⁵	4.64 [13]
	Fuse Rating - MCB Sizes (A) ⁶	16
REFRIGERANT CHARGE (kg) / CO ₂ EQUIVALENT (t)	R32 (GWP 675)	2.0 / 1.35



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CYLINDER			EHPT15X-UKHLDW
NOMINAL HOT WATER VOLUME (LITRES)			150
ErP RATING			C
HEAT LOSS (kWh/24hrs)			1.40
HEAT LOSS (W)			58
WATER			Flow Rate (l/min) - WM 50 / 60 / 85 14 / 17 / 24
			Primary Circuit Pump Grundfos UPM
			Heating Circuit Pump Grundfos UPI
			Sanitary Hot Water Pump Grundfos UPSO
			Connection Size (mm) Heating / DHW 22 / 22
			Charge Pressure (MPa (Bar)) 0.35 (3.5)
WATER SAFETY			
	Water Circuit	Control Thermistor (°C)	80
	DHW Cylinder	DHW Expansion Vessel (Litres)	12
		Control Thermistor (°C)	75
		Over Temperature Cut-Out (°C)	80 ± 5
		Temp and Pressure Relief Valve (°C) / (MPa (Bar))	90 / 1.0 (10)
		expansion Relief Valve (Cold) (MPa (bar))	0.8 (8)
DIMENSIONS (mm)			
		Width	649
		Depth	646
		Height	1515
WEIGHT EMPTY / FULL (kg)			54 / 204
CYLINDER MATERIAL			
	Cylinder	Cylinder Material	Stainless Steel
	Insulation	Insulation Type	CFC / HCFC-free flame-retard
		Insulation Thickness (mm)	50
		GWP of Insulation	3.1
		ODP of Insulation	0
ELECTRICAL DATA			
	Control Board - optionally powered by outdoor unit	Electrical Supply	220-240v, 50Hz
		Phase	Single
		Fuse Rating - MCB Sizes (A)*1	16
	Immersion Heater	Electrical Supply	220-240v, 50Hz
		Phase	Single
		Capacity (kW)	3
		Max Running Current (A)	13
		Fuse Rating - MCB Sizes (A)*1	16
MECHANICAL ZONES			DHW and 1 He
OPTIONAL SIMPLIFIED WIRELESS ROOM THERMOSTAT AND WIRELESS RECEIVER			PAR-WT50-E Controller and

This technology was deemed the most appropriate renewable technology to compliment the fabric first approach where U-values have been enhanced. The above example unit is indicative of the potential savings the technology can provide for the purposes of this assessment. This particular model may or may not be incorporated into the final specification.

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1.4 Innovative waste facilities.

Recycling storage will comply with the local authority requirements for recycling externally and internally. External storage areas will be in compliance with disabled access and volumes will be in line with BS5906.

The separation for recyclables will be provided in a fixed position in the kitchen with 30 litres to be provided for waste and minimum 30 litres for recyclables. A recycling bin with a 44-litre capacity will be provided.



1.5 Rainwater harvesting and recycling.

The site is being drained by soakaways so no surface water will be leaving site, the design team are also looking into using permeable paving for the hard-standing areas.

1.6 Water Saving devices

Mains water usage shall be significantly reduced through water efficient products in line with the mandatory requirements. An indicative specification for the development is:

Shower of 7 litres/minute

Bath sizes to be 180 litres to overflow

Washbasin taps to be flow limited to 6 litres/minute

Dual Flush WCs at 6/3 litre

Low water use white goods

The above specifications will give a usage of 105.01 litres/person/day

See Part G calculation found at the end of this document.

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1.7 Sustainable materials and construction

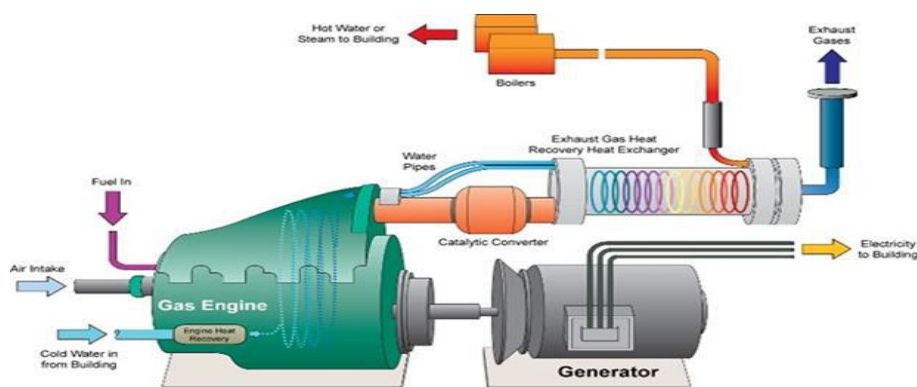
The design team are committed to ensuring that at least 5 elements build are A rated under the BRE Green Guide.

All concrete used within the development will have BES:6001 certification under an environmental management system (EMS) such as ISO14001. All timber used within the development will be wither PEFC or FSC certified.

Building Elements all skirting, stairs, doors and other timber finishing elements will be sourced from FSC or PEFC certified timber.

1.8 Community Heating networks

Combined heat and power (CHP), also known as cogeneration, is the simultaneous generation of thermal and electrical energy from a single stream of fuel.



CHP installations can typically convert between 80% and 90% of the energy in the fuel into electrical power and useful heat. By generating the electricity in an on-site CHP unit, and utilizing the heat, electricity from conventional power stations is displaced and the substantial conversion, transmission and distribution losses are avoided. The resulting efficiency gives typical small-scale CHP installations a simple payback period of between 3 and 5 years, beyond which the units continue to save energy right up until the end of the life of the plant.



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Systems must be 'heat lead' for high efficiency, which best suits applications to situations where there is a significant demand for heat for long periods of time, such as hospitals, hotels and leisure centres. Due to the nature and limited size of this development, CHP would not be applicable as there is not a constant heat requirement. It is likely there will be a small number of peak demands, e.g. between 6am – 7.30am as residents shower in the morning, rather than a steady load throughout the day.

Plans show there are no existing district heating networks that the proposed scheme could connect to. Therefore, CHP either on-site or via an existing network is not a viable solution for this residential scheme.

Disclaimer

This report is for the use of the client only and is not for the use of any other parties without the express permission of the client. All energy calculations, related quantified predictions and the code for sustainable homes pre-assessment are indicative for planning and are based solely on the available design proposals and must be reassessed during detailed design with the appropriate compliance methodology.

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1.9 Summary of carbon reductions and specification

Construction	'Green ' Reduction Specification (U Values and specifications)
External wall	0.28/0.17
Floor	0.25
Roof	0.16/0.15/0.13
Window	1.3
Door	1
Boiler	Air source Heat pump
Lighting	100% low energy

Variant	CO2 t/year	% Reduction from baseline CO2 t/year
Baseline	3.18	-
Lean	3.06	3.77
Green	1.05	66.98

The baseline CO2 emissions for the site are: 3.18 t/year

The improved CO2 emissions for the site are: 1.05 t/year

The site achieves a 66.98% reduction in Co2 emissions through a combination of thermal improvements, efficient technologies and renewable technologies.



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1.10 Part G Water efficiency calculations

Project Details			
Address/Reference	126 High Street Hurstpierpoint, BN6 9PX		Case Reference
Number of Bedrooms	3	Occupancy for Calculation Purposes	4

Appliance/Usage Details			
Taps (Excluding Kitchen Taps)			
Tap Fitting Type	Flow Rate Litres/Min	Quantity (No.)	Total per Fitting type
Basin	6.40	6	38.40
			0.00
			0.00
			0.00
			0.00
			0.00
Total No. of Fittings (No.)		6	
Total Flow (l/s)			38.40
Maximum Flow (l/s)			6.40
Average Flow (l/s)			6.40
Weighted Average Flow (l/s)			4.48
Flow for Calculation (l/s)			6.40

Showers			
Shower fitting Type	Flow Rate Litres/Min	Quantity (No.)	Total per Fitting type
Bathroom	7.00	1	7.00
ensuite	7.00	1	7.00
			0.00
			0.00
			0.00
			0.00
Total No. of Fittings (No.)		2	
Total Flow (l/s)			14.00
Maximum Flow (l/s)			7.00
Average Flow (l/s)			7.00
Weighted Average Flow (l/s)			4.90
Flow for Calculation (l/s)			7.00

Baths			
Bath Type	Capacity to Overflow	Quantity (No.)	Total per Fitting type
Bathroom	180.00	1	180.00
			0.00
			0.00
			0.00
Total No. of Fittings (No.)		1	
Total Capacity (l)			180.00
Maximum Capacity (l)			180.00
Average Capacity (l)			180.00
Weighted Average Capacity (l)			126.00
Capacity for Calculation (l)			180.00

WCs			
WC Type	Full Flush Volume	Part Flush Volume	Quantity (No)
Standard Dual	6.00	3.00	3
Total number of fittings			3
Average effective flushing volume			4.00

Dishwashers			
Dishwasher Type	L per Place Setting	Quantity (No.)	Total per Fitting type
DW	0.90	1	0.90
			0.00
Total No. of Fittings (No.)		1	
Total Consumption (l)			0.90
Maximum Consumption (l)			0.90
Average Consumption (l/s)			0.90
Weighted Average Consumption (l)			0.63
Consumption for Calculation (l/s)			0.90

Washing Machines			
Washing Machine Type	L per Kg Dry Load	Quantity (No.)	Total per Fitting type
WM	6.20	1	6.20
			0.00
Total No. of Fittings (No.)		1	
Total Consumption (l)			6.20
Maximum Consumption (l)			6.20
Average Consumption (l/s)			6.20
Weighted Average Consumption (l)			4.34
Consumption for Calculation (l/s)			6.20

Kitchen Taps

Tap Fitting Type	Flow Rate Litres/Min	Quantity (No.)	Total per Fitting type
Sink Hot	8.00	1	8.00
Sink Cold	8.00	1	8.00
			0.00
Total No. of Fittings (No.)			2
Total Flow (l/s)			16.00
Maximum Flow (l/s)			8.00
Average Flow (l/s)			8.00
Weighted Average Flow (l/s)			5.60
Flow for Calculation (l/s)			8.00

Water Use Assessment

Installation Type	Unit	Capacity/ Flow Rate	Use Factor	Fixed use (l/p/day)	Total Use (l/p/day)
WC Single Flush	Volume (l)	0.00	4.42	0.00	0.00
WC Dual Flush	Full Flush (l)	0.00	1.46	0.00	0.00
	Pt Flush (l)	0.00	2.96	0.00	0.00
WC's (Multiple)	Volume (l)	4.00	4.42	0.00	17.68
Taps Exc. Kitchen	Flow Rate	6.40	1.58	1.58	11.69
Bath (shower present)	(l/s)	180.00	0.11	0.00	19.80
Shower (bath present)	(l/s)	7.00	4.37	0.00	30.59
Bath Only	(l)	0.00	0.50	0.00	0.00
Shower Only	(l/s)	0.00	5.60	0.00	0.00
Kitchen Taps	(l/s)	8.00	0.44	10.36	13.88
Washing Machines	(l/kgdry)	6.20	2.10	0.00	13.02
Dishwashers	(l/place)	0.90	3.60	0.00	3.24
Waste Disposal	(l/s)	0.00	3.08	0.00	0.00
Water Softner	(l/s)	0.00	1.00	0.00	0.00
Total Calculated Water Use (l/p/day)					109.90
Grey/RainWater Reused (l)					0.00
Normalisation Factor (Factor)					0.91
Total Consumption CSH (l/p/day)					100.01
External Water Use Allowance (l)					5.00
Total Consumption Part G (l/p/day)					105.01

Assesment Result

PASS

Other Fittings

Waste Disposal Y/N	
Water softner	
Consumption beyond 4% l/p/d	

Use of grey water and harvested rainwater

Total Grey water from WHB taps (l)	
Total Available Grey Water Supply (l)	201.56
Possible Demand (l)	122.80
Grey/Rain Installed Capacity (l)	
Figure for Calculation lit/person/day	0.00



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1.11 SAP calculation sheets for Baseline, Lean and Green variants

SAP 10 WORKSHEET FOR Conversion (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

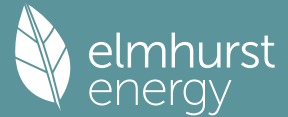
	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	5.3000 (1b)	x 3.0500 (2b)	= 16.1650 (1b) - (3b)
First floor	86.1000 (1c)	x 2.8600 (2c)	= 246.2460 (1c) - (3c)
Second floor	79.2100 (1d)	x 2.7600 (2d)	= 218.6196 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)... (1n)	170.6100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)... (3n)	= 481.0306 (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		2 * 10 =	20.0000 (7a)
Number of passive vents		0 * 10 =	0.0000 (7b)
Number of flueless gas fires		0 * 40 =	0.0000 (7c)
			Air changes per hour
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =		0.0416 (8)
Pressure test			No
Pressure Test Method			Blower Door
Measured/design AP50			15.0000 (17)
Infiltration rate			0.7916 (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) =		0.7322 (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												
	0.9336	0.9153	0.8970	0.8054	0.7871	0.6956	0.6956	0.6773	0.7322	0.7871	0.8237	0.8603 (22b)
Effective ac	0.9358	0.9189	0.9023	0.8244	0.8098	0.7419	0.7419	0.7294	0.7681	0.8098	0.8393	0.8701 (25)

[illegible]

Full SAP Calculation Printout



Point Thermal bridges
Total fabric heat loss

(33) + (36) + (36a) = 0.0000
139.6197 (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	148.5447	145.8586	143.2257	130.8588	128.5450	117.7738	117.7738	115.7792	121.9227	128.5450	133.2258	138.1193	(38)
Heat transfer coeff	288.1645	285.4783	282.8454	270.4785	268.1647	257.3935	257.3935	255.3989	261.5424	268.1647	272.8455	277.7390	(39)
Average = Sum(39)m / 12 =												270.4674	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.6890	1.6733	1.6578	1.5854	1.5718	1.5087	1.5087	1.4970	1.5330	1.5718	1.5992	1.6279	(40)
HLP (average)												1.5853	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.9634 (42)
Hot water usage for mixer showers													
101.6210	100.0938	97.8684	93.6105	90.4684	86.9642	84.9724	87.1810	89.6020	93.3643	97.7137	101.2316	(42a)	
Hot water usage for baths													
31.9053	31.4314	30.7642	29.5339	28.6126	27.5911	27.0393	27.7019	28.4234	29.5164	30.7721	31.7974	(42b)	
Hot water usage for other uses													
44.9781	43.3425	41.7069	40.0714	38.4358	36.8002	36.8002	38.4358	40.0714	41.7069	43.3425	44.9781	(42c)	
Average daily hot water use (litres/day)												164.1615	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	178.5043	174.8677	170.3395	163.2158	157.5168	151.3556	148.8120	153.3187	158.0967	164.5877	171.8282	178.0071	(44)
Energy content (annual)	282.7072	249.0093	261.8055	223.4343	212.0479	186.1093	179.9752	189.8406	194.9490	223.3440	244.8008	278.7161	(45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		2726.7393	
42.4061	37.3514	39.2708	33.5151	31.8072	27.9164	26.9963	28.4761	29.2424	33.5016	36.7201	41.8074	(46)	
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month													
333.6661	295.0367	312.7644	272.7493	263.0068	235.4244	230.9342	240.7995	244.2641	274.3029	294.1159	329.6750	(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	333.6661	295.0367	312.7644	272.7493	263.0068	235.4244	230.9342	240.7995	244.2641	274.3029	294.1159	329.6750	(64)
									Total per year (kWh/year) = Sum(64)m =			3326.7393	(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	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													
106.7399	94.3025	99.7901	86.6207	83.2456	74.2101	72.5815	75.8617	77.1493	87.0016	93.7250	105.4128	(65)	

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

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	177.8034	177.8034	177.8034	177.8034	177.8034	177.8034	177.8034	177.8034	177.8034	177.8034	177.8034	177.8034 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	53.7578	47.7472	38.8306	29.3973	21.9748	18.5521	20.0461	26.0567	34.9733	44.4066	51.8291	55.2519 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	510.7034	516.0029	502.6484	474.2181	438.3299	404.6001	382.0665	376.7670	390.1216	418.5519	454.4400	488.1699 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.7437	55.7437	55.7437	55.7437	55.7437	55.7437	55.7437	55.7437	55.7437	55.7437	55.7437	55.7437 (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)	-118.5356	-118.5356	-118.5356	-118.5356	-118.5356	-118.5356	-118.5356	-118.5356	-118.5356	-118.5356	-118.5356	-118.5356 (71)
Water heating gains (Table 5)	143.4676	140.3310	134.1264	120.3065	111.8893	103.0696	97.5558	101.9647	107.1518	116.9376	130.1737	141.6839 (72)
Total internal gains	825.9403	822.0927	793.6169	741.9333	690.2055	641.2332	614.6799	619.7999	647.2582	697.9077	754.4543	803.1171 (73)

6. Solar gains

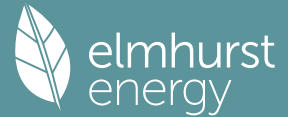
[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	8.2700	10.6334	0.7600	0.7000	0.7700	32.4207	(74)
Northeast	1.3600	11.2829	0.7600	0.7000	0.7700	5.6573	(75)
Southeast	13.9700	36.7938	0.7600	0.7000	0.7700	189.5031	(77)
Northwest	1.3600	11.2829	0.7600	0.7000	0.7700	5.6573	(81)

Solar gains	233.2383	407.7825	588.4363	784.4934	932.3594	950.0493	905.7203	791.1225	655.3689	458.6542	281.2127	198.4426	(83)
Total gains	1059.1786	1229.8752	1382.0532	1526.4267	1622.5649	1591.2825	1520.4002	1410.9224	1302.6271	1156.5618	1035.6670	1001.5598	(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	39.7380	40.1119	40.4853	42.3364	42.7017	44.4887	44.4887	44.8361	43.7829	42.7017	41.9691	41.2297
alpha	3.6492	3.6741	3.6990	3.8224	3.8468	3.9659	3.9659	3.9891	3.9189	3.8468	3.7979	3.7486
util living area												
	0.9969	0.9942	0.9881	0.9703	0.9236	0.8122	0.6680	0.7206	0.9029	0.9799	0.9947	0.9975 (86)

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MIT	18.7977	19.0169	19.3876	19.9308	20.4046	20.7854	20.9293	20.9042	20.6215	20.0096	19.3554	18.8276 (87)
Th 2	19.5487	19.5600	19.5712	19.6241	19.6341	19.6810	19.6810	19.6898	19.6629	19.6341	19.6139	19.5929 (88)
util rest of house	0.9958	0.9921	0.9834	0.9574	0.8855	0.7138	0.5019	0.5626	0.8382	0.9687	0.9925	0.9967 (89)
MIT 2	17.5909	17.8171	18.1932	18.7651	19.2208	19.5770	19.6629	19.6616	19.4442	18.8551	18.1931	17.6515 (90)
Living area fraction									fLA = Living area / (4) =			0.1914 (91)
MIT	17.8218	18.0467	18.4217	18.9882	19.4474	19.8083	19.9053	19.8994	19.6695	19.0760	18.4155	17.8766 (92)
Temperature adjustment												0.0000
adjusted MIT	17.8218	18.0467	18.4217	18.9882	19.4474	19.8083	19.9053	19.8994	19.6695	19.0760	18.4155	17.8766 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9937	0.9888	0.9779	0.9491	0.8788	0.7251	0.5335	0.5916	0.8386	0.9620	0.9895	0.9950 (94)
Useful gains	1052.5129	1216.0849	1351.4877	1448.6876	1425.9126	1153.8773	811.0655	834.6780	1092.4350	1112.6681	1024.7420	996.5676 (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	3896.5057	3753.1003	3372.0067	2728.6378	2077.5730	1340.5783	850.7555	893.7412	1456.6646	2272.9741	3087.3831	3798.5253 (97)
Space heating kWh	2115.9307	1704.8743	1503.2661	921.5641	484.8353	0.0000	0.0000	0.0000	0.0000	863.2677	1485.1016	2084.6565 (98a)
Space heating requirement - total per year (kWh/year)												11163.4963
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	2115.9307	1704.8743	1503.2661	921.5641	484.8353	0.0000	0.0000	0.0000	0.0000	863.2677	1485.1016	2084.6565 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												11163.4963
Space heating per m2										(98c) / (4) =		65.4328 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												84.0000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	2115.9307	1704.8743	1503.2661	921.5641	484.8353	0.0000	0.0000	0.0000	0.0000	863.2677	1485.1016	2084.6565 (98)
Space heating efficiency (main heating system 1)	84.0000	84.0000	84.0000	84.0000	84.0000	0.0000	0.0000	0.0000	0.0000	84.0000	84.0000	84.0000 (210)
Space heating fuel (main heating system)	2518.9651	2029.6122	1789.6025	1097.1002	577.1849	0.0000	0.0000	0.0000	0.0000	1027.6997	1767.9780	2481.7340 (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	333.6661	295.0367	312.7644	272.7493	263.0068	235.4244	230.9342	240.7995	244.2641	274.3029	294.1159	329.6750 (64)
Efficiency of water heater (217)m	82.6491	82.5388	82.2991	81.7594	80.5985	75.0000	75.0000	75.0000	75.0000	81.6378	82.3661	75.0000 (216)
Fuel for water heating, kWh/month	403.7143	357.4521	380.0337	333.6000	326.3170	313.8992	307.9122	321.0660	325.6855	336.0000	357.0836	398.9012 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	3.4822	3.1452	3.4822	3.3699	3.4822	3.3699	3.4822	3.4822	3.3699	3.4822	3.3699	3.4822 (231)
Lighting	47.0539	37.7484	33.9882	24.9012	19.2344	15.7147	17.5463	22.8073	29.6244	38.8689	43.9023	48.3616 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												13289.8765 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												75.0000
Water heating fuel used												4161.6648 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
central heating pump												41.0000 (230c)
Total electricity for the above, kWh/year												41.0000 (231)
Electricity for lighting (calculated in Appendix L)												379.7516 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												0.0000 (233)
Wind generation												0.0000 (234)
Hydro-electric generation (Appendix N)												0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)												0.0000 (235)
Appendix Q - special features												
Energy saved or generated												-0.0000 (236)
Energy used												0.0000 (237)
Total delivered energy for all uses												17872.2929 (238)

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10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	13289.8765	3.6400	483.7515 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	4161.6648	3.6400	151.4846 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Pumps, fans and electric keep-hot	41.0000	16.4900	6.7609 (249)
Energy for lighting	379.7516	16.4900	62.6210 (250)
Additional standing charges			92.0000 (251)
Total energy cost			796.6180 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	1.3301 (257)
SAP value		78.4391
SAP rating (Section 12)		78 (258)
SAP band		C

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	13289.8765	0.2100	2790.8741 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	4161.6648	0.2100	873.9496 (264)
Space and water heating			3664.8237 (265)
Pumps, fans and electric keep-hot	41.0000	0.1387	5.6872 (267)
Energy for lighting	379.7516	0.1443	54.8099 (268)
Total CO2, kg/year			3725.3208 (272)
CO2 emissions per m2			21.8400 (273)
EI value			76.8474
EI rating			77 (274)
EI band			C

SAP 10 WORKSHEET FOR Conversion (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	5.3000 (1b)	x 3.0500 (2b)	= 16.1650 (1b) - (3b)
First floor	86.1000 (1c)	x 2.8600 (2c)	= 246.2460 (1c) - (3c)
Second floor	79.2100 (1d)	x 2.7600 (2d)	= 218.6196 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	170.6100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	481.0306 (5)

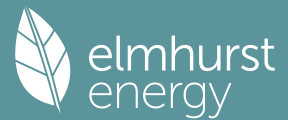
2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.0416 (8)
Pressure test	No
Pressure Test Method	Blower Door
Measured/design AP50	15.0000 (17)
Infiltration rate	0.7916 (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) = 0.7322 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.1000	3.8000	3.7000	3.5000	3.5000	3.2000	3.3000	3.1000	3.1000	3.4000	3.3000	3.7000 (22)
Wind factor	1.0250	0.9500	0.9250	0.8750	0.8750	0.8000	0.8250	0.7750	0.7750	0.8500	0.8250	0.9250 (22a)
Adj infilt rate	0.7505	0.6956	0.6773	0.6407	0.6407	0.5858	0.6041	0.5675	0.5675	0.6224	0.6041	0.6773 (22b)
Effective ac	0.7816	0.7419	0.7294	0.7052	0.7052	0.6716	0.6825	0.6610	0.6610	0.6937	0.6825	0.7294 (25)

3. Heat losses and heat loss parameter

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Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
New windows (Uw = 1.40)			24.9600	1.3258	33.0909			(27)
Ground floor			5.3000	0.2500	1.3250	110.0000	583.0000	(28a)
Existing upg	103.3400	24.9600	78.3800	0.3000	23.5140	17.0000	1332.4600	(29a)
External Wall NEW	62.2800		62.2800	0.1800	11.2104	60.0000	3736.8000	(29a)
Existing pitched	41.7300		41.7300	0.1600	6.6768	9.0000	375.5700	(30)
Existing plane	23.7600		23.7600	0.1600	3.8016	9.0000	213.8400	(30)
New pitched	18.1100		18.1100	0.1500	2.7165	9.0000	162.9900	(30)
New plane	18.2300		18.2300	0.1500	2.7345	9.0000	164.0700	(30)
Total net area of external elements Aum(A, m2)			272.7500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		85.0697			(33)
Party Wall 1			56.8800	0.0000	0.0000	180.0000	10238.4000	(32)
Party Floor 1			80.8000			30.0000	2424.0000	(32d)
Internal Wall 1			204.4300			100.0000	20443.0000	(32c)
Internal Floor 1			86.1000			18.0000	1549.8000	(32d)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K
Thermal bridges (Default value 0.200 * total exposed area)
Point Thermal bridges
Total fabric heat loss

(28)...(30) + (32) + (32a)...(32e) = 41223.9300 (34)
241.6267 (35)
54.5500 (36)
(36a) = 0.0000
(33) + (36) + (36a) = 139.6197 (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	124.0770	117.7738	115.7792	111.9494	111.9494	106.6038	108.3325	104.9283	104.9283	110.1144	108.3325	115.7792	(38)
Heat transfer coeff	263.6967	257.3935	255.3989	251.5692	251.5692	246.2235	247.9522	244.5480	244.5480	249.7341	247.9522	255.3989	(39)
Average = Sum(39)m / 12 =												251.3320	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.5456	1.5087	1.4970	1.4745	1.4745	1.4432	1.4533	1.4334	1.4334	1.4638	1.4533	1.4970	(40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.9634 (42)
Hot water usage for mixer showers													
101.6210	100.0938	97.8684	93.6105	90.4684	86.9642	84.9724	87.1810	89.6020	93.3643	97.7137	101.2316	(42a)	
Hot water usage for baths													
31.9053	31.4314	30.7642	29.5339	28.6126	27.5911	27.0393	27.7019	28.4234	29.5164	30.7721	31.7974	(42b)	
Hot water usage for other uses													
44.9781	43.3425	41.7069	40.0714	38.4358	36.8002	36.8002	38.4358	40.0714	41.7069	43.3425	44.9781	(42c)	
Average daily hot water use (litres/day)												164.1615	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
178.5043	174.8677	170.3395	163.2158	157.5168	151.3556	148.8120	153.3187	158.0967	164.5877	171.8282	178.0071	(44)	
Energy content (annual)	282.7072	249.0093	261.8055	223.4343	212.0479	186.1093	179.9752	189.8406	194.9490	223.3440	244.8008	278.7161	(45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		2726.7393	
42.4061	37.3514	39.2708	33.5151	31.8072	27.9164	26.9963	28.4761	29.2424	33.5016	36.7201	41.8074	(46)	
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month													
333.6661	295.0367	312.7644	272.7493	263.0068	235.4244	230.9342	240.7995	244.2641	274.3029	294.1159	329.6750	(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	333.6661	295.0367	312.7644	272.7493	263.0068	235.4244	230.9342	240.7995	244.2641	274.3029	294.1159	329.6750	(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	0.0000	(64a)
Heat gains from water heating, kWh/month	106.7399	94.3025	99.7901	86.6207	83.2456	74.2101	72.5815	75.8617	77.1493	87.0016	93.7250	105.4128	(65)

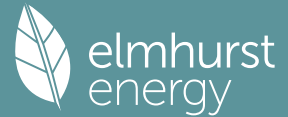
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	177.8034	177.8034	177.8034	177.8034	177.8034	177.8034	177.8034	177.8034	177.8034	177.8034	177.8034	177.8034 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	53.7578	47.7472	38.8306	29.3973	21.9748	18.5521	20.0461	26.0567	34.9733	44.4066	51.8291	55.2519 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	510.7034	516.0029	502.6484	474.2181	438.3299	404.6001	382.0665	376.7670	390.1216	418.5519	454.4400	488.1699 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.7437	55.7437	55.7437	55.7437	55.7437	55.7437	55.7437	55.7437	55.7437	55.7437	55.7437	55.7437 (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)	-118.5356	-118.5356	-118.5356	-118.5356	-118.5356	-118.5356	-118.5356	-118.5356	-118.5356	-118.5356	-118.5356	-118.5356 (71)
Water heating gains (Table 5)	143.4676	140.3310	134.1264	120.3065	111.8893	103.0696	97.5558	101.9647	107.1518	116.9376	130.1737	141.6839 (72)
Total internal gains	825.9403	822.0927	793.6169	741.9333	690.2055	641.2332	614.6799	619.7999	647.2582	697.9077	754.4543	803.1171 (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	8.2700	12.6762	0.7600	0.7000	0.7700	38.6490 (74)

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Northeast	1.3600	13.7534	0.7600	0.7000	0.7700	6.8960 (75)
Southeast	13.9700	42.4133	0.7600	0.7000	0.7700	218.4458 (77)
Northwest	1.3600	13.7534	0.7600	0.7000	0.7700	6.8960 (81)

Solar gains	270.8868	422.3990	611.4471	856.3490	990.9948	1095.9778	1023.0963	893.6126	731.6058	509.1836	330.0347	231.6713 (83)
Total gains	1096.8270	1244.4916	1405.0640	1598.2823	1681.2003	1737.2111	1637.7762	1513.4126	1378.8640	1207.0913	1084.4891	1034.7884 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	43.4252	44.4887	44.8361	45.5187	45.5187	46.5069	46.1827	46.8255	46.8255	45.8531	46.1827	44.8361
alpha	3.8950	3.9659	3.9891	4.0346	4.0346	4.1005	4.0788	4.1217	4.1217	4.0569	4.0788	3.9891
util living area	0.9961	0.9934	0.9849	0.9581	0.8846	0.7103	0.5721	0.5794	0.8521	0.9661	0.9924	0.9969 (86)
MIT	19.1211	19.3191	19.6871	20.1561	20.6038	20.8963	20.9665	20.9679	20.7609	20.2799	19.6735	19.1486 (87)
Th 2	19.6535	19.6810	19.6898	19.7067	19.7067	19.7304	19.7227	19.7378	19.7378	19.7148	19.7227	19.6898 (88)
util rest of house	0.9947	0.9909	0.9789	0.9403	0.8304	0.5897	0.4056	0.4039	0.7657	0.9467	0.9890	0.9957 (89)
MIT 2	17.9870	18.2037	18.5747	19.0435	19.4530	19.6897	19.7161	19.7321	19.6148	19.1760	18.5874	18.0405 (90)
Living area fraction									fLA = Living area / (4) =			0.1914 (91)
MIT	18.2041	18.4171	18.7876	19.2564	19.6732	19.9206	19.9554	19.9686	19.8341	19.3873	18.7952	18.2525 (92)
Temperature adjustment												0.0000
adjusted MIT	18.2041	18.4171	18.7876	19.2564	19.6732	19.9206	19.9554	19.9686	19.8341	19.3873	18.7952	18.2525 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9924	0.9875	0.9732	0.9321	0.8287	0.6099	0.4380	0.4382	0.7737	0.9398	0.9854	0.9938 (94)
Useful gains	1088.4457	1228.9781	1367.3747	1489.8091	1393.1866	1059.4567	717.3010	663.2387	1066.8510	1134.4376	1068.6475	1028.4129 (95)
Ext temp.	5.0000	5.4000	7.1000	9.4000	12.5000	15.3000	17.0000	17.2000	14.6000	11.6000	7.9000	5.0000 (96)
Heat loss rate W	3481.8729	3350.5259	2984.9883	2479.5667	1804.5625	1137.7094	732.7930	677.0526	1279.9989	1944.7430	2701.4971	3384.6788 (97)
Space heating kWh	1780.7099	1425.6802	1203.5045	712.6255	306.0637	0.0000	0.0000	0.0000	0.0000	602.8673	1175.6517	1753.0618 (98a)
Space heating requirement - total per year (kWh/year)												8960.1645
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	1780.7099	1425.6802	1203.5045	712.6255	306.0637	0.0000	0.0000	0.0000	0.0000	602.8673	1175.6517	1753.0618 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												8960.1645
Space heating per m2										(98c) / (4) =		52.5184 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												84.0000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	1780.7099	1425.6802	1203.5045	712.6255	306.0637	0.0000	0.0000	0.0000	0.0000	602.8673	1175.6517	1753.0618 (98)
Space heating efficiency (main heating system 1)	84.0000	84.0000	84.0000	84.0000	84.0000	0.0000	0.0000	0.0000	0.0000	84.0000	84.0000	84.0000 (210)
Space heating fuel (main heating system)	2119.8927	1697.2383	1432.7435	848.3637	364.3615	0.0000	0.0000	0.0000	0.0000	717.6991	1399.5853	2086.9784 (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	333.6661	295.0367	312.7644	272.7493	263.0068	235.4244	230.9342	240.7995	244.2641	274.3029	294.1159	329.6750 (64)
Efficiency of water heater (217)m	82.4389	82.3065	81.9710	81.2996	79.5861	75.0000	75.0000	75.0000	75.0000	80.9619	82.0302	75.0000 (216)
Fuel for water heating, kWh/month	404.7437	358.4610	381.5550	335.4868	330.4681	313.8992	307.9122	321.0660	325.6855	338.8051	358.5459	399.9251 (219)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	3.4822	3.1452	3.4822	3.3699	3.4822	3.3699	3.4822	3.4822	3.3699	3.4822	3.3699	3.4822 (231)
Lighting	47.0539	37.7484	33.9882	24.9012	19.2344	15.7147	17.5463	22.8073	29.6244	38.8689	43.9023	48.3616 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												10666.8624 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												75.0000
Water heating fuel used												4176.5535 (219)

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Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
central heating pump	41.0000 (230c)
Total electricity for the above, kWh/year	41.0000 (231)
Electricity for lighting (calculated in Appendix L)	379.7516 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	0.0000 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	15264.1675 (238)

10a. Fuel costs - using BEDF prices (538)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	10666.8624	6.1900	660.2788 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	4176.5535	6.1900	258.5287 (247)
Energy for instantaneous electric shower(s)	0.0000	25.1600	0.0000 (247a)
Pumps, fans and electric keep-hot	41.0000	25.1600	10.3156 (249)
Energy for lighting	379.7516	25.1600	95.5455 (250)
Additional standing charges			102.0000 (251)
Total energy cost			1126.6685 (255)

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	10666.8624	0.2100	2240.0411 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	4176.5535	0.2100	877.0762 (264)
Space and water heating			3117.1174 (265)
Pumps, fans and electric keep-hot	41.0000	0.1387	5.6872 (267)
Energy for lighting	379.7516	0.1443	54.8099 (268)
Total CO2, kg/year			3177.6144 (272)

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	10666.8624	1.1300	12053.5546 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	4176.5535	1.1300	4719.5055 (278)
Space and water heating			16773.0600 (279)
Pumps, fans and electric keep-hot	41.0000	1.5128	62.0248 (281)
Energy for lighting	379.7516	1.5338	582.4757 (282)
Total Primary energy kWh/year			17417.5605 (286)

SAP 10 EPC IMPROVEMENTS

Baseline

Current energy efficiency rating:	C 78
Current environmental impact rating:	C 77

N Solar water heating	Not applicable
U Solar photovoltaic panels	Not applicable
V2 Wind turbine	Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
(none)			

Recommended measures	Typical annual savings		Energy efficiency	Environmental impact
(none)	Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating:	C 78
Potential environmental impact rating:	C 77

Fuel prices for cost data on this page from database revision number 538 TEST (29 Feb 2024)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, South East England):

	Current	Potential	Saving
Electricity	£106	£106	£0
Mains gas	£1021	£1021	£0
Space heating	£773	£773	£0
Water heating	£259	£259	£0
Lighting	£96	£96	£0
Total cost of fuels	£1127	£1127	£0
Total cost of uses	£1128	£1128	£0
Delivered energy	89 kWh/m²	89 kWh/m²	0 kWh/m²
Carbon dioxide emissions	3.2 tonnes	3.2 tonnes	0.0 tonnes
CO2 emissions per m²	19 kg/m²	19 kg/m²	0 kg/m²

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Primary energy 102 kWh/m² 102 kWh/m² 0 kWh/m²

SAP 10 WORKSHEET FOR Conversion (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	5.3000 (1b)	x 3.0500 (2b)	= 16.1650 (1b) - (3b)
First floor	86.1000 (1c)	x 2.8600 (2c)	= 246.2460 (1c) - (3c)
Second floor	79.2100 (1d)	x 2.7600 (2d)	= 218.6196 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	170.6100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 481.0306 (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	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c)	20.0000 / (5) = 0.0416 (8)
Pressure test	No
Pressure Test Method	Blower Door
Measured/design AP50	15.0000 (17)
Infiltration rate	0.7916 (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) = 0.7322 (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	0.9336	0.9153	0.8970	0.8054	0.7871	0.6956	0.6956	0.6773	0.7322	0.7871	0.8237	0.8603 (22b)
Effective ac	0.9358	0.9189	0.9023	0.8244	0.8098	0.7419	0.7419	0.7294	0.7681	0.8098	0.8393	0.8701 (25)

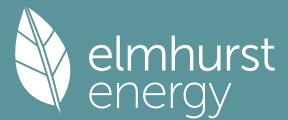
3. Heat losses and heat loss parameter

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
New windows (Uw = 1.40)			24.9600	1.3258	33.0909		(27)
Ground floor			5.3000	0.2500	1.3250	110.0000	583.0000 (28a)
Existing upg	103.3400	24.9600	78.3800	0.3000	23.5140	17.0000	1332.4600 (29a)
External Wall NEW	62.2800		62.2800	0.1800	11.2104	60.0000	3736.8000 (29a)
Existing pitched	41.7300		41.7300	0.1600	6.6768	9.0000	375.5700 (30)
Existing plane	23.7600		23.7600	0.1600	3.8016	9.0000	213.8400 (30)
New pitched	18.1100		18.1100	0.1500	2.7165	9.0000	162.9900 (30)
New plane	18.2300		18.2300	0.1500	2.7345	9.0000	164.0700 (30)
Total net area of external elements Aum(A, m ²)			272.7500				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	85.0697			(33)
Party Wall 1			56.8800	0.0000	0.0000	180.0000	10238.4000 (32)
Party Floor 1			80.8000			30.0000	2424.0000 (32d)
Internal Wall 1			204.4300			100.0000	20443.0000 (32c)
Internal Floor 1			86.1000			18.0000	1549.8000 (32d)
Heat capacity Cm = Sum(A x k)			(28)...(30) + (32) + (32a)...(32e) =	41223.9300			(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K				241.6267			(35)
Thermal bridges (Default value 0.200 * total exposed area)				54.5500			(36)
Point Thermal bridges				(36a) =	0.0000		
Total fabric heat loss			(33) + (36) + (36a) =	139.6197			(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	148.5447	145.8586	143.2257	130.8588	128.5450	117.7738	117.7738	115.7792	121.9227	128.5450	133.2258	138.1193 (38)
Average = Sum(39)m / 12 =	288.1645	285.4783	282.8454	270.4785	268.1647	257.3935	257.3935	255.3989	261.5424	268.1647	272.8455	277.7390 (39)
												270.4674
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.6890	1.6733	1.6578	1.5854	1.5718	1.5087	1.5087	1.4970	1.5330	1.5718	1.5992	1.6279 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Full SAP Calculation Printout



Assumed occupancy												2.9634 (42)
Hot water usage for mixer showers	101.6210	100.0938	97.8684	93.6105	90.4684	86.9642	84.9724	87.1810	89.6020	93.3643	97.7137	101.2316 (42a)
Hot water usage for baths	31.9053	31.4314	30.7642	29.5339	28.6126	27.5911	27.0393	27.7019	28.4234	29.5164	30.7721	31.7974 (42b)
Hot water usage for other uses	44.9781	43.3425	41.7069	40.0714	38.4358	36.8002	36.8002	38.4358	40.0714	41.7069	43.3425	44.9781 (42c)
Average daily hot water use (litres/day)												164.1615 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	178.5043	174.8677	170.3395	163.2158	157.5168	151.3556	148.8120	153.3187	158.0967	164.5877	171.8282	178.0071 (44)
Energy content	282.7072	249.0093	261.8055	223.4343	212.0479	186.1093	179.9752	189.8406	194.9490	223.3440	244.8008	278.7161 (45)
Energy content (annual)											Total = Sum(45)m =	2726.7393
Distribution loss (46)m = 0.15 x (45)m	42.4061	37.3514	39.2708	33.5151	31.8072	27.9164	26.9963	28.4761	29.2424	33.5016	36.7201	41.8074 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month	333.6661	295.0367	312.7644	272.7493	263.0068	235.4244	230.9342	240.7995	244.2641	274.3029	294.1159	329.6750 (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	333.6661	295.0367	312.7644	272.7493	263.0068	235.4244	230.9342	240.7995	244.2641	274.3029	294.1159	329.6750 (64)
	Total per year (kWh/year) = Sum(64)m =											3326.7393 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
	Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =											0.0000 (64a)
Heat gains from water heating, kWh/month	106.7399	94.3025	99.7901	86.6207	83.2456	74.2101	72.5815	75.8617	77.1493	87.0016	93.7250	105.4128 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	177.8034	177.8034	177.8034	177.8034	177.8034	177.8034	177.8034	177.8034	177.8034	177.8034	177.8034	177.8034 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	53.7578	47.7472	38.8306	29.3973	21.9748	18.5521	20.0461	26.0567	34.9733	44.4066	51.8291	55.2519 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	510.7034	516.0029	502.6484	474.2181	438.3299	404.6001	382.0665	376.7670	390.1216	418.5519	454.4400	488.1699 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.7437	55.7437	55.7437	55.7437	55.7437	55.7437	55.7437	55.7437	55.7437	55.7437	55.7437	55.7437 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-118.5356	-118.5356	-118.5356	-118.5356	-118.5356	-118.5356	-118.5356	-118.5356	-118.5356	-118.5356	-118.5356	-118.5356 (71)
Water heating gains (Table 5)	143.4676	140.3310	134.1264	120.3065	111.8893	103.0696	97.5558	101.9647	107.1518	116.9376	130.1737	141.6839 (72)
Total internal gains	825.9403	822.0927	793.6169	741.9333	690.2055	641.2332	614.6799	619.7999	647.2582	697.9077	754.4543	803.1171 (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				8.2700	10.6334		0.7600		0.7000		0.7700		32.4207 (74)
Northeast				1.3600	11.2829		0.7600		0.7000		0.7700		5.6573 (75)
Southeast				13.9700	36.7938		0.7600		0.7000		0.7700		189.5031 (77)
Northwest				1.3600	11.2829		0.7600		0.7000		0.7700		5.6573 (81)
Solar gains	233.2383	407.7825	588.4363	784.4934	932.3594	950.0493	905.7203	791.1225	655.3689	458.6542	281.2127	198.4426	(83)
Total gains	1059.1786	1229.8752	1382.0532	1526.4267	1622.5649	1591.2825	1520.4002	1410.9224	1302.6271	1156.5618	1035.6670	1001.5598	(84)

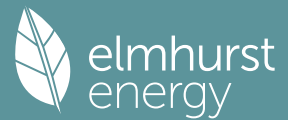
7. Mean internal temperature (heating season)

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	39.7380	40.1119	40.4853	42.3364	42.7017	44.4887	44.4887	44.8361	43.7829	42.7017	41.9691	41.2297
alpha	3.6492	3.6741	3.6990	3.8224	3.8468	3.9659	3.9659	3.9891	3.9189	3.8468	3.7979	3.7486
util living area	0.9969	0.9942	0.9881	0.9703	0.9236	0.8122	0.6680	0.7206	0.9029	0.9799	0.9947	0.9975 (86)
MIT	18.7977	19.0169	19.3876	19.9308	20.4046	20.7854	20.9293	20.9042	20.6215	20.0096	19.3554	18.8276 (87)
Th 2	19.5487	19.5600	19.5712	19.6241	19.6341	19.6810	19.6810	19.6898	19.6629	19.6341	19.6139	19.5929 (88)
util rest of house	0.9958	0.9921	0.9834	0.9574	0.8855	0.7138	0.5019	0.5626	0.8382	0.9687	0.9925	0.9967 (89)
MIT 2	17.5909	17.8171	18.1932	18.7651	19.2208	19.5770	19.6629	19.6616	19.4442	18.8551	18.1931	17.6515 (90)
Living area fraction	17.8218	18.0467	18.4217	18.9882	19.4474	19.8083	19.9053	19.8994	19.6695	FLA = Living area / (4) = 19.0760	18.4155	17.8766 (91)
MIT	17.8218	18.0467	18.4217	18.9882	19.4474	19.8083	19.9053	19.8994	19.6695	19.0760	18.4155	17.8766 (92)
Temperature adjustment												0.0000
adjusted MIT	17.8218	18.0467	18.4217	18.9882	19.4474	19.8083	19.9053	19.8994	19.6695	19.0760	18.4155	17.8766 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	1052.5129	1216.0849	1351.4877	1448.6876	1425.9126	1153.8773	811.0655	834.6780	1092.4350	1112.6681	1024.7420	996.5676 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)

Full SAP Calculation Printout



Heat loss rate W	3896.5057	3753.1003	3372.0067	2728.6378	2077.5730	1340.5783	850.7555	893.7412	1456.6646	2272.9741	3087.3831	3798.5253 (97)
Space heating kWh	2115.9307	1704.8743	1503.2661	921.5641	484.8353	0.0000	0.0000	0.0000	0.0000	863.2677	1485.1016	2084.6565 (98a)
Space heating requirement - total per year (kWh/year)												11163.4963
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	2115.9307	1704.8743	1503.2661	921.5641	484.8353	0.0000	0.0000	0.0000	0.0000	863.2677	1485.1016	2084.6565 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												11163.4963
Space heating per m2										(98c) / (4) =		65.4328 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												84.0000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2115.9307	1704.8743	1503.2661	921.5641	484.8353	0.0000	0.0000	0.0000	0.0000	0.0000	863.2677	1485.1016	2084.6565 (98)
Space heating efficiency (main heating system 1)	84.0000	84.0000	84.0000	84.0000	84.0000	0.0000	0.0000	0.0000	0.0000	84.0000	84.0000	84.0000 (210)
Space heating fuel (main heating system)	2518.9651	2029.6122	1789.6025	1097.1002	577.1849	0.0000	0.0000	0.0000	0.0000	1027.6997	1767.9780	2481.7340 (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	333.6661	295.0367	312.7644	272.7493	263.0068	235.4244	230.9342	240.7995	244.2641	274.3029	294.1159	329.6750 (64)
Efficiency of water heater (217)m	82.6491	82.5388	82.2991	81.7594	80.5985	75.0000	75.0000	75.0000	75.0000	81.6378	82.3661	82.6458 (216)
Fuel for water heating, kWh/month	403.7143	357.4521	380.0337	333.6000	326.3170	313.8992	307.9122	321.0660	325.6855	336.0000	357.0836	398.9012 (219)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	3.4822	3.1452	3.4822	3.3699	3.4822	3.3699	3.4822	3.4822	3.3699	3.4822	3.3699	3.4822 (231)
Lighting	47.0539	37.7484	33.9882	24.9012	19.2344	15.7147	17.5463	22.8073	29.6244	38.8689	43.9023	48.3616 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												13289.8765 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												75.0000
Water heating fuel used												4161.6648 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans: central heating pump												41.0000 (230c)
Total electricity for the above, kWh/year												41.0000 (231)
Electricity for lighting (calculated in Appendix L)												379.7516 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												0.0000 (233)
Wind generation												0.0000 (234)
Hydro-electric generation (Appendix N)												0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)												0.0000 (235)
Appendix Q - special features												
Energy saved or generated												-0.0000 (236)
Energy used												0.0000 (237)
Total delivered energy for all uses												17872.2929 (238)

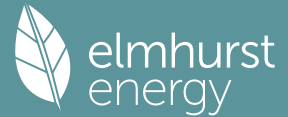
10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	13289.8765	3.6400	483.7515 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	4161.6648	3.6400	151.4846 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Pumps, fans and electric keep-hot	41.0000	16.4900	6.7609 (249)
Energy for lighting	379.7516	16.4900	62.6210 (250)
Additional standing charges			92.0000 (251)
Total energy cost			796.6180 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	1.3301 (257)

Full SAP Calculation Printout



SAP value
SAP rating (Section 12)
SAP band

78.4391
78 (258)
C

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

	Energy kWh/year	Emission factor kg CO ₂ /kWh	Emissions kg CO ₂ /year	
Space heating - main system 1	13289.8765	0.2100	2790.8741	(261)
Total CO ₂ associated with community systems			0.0000	(373)
Water heating (other fuel)	4161.6648	0.2100	873.9496	(264)
Space and water heating			3664.8237	(265)
Pumps, fans and electric keep-hot	41.0000	0.1387	5.6872	(267)
Energy for lighting	379.7516	0.1443	54.8099	(268)
Total CO ₂ , kg/year			3725.3208	(272)
CO ₂ emissions per m ²			21.8400	(273)
EI value			76.8474	
EI rating			77	(274)
EI band			C	

SAP 10 WORKSHEET FOR Conversion (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)	
Ground floor	5.3000 (1b)	x 3.0500 (2b)	= 16.1650	(1b) - (3b)
First floor	86.1000 (1c)	x 2.8600 (2c)	= 246.2460	(1c) - (3c)
Second floor	79.2100 (1d)	x 2.7600 (2d)	= 218.6196	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	170.6100			(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 481.0306	(5)

2. Ventilation rate

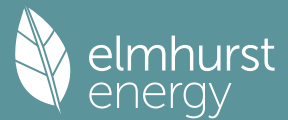
	m ³ per hour	
Number of open chimneys	0 * 80 = 0.0000	(6a)
Number of open flues	0 * 20 = 0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000	(6d)
Number of flues attached to other heater	0 * 35 = 0.0000	(6e)
Number of blocked chimneys	0 * 20 = 0.0000	(6f)
Number of intermittent extract fans	2 * 10 = 20.0000	(7a)
Number of passive vents	0 * 10 = 0.0000	(7b)
Number of flueless gas fires	0 * 40 = 0.0000	(7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.0416	(8)
Pressure test	No	
Pressure Test Method	Blower Door	
Measured/design AP50	15.0000	(17)
Infiltration rate	0.7916	(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) = 0.7322	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.1000	3.8000	3.7000	3.5000	3.5000	3.2000	3.3000	3.1000	3.1000	3.4000	3.3000	3.7000	(22)
Wind factor	1.0250	0.9500	0.9250	0.8750	0.8750	0.8000	0.8250	0.7750	0.7750	0.8500	0.8250	0.9250	(22a)
Adj infilt rate	0.7505	0.6956	0.6773	0.6407	0.6407	0.5858	0.6041	0.5675	0.5675	0.6224	0.6041	0.6773	(22b)
Effective ac	0.7816	0.7419	0.7294	0.7052	0.7052	0.6716	0.6825	0.6610	0.6610	0.6937	0.6825	0.7294	(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	
New windows (Uw = 1.40)			24.9600	1.3258	33.0909			(27)
Ground floor			5.3000	0.2500	1.3250	110.0000	583.0000	(28a)
Existing upg	103.3400	24.9600	78.3800	0.3000	23.5140	17.0000	1332.4600	(29a)
External Wall NEW	62.2800		62.2800	0.1800	11.2104	60.0000	3736.8000	(29a)
Existing pitched	41.7300		41.7300	0.1600	6.6768	9.0000	375.5700	(30)
Existing plane	23.7600		23.7600	0.1600	3.8016	9.0000	213.8400	(30)
New pitched	18.1100		18.1100	0.1500	2.7165	9.0000	162.9900	(30)
New plane	18.2300		18.2300	0.1500	2.7345	9.0000	164.0700	(30)
Total net area of external elements Aum(A, m ²)			272.7500					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	85.0697			(33)
Party Wall 1			56.8800	0.0000	0.0000	180.0000	10238.4000	(32)
Party Floor 1			80.8000			30.0000	2424.0000	(32d)
Internal Wall 1			204.4300			100.0000	20443.0000	(32c)
Internal Floor 1			86.1000			18.0000	1549.8000	(32d)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	41223.9300	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							241.6267	(35)
Thermal bridges (Default value 0.200 * total exposed area)							54.5500	(36)
Point Thermal bridges						(36a) =	0.0000	

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Total fabric heat loss

(33) + (36) + (36a) = 139.6197 (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	124.0770	117.7738	115.7792	111.9494	111.9494	106.6038	108.3325	104.9283	104.9283	110.1144	108.3325	115.7792	(38)
Heat transfer coeff	263.6967	257.3935	255.3989	251.5692	251.5692	246.2235	247.9522	244.5480	244.5480	249.7341	247.9522	255.3989	(39)
Average = Sum(39)m / 12 =												251.3320	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.5456	1.5087	1.4970	1.4745	1.4745	1.4432	1.4533	1.4334	1.4334	1.4638	1.4533	1.4970	(40)
HLP (average)												1.4731	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.9634 (42)
Hot water usage for mixer showers													
101.6210	100.0938	97.8684	93.6105	90.4684	86.9642	84.9724	87.1810	89.6020	93.3643	97.7137	101.2316	(42a)	
Hot water usage for baths													
31.9053	31.4314	30.7642	29.5339	28.6126	27.5911	27.0393	27.7019	28.4234	29.5164	30.7721	31.7974	(42b)	
Hot water usage for other uses													
44.9781	43.3425	41.7069	40.0714	38.4358	36.8002	36.8002	38.4358	40.0714	41.7069	43.3425	44.9781	(42c)	
Average daily hot water use (litres/day)												164.1615	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	178.5043	174.8677	170.3395	163.2158	157.5168	151.3556	148.8120	153.3187	158.0967	164.5877	171.8282	178.0071	(44)
Energy content (annual)	282.7072	249.0093	261.8055	223.4343	212.0479	186.1093	179.9752	189.8406	194.9490	223.3440	244.8008	278.7161	(45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		2726.7393	
42.4061	37.3514	39.2708	33.5151	31.8072	27.9164	26.9963	28.4761	29.2424	33.5016	36.7201	41.8074	(46)	
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month													
333.6661	295.0367	312.7644	272.7493	263.0068	235.4244	230.9342	240.7995	244.2641	274.3029	294.1159	329.6750	(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													
333.6661	295.0367	312.7644	272.7493	263.0068	235.4244	230.9342	240.7995	244.2641	274.3029	294.1159	329.6750	(64)	
Electric shower(s)										Total per year (kWh/year) = Sum(64)m =	3326.7393	(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													
106.7399	94.3025	99.7901	86.6207	83.2456	74.2101	72.5815	75.8617	77.1493	87.0016	93.7250	105.4128	(65)	

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

Metabolic gains (Table 5), Watts													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	177.8034	177.8034	177.8034	177.8034	177.8034	177.8034	177.8034	177.8034	177.8034	177.8034	177.8034	177.8034	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	53.7578	47.7472	38.8306	29.3973	21.9748	18.5521	20.0461	26.0567	34.9733	44.4066	51.8291	55.2519	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	510.7034	516.0029	502.6484	474.2181	438.3299	404.6001	382.0665	376.7670	390.1216	418.5519	454.4400	488.1699	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	55.7437	55.7437	55.7437	55.7437	55.7437	55.7437	55.7437	55.7437	55.7437	55.7437	55.7437	55.7437	(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)													
	-118.5356	-118.5356	-118.5356	-118.5356	-118.5356	-118.5356	-118.5356	-118.5356	-118.5356	-118.5356	-118.5356	-118.5356	(71)
Water heating gains (Table 5)													
	143.4676	140.3310	134.1264	120.3065	111.8893	103.0696	97.5558	101.9647	107.1518	116.9376	130.1737	141.6839	(72)
Total internal gains													
	825.9403	822.0927	793.6169	741.9333	690.2055	641.2332	614.6799	619.7999	647.2582	697.9077	754.4543	803.1171	(73)

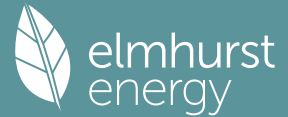
6. Solar gains

[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					8.2700	12.6762		0.7600	0.7000	0.7700		38.6490 (74)	
Northeast					1.3600	13.7534		0.7600	0.7000	0.7700		6.8960 (75)	
Southeast					13.9700	42.4133		0.7600	0.7000	0.7700		218.4458 (77)	
Northwest					1.3600	13.7534		0.7600	0.7000	0.7700		6.8960 (81)	
Solar gains	270.8868	422.3990	611.4471	856.3490	990.9948	1095.9778	1023.0963	893.6126	731.6058	509.1836	330.0347	231.6713	(83)
Total gains	1096.8270	1244.4916	1405.0640	1598.2823	1681.2003	1737.2111	1637.7762	1513.4126	1378.8640	1207.0913	1084.4891	1034.7884	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)														
tau	43.4252	44.4887	44.8361	45.5187	45.5187	46.5069	46.1827	46.8255	46.8255	45.8531	46.1827	44.8361		
alpha	3.8950	3.9659	3.9891	4.0346	4.0346	4.1005	4.0788	4.1217	4.1217	4.0569	4.0788	3.9891		
util living area														
0.9961	0.9934	0.9849	0.9581	0.8846	0.7103	0.5721	0.5794	0.8521	0.9661	0.9924	0.9969	(86)		

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MIT	19.1211	19.3191	19.6871	20.1561	20.6038	20.8963	20.9665	20.9679	20.7609	20.2799	19.6735	19.1486 (87)
Th 2	19.6535	19.6810	19.6898	19.7067	19.7067	19.7304	19.7227	19.7378	19.7378	19.7148	19.7227	19.6898 (88)
util rest of house												
	0.9947	0.9909	0.9789	0.9403	0.8304	0.5897	0.4056	0.4039	0.7657	0.9467	0.9890	0.9957 (89)
MIT 2	17.9870	18.2037	18.5747	19.0435	19.4530	19.6897	19.7161	19.7321	19.6148	19.1760	18.5874	18.0405 (90)
Living area fraction									fLA =	Living area /	(4) =	0.1914 (91)
MIT	18.2041	18.4171	18.7876	19.2564	19.6732	19.9206	19.9554	19.9686	19.8341	19.3873	18.7952	18.2525 (92)
Temperature adjustment												0.0000
adjusted MIT	18.2041	18.4171	18.7876	19.2564	19.6732	19.9206	19.9554	19.9686	19.8341	19.3873	18.7952	18.2525 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9924	0.9875	0.9732	0.9321	0.8287	0.6099	0.4380	0.4382	0.7737	0.9398	0.9854	0.9938	(94)
Useful gains	1088.4457	1228.9781	1367.3747	1489.8091	1393.1866	1059.4567	717.3010	663.2387	1066.8510	1134.4376	1068.6475	1028.4129	(95)
Ext temp.	5.0000	5.4000	7.1000	9.4000	12.5000	15.3000	17.0000	17.2000	14.6000	11.6000	7.9000	5.0000	(96)
Heat loss rate W													
	3481.8729	3350.5259	2984.9883	2479.5667	1804.5625	1137.7094	732.7930	677.0526	1279.9989	1944.7430	2701.4971	3384.6788	(97)
Space heating kWh													
	1780.7099	1425.6802	1203.5045	712.6255	306.0637	0.0000	0.0000	0.0000	0.0000	602.8673	1175.6517	1753.0618	(98a)
Space heating requirement - total per year (kWh/year)												8960.1645	
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													
	1780.7099	1425.6802	1203.5045	712.6255	306.0637	0.0000	0.0000	0.0000	0.0000	602.8673	1175.6517	1753.0618	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												8960.1645	
Space heating per m2											(98c) / (4) =	52.5184	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													84.0000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement													
	1780.7099	1425.6802	1203.5045	712.6255	306.0637	0.0000	0.0000	0.0000	0.0000	602.8673	1175.6517	1753.0618	(98)
Space heating efficiency (main heating system 1)													
	84.0000	84.0000	84.0000	84.0000	84.0000	0.0000	0.0000	0.0000	0.0000	84.0000	84.0000	84.0000	(210)
Space heating fuel (main heating system)													
	2119.8927	1697.2383	1432.7435	848.3637	364.3615	0.0000	0.0000	0.0000	0.0000	717.6991	1399.5853	2086.9784	(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													
	333.6661	295.0367	312.7644	272.7493	263.0068	235.4244	230.9342	240.7995	244.2641	274.3029	294.1159	329.6750	(64)
Efficiency of water heater (217)m													
	82.4389	82.3065	81.9710	81.2996	79.5861	75.0000	75.0000	75.0000	75.0000	80.9619	82.0302	82.4342	(217)
Fuel for water heating, kWh/month													
	404.7437	358.4610	381.5550	335.4868	330.4681	313.8992	307.9122	321.0660	325.6855	338.8051	358.5459	399.9251	(219)
Space cooling fuel requirement (221)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa													
	3.4822	3.1452	3.4822	3.3699	3.4822	3.3699	3.4822	3.4822	3.3699	3.4822	3.3699	3.4822	(231)
Lighting													
	47.0539	37.7484	33.9882	24.9012	19.2344	15.7147	17.5463	22.8073	29.6244	38.8689	43.9023	48.3616	(232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234b)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235b)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235d)m													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												10666.8624	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												75.0000	
Water heating fuel used												4176.5535	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans: central heating pump												41.0000	(230c)
Total electricity for the above, kWh/year												41.0000	(231)
Electricity for lighting (calculated in Appendix L)												379.7516	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												15264.1675	(238)

10a. Fuel costs - using BEDF prices (538)

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	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	10666.8624	6.1900	660.2788 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	4176.5535	6.1900	258.5287 (247)
Energy for instantaneous electric shower(s)	0.0000	25.1600	0.0000 (247a)
Pumps, fans and electric keep-hot	41.0000	25.1600	10.3156 (249)
Energy for lighting	379.7516	25.1600	95.5455 (250)
Additional standing charges			102.0000 (251)
Total energy cost			1126.6685 (255)

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	10666.8624	0.2100	2240.0411 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	4176.5535	0.2100	877.0762 (264)
Space and water heating			3117.1174 (265)
Pumps, fans and electric keep-hot	41.0000	0.1387	5.6872 (267)
Energy for lighting	379.7516	0.1443	54.8099 (268)
Total CO2, kg/year			3177.6144 (272)

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	10666.8624	1.1300	12053.5546 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	4176.5535	1.1300	4719.5055 (278)
Space and water heating			16773.0600 (279)
Pumps, fans and electric keep-hot	41.0000	1.5128	62.0248 (281)
Energy for lighting	379.7516	1.5338	582.4757 (282)
Total Primary energy kWh/year			17417.5605 (286)

Property Reference	126 Hurstpierpoint			Issued on Date	17/03/2024
Assessment Reference	Lean	Prop Type Ref	Conversion		
Property	126 High Street, Hurstpierpoint, Hassocks, BN6 9PX				
SAP Rating	79 C	DER		TER	
Environmental	78 C	% DER < TER			N/A
CO ₂ Emissions (t/year)	3.06	DFEE		TFEE	
Compliance Check	See BREL	% DFEE < TFEE			
% DPER < TPER		DPER		TPER	
Assessor Details	Mr. Adam Hicks			Assessor ID	AY20-0001
Client					

SAP 10 WORKSHEET FOR Conversion (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	5.3000 (1b)	x 3.0500 (2b)	= 16.1650 (1b) - (3b)
First floor	86.1000 (1c)	x 2.8600 (2c)	= 246.2460 (1c) - (3c)
Second floor	79.2100 (1d)	x 2.7600 (2d)	= 218.6196 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)... (1n)	170.6100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)... (3n)	= 481.0306 (5)

2. Ventilation rate

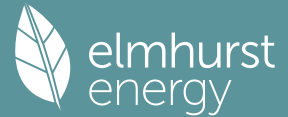
		m3 per hour
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	2 * 10 =	20.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		Air changes per hour
Pressure test	20.0000 / (5) =	0.0416 (8)
Pressure Test Method		No
Measured/design AP50		Blower Door
Infiltration rate		15.0000 (17)
Number of sides sheltered		0.7916 (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) =	0.7322 (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												
	0.9336	0.9153	0.8970	0.8054	0.7871	0.6956	0.6956	0.6773	0.7322	0.7871	0.8237	0.8603 (22b)
Effective ac	0.9358	0.9189	0.9023	0.8244	0.8098	0.7419	0.7419	0.7294	0.7681	0.8098	0.8393	0.8701 (25)

3. Heat losses and heat loss parameter

[illegible]

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Point Thermal bridges
Total fabric heat loss

(33) + (36) + (36a) = 0.0000
134.1051 (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	148.5447	145.8586	143.2257	130.8588	128.5450	117.7738	117.7738	115.7792	121.9227	128.5450	133.2258	138.1193	(38)
Heat transfer coeff	282.6499	279.9637	277.3308	264.9639	262.6501	251.8789	251.8789	249.8843	256.0278	262.6501	267.3309	272.2244	(39)
Average = Sum(39)m / 12 =												264.9528	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.6567	1.6410	1.6255	1.5530	1.5395	1.4763	1.4763	1.4647	1.5007	1.5395	1.5669	1.5956	(40)
HLP (average)												1.5530	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.9634 (42)
Hot water usage for mixer showers													
101.6210	100.0938	97.8684	93.6105	90.4684	86.9642	84.9724	87.1810	89.6020	93.3643	97.7137	101.2316	(42a)	
Hot water usage for baths													
31.9053	31.4314	30.7642	29.5339	28.6126	27.5911	27.0393	27.7019	28.4234	29.5164	30.7721	31.7974	(42b)	
Hot water usage for other uses													
44.9781	43.3425	41.7069	40.0714	38.4358	36.8002	36.8002	38.4358	40.0714	41.7069	43.3425	44.9781	(42c)	
Average daily hot water use (litres/day)												164.1615	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	178.5043	174.8677	170.3395	163.2158	157.5168	151.3556	148.8120	153.3187	158.0967	164.5877	171.8282	178.0071	(44)
Energy content (annual)	282.7072	249.0093	261.8055	223.4343	212.0479	186.1093	179.9752	189.8406	194.9490	223.3440	244.8008	278.7161	(45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		2726.7393	
42.4061	37.3514	39.2708	33.5151	31.8072	27.9164	26.9963	28.4761	29.2424	33.5016	36.7201	41.8074	(46)	
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month													
333.6661	295.0367	312.7644	272.7493	263.0068	235.4244	230.9342	240.7995	244.2641	274.3029	294.1159	329.6750	(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	333.6661	295.0367	312.7644	272.7493	263.0068	235.4244	230.9342	240.7995	244.2641	274.3029	294.1159	329.6750	(64)
								Total per year (kWh/year) = Sum(64)m =				3326.7393	(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	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													
106.7399	94.3025	99.7901	86.6207	83.2456	74.2101	72.5815	75.8617	77.1493	87.0016	93.7250	105.4128	(65)	

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

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	177.8034	177.8034	177.8034	177.8034	177.8034	177.8034	177.8034	177.8034	177.8034	177.8034	177.8034	177.8034 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	53.7578	47.7472	38.8306	29.3973	21.9748	18.5521	20.0461	26.0567	34.9733	44.4066	51.8291	55.2519 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	510.7034	516.0029	502.6484	474.2181	438.3299	404.6001	382.0665	376.7670	390.1216	418.5519	454.4400	488.1699 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.7437	55.7437	55.7437	55.7437	55.7437	55.7437	55.7437	55.7437	55.7437	55.7437	55.7437	55.7437 (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)	-118.5356	-118.5356	-118.5356	-118.5356	-118.5356	-118.5356	-118.5356	-118.5356	-118.5356	-118.5356	-118.5356	-118.5356 (71)
Water heating gains (Table 5)	143.4676	140.3310	134.1264	120.3065	111.8893	103.0696	97.5558	101.9647	107.1518	116.9376	130.1737	141.6839 (72)
Total internal gains	825.9403	822.0927	793.6169	741.9333	690.2055	641.2332	614.6799	619.7999	647.2582	697.9077	754.4543	803.1171 (73)

6. Solar gains

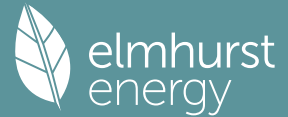
[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	8.2700	10.6334	0.7600	0.7000	0.7700	32.4207	(74)
Northeast	1.3600	11.2829	0.7600	0.7000	0.7700	5.6573	(75)
Southeast	13.9700	36.7938	0.7600	0.7000	0.7700	189.5031	(77)
Northwest	1.3600	11.2829	0.7600	0.7000	0.7700	5.6573	(81)

Solar gains	233.2383	407.7825	588.4363	784.4934	932.3594	950.0493	905.7203	791.1225	655.3689	458.6542	281.2127	198.4426	(83)
Total gains	1059.1786	1229.8752	1382.0532	1526.4267	1622.5649	1591.2825	1520.4002	1410.9224	1302.6271	1156.5618	1035.6670	1001.5598	(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	40.5133	40.9021	41.2904	43.2176	43.5983	45.4627	45.4627	45.8256	44.7260	43.5983	42.8349	42.0649
alpha	3.7009	3.7268	3.7527	3.8812	3.9066	4.0308	4.0308	4.0550	3.9817	3.9066	3.8557	3.8043
util living area												
	0.9969	0.9942	0.9880	0.9698	0.9215	0.8064	0.6595	0.7128	0.9000	0.9796	0.9948	0.9976 (86)

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MIT	18.8398	19.0584	19.4260	19.9643	20.4301	20.8000	20.9358	20.9123	20.6401	20.0383	19.3921	18.8707 (87)
Th 2	19.5720	19.5834	19.5947	19.6480	19.6580	19.7053	19.7053	19.7141	19.6870	19.6580	19.6377	19.6166 (88)
util rest of house	0.9958	0.9922	0.9833	0.9567	0.8831	0.7082	0.4967	0.5570	0.8348	0.9684	0.9925	0.9967 (89)
MIT 2	17.6491	17.8748	18.2478	18.8152	19.2626	19.6086	19.6889	19.6883	19.4793	18.9006	18.2464	17.7111 (90)
Living area fraction									fLA = Living area / (4) =			0.1914 (91)
MIT	17.8770	18.1013	18.4733	19.0351	19.4860	19.8366	19.9275	19.9226	19.7014	19.1183	18.4657	17.9330 (92)
Temperature adjustment												-0.1500
adjusted MIT	17.7270	17.9513	18.3233	18.8851	19.3360	19.6866	19.7775	19.7726	19.5514	18.9683	18.3157	17.7830 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9936	0.9885	0.9770	0.9463	0.8709	0.7065	0.5069	0.5652	0.8259	0.9597	0.9891	0.9949 (94)
Useful gains	1052.3758	1215.6915	1350.2846	1444.4494	1413.1239	1124.2367	770.6324	797.4134	1075.7939	1109.9555	1024.3509	996.4745 (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	3795.1274	3653.8909	3278.9531	2645.7024	2005.5972	1281.2057	800.3439	842.7546	1395.7188	2197.9408	2998.2938	3697.6286 (97)
Space heating kWh	2040.6072	1638.4700	1434.9293	864.9022	440.8001	0.0000	0.0000	0.0000	0.0000	809.4611	1421.2389	2009.6586 (98a)
Space heating requirement - total per year (kWh/year)												10660.0674
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	2040.6072	1638.4700	1434.9293	864.9022	440.8001	0.0000	0.0000	0.0000	0.0000	809.4611	1421.2389	2009.6586 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												10660.0674
Space heating per m2										(98c) / (4) =		62.4821 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												84.0000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	2040.6072	1638.4700	1434.9293	864.9022	440.8001	0.0000	0.0000	0.0000	0.0000	809.4611	1421.2389	2009.6586 (98)
Space heating efficiency (main heating system 1)	84.0000	84.0000	84.0000	84.0000	84.0000	0.0000	0.0000	0.0000	0.0000	84.0000	84.0000	84.0000 (210)
Space heating fuel (main heating system)	2429.2943	1950.5595	1708.2492	1029.6454	524.7621	0.0000	0.0000	0.0000	0.0000	963.6441	1691.9511	2392.4507 (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	333.6661	295.0367	312.7644	272.7493	263.0068	235.4244	230.9342	240.7995	244.2641	274.3029	294.1159	329.6750 (64)
Efficiency of water heater (217)m	82.6069	82.4895	82.2340	81.6509	80.3949	75.0000	75.0000	75.0000	75.0000	81.5239	82.3065	75.0000 (216)
Fuel for water heating, kWh/month	403.9203	357.6656	380.3346	334.0431	327.1438	313.8992	307.9122	321.0660	325.6855	336.4691	357.3422	399.1074 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	3.4822	3.1452	3.4822	3.3699	3.4822	3.3699	3.4822	3.4822	3.3699	3.4822	3.3699	3.4822 (231)
Lighting	47.0539	37.7484	33.9882	24.9012	19.2344	15.7147	17.5463	22.8073	29.6244	38.8689	43.9023	48.3616 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												12690.5564 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												75.0000
Water heating fuel used												4164.5890 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
central heating pump												41.0000 (230c)
Total electricity for the above, kWh/year												41.0000 (231)
Electricity for lighting (calculated in Appendix L)												379.7516 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												0.0000 (233)
Wind generation												0.0000 (234)
Hydro-electric generation (Appendix N)												0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)												0.0000 (235)
Appendix Q - special features												
Energy saved or generated												-0.0000 (236)
Energy used												0.0000 (237)
Total delivered energy for all uses												17275.8971 (238)

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10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	12690.5564	3.6400	461.9363 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	4164.5890	3.6400	151.5910 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Pumps, fans and electric keep-hot	41.0000	16.4900	6.7609 (249)
Energy for lighting	379.7516	16.4900	62.6210 (250)
Additional standing charges			92.0000 (251)
Total energy cost			774.9092 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	1.2939 (257)
SAP value		79.0267
SAP rating (Section 12)		79 (258)
SAP band		C

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	12690.5564	0.2100	2665.0169 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	4164.5890	0.2100	874.5637 (264)
Space and water heating			3539.5805 (265)
Pumps, fans and electric keep-hot	41.0000	0.1387	5.6872 (267)
Energy for lighting	379.7516	0.1443	54.8099 (268)
Total CO2, kg/year			3600.0776 (272)
CO2 emissions per m2			21.1000 (273)
EI value			77.6258
EI rating			78 (274)
EI band			C

SAP 10 WORKSHEET FOR Conversion (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	5.3000 (1b)	x 3.0500 (2b)	= 16.1650 (1b) - (3b)
First floor	86.1000 (1c)	x 2.8600 (2c)	= 246.2460 (1c) - (3c)
Second floor	79.2100 (1d)	x 2.7600 (2d)	= 218.6196 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	170.6100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	481.0306 (5)

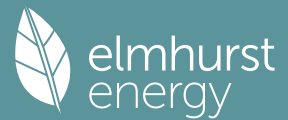
2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.0416 (8)
Pressure test	No
Pressure Test Method	Blower Door
Measured/design AP50	15.0000 (17)
Infiltration rate	0.7916 (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) = 0.7322 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.1000	3.8000	3.7000	3.5000	3.5000	3.2000	3.3000	3.1000	3.1000	3.4000	3.3000	3.7000 (22)
Wind factor	1.0250	0.9500	0.9250	0.8750	0.8750	0.8000	0.8250	0.7750	0.7750	0.8500	0.8250	0.9250 (22a)
Adj infilt rate	0.7505	0.6956	0.6773	0.6407	0.6407	0.5858	0.6041	0.5675	0.5675	0.6224	0.6041	0.6773 (22b)
Effective ac	0.7816	0.7419	0.7294	0.7052	0.7052	0.6716	0.6825	0.6610	0.6610	0.6937	0.6825	0.7294 (25)

3. Heat losses and heat loss parameter

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Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
New windows (Uw = 1.30)			24.9600	1.2357	30.8441			(27)
Ground floor			5.3000	0.2500	1.3250	110.0000	583.0000	(28a)
Existing upg	103.3400	24.9600	78.3800	0.2800	21.9464	17.0000	1332.4600	(29a)
External Wall NEW	62.2800		62.2800	0.1700	10.5876	60.0000	3736.8000	(29a)
Existing pitched	41.7300		41.7300	0.1600	6.6768	9.0000	375.5700	(30)
Existing plane	23.7600		23.7600	0.1300	3.0888	9.0000	213.8400	(30)
New pitched	18.1100		18.1100	0.1500	2.7165	9.0000	162.9900	(30)
New plane	18.2300		18.2300	0.1300	2.3699	9.0000	164.0700	(30)
Total net area of external elements Aum(A, m2)			272.7500					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		79.5551			(33)
Party Wall 1			56.8800	0.0000	0.0000	180.0000	10238.4000	(32)
Party Floor 1			80.8000			30.0000	2424.0000	(32d)
Internal Wall 1			204.4300			100.0000	20443.0000	(32c)
Internal Floor 1			86.1000			18.0000	1549.8000	(32d)

Heat capacity Cm = Sum(A x k)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K
Thermal bridges (Default value 0.200 * total exposed area)
Point Thermal bridges
Total fabric heat loss

(28)...(30) + (32) + (32a)...(32e) = 41223.9300 (34)
241.6267 (35)
54.5500 (36)
(36a) = 0.0000
(33) + (36) + (36a) = 134.1051 (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	124.0770	117.7738	115.7792	111.9494	111.9494	106.6038	108.3325	104.9283	104.9283	110.1144	108.3325	115.7792	(38)
Heat transfer coeff	258.1821	251.8789	249.8843	246.0545	246.0545	240.7089	242.4376	239.0334	239.0334	244.2195	242.4376	249.8843	(39)
Average = Sum(39)m / 12 =												245.8174	
HLP	1.5133	1.4763	1.4647	1.4422	1.4422	1.4109	1.4210	1.4011	1.4011	1.4314	1.4210	1.4647	(40)
HLP (average)												1.4408	
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.9634 (42)
Hot water usage for mixer showers													
101.6210	100.0938	97.8684	93.6105	90.4684	86.9642	84.9724	87.1810	89.6020	93.3643	97.7137	101.2316	(42a)	
Hot water usage for baths													
31.9053	31.4314	30.7642	29.5339	28.6126	27.5911	27.0393	27.7019	28.4234	29.5164	30.7721	31.7974	(42b)	
Hot water usage for other uses													
44.9781	43.3425	41.7069	40.0714	38.4358	36.8002	36.8002	38.4358	40.0714	41.7069	43.3425	44.9781	(42c)	
Average daily hot water use (litres/day)													164.1615 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
178.5043	174.8677	170.3395	163.2158	157.5168	151.3556	148.8120	153.3187	158.0967	164.5877	171.8282	178.0071	(44)	
Energy content (annual)	282.7072	249.0093	261.8055	223.4343	212.0479	186.1093	179.9752	189.8406	194.9490	223.3440	244.8008	278.7161	(45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		2726.7393	
42.4061	37.3514	39.2708	33.5151	31.8072	27.9164	26.9963	28.4761	29.2424	33.5016	36.7201	41.8074	(46)	
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month													
333.6661	295.0367	312.7644	272.7493	263.0068	235.4244	230.9342	240.7995	244.2641	274.3029	294.1159	329.6750	(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													
333.6661	295.0367	312.7644	272.7493	263.0068	235.4244	230.9342	240.7995	244.2641	274.3029	294.1159	329.6750	(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	0.0000	(64a)
Heat gains from water heating, kWh/month													
106.7399	94.3025	99.7901	86.6207	83.2456	74.2101	72.5815	75.8617	77.1493	87.0016	93.7250	105.4128	(65)	
									</				

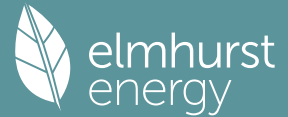
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	177.8034	177.8034	177.8034	177.8034	177.8034	177.8034	177.8034	177.8034	177.8034	177.8034	177.8034	177.8034	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	53.7578	47.7472	38.8306	29.3973	21.9748	18.5521	20.0461	26.0567	34.9733	44.4066	51.8291	55.2519	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	510.7034	516.0029	502.6484	474.2181	438.3299	404.6001	382.0665	376.7670	390.1216	418.5519	454.4400	488.1699	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	55.7437	55.7437	55.7437	55.7437	55.7437	55.7437	55.7437	55.7437	55.7437	55.7437	55.7437	55.7437	(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)													
	-118.5356	-118.5356	-118.5356	-118.5356	-118.5356	-118.5356	-118.5356	-118.5356	-118.5356	-118.5356	-118.5356	-118.5356	(71)
Water heating gains (Table 5)													
	143.4676	140.3310	134.1264	120.3065	111.8893	103.0696	97.5558	101.9647	107.1518	116.9376	130.1737	141.6839	(72)
Total internal gains													
	825.9403	822.0927	793.6169	741.9333	690.2055	641.2332	614.6799	619.7999	647.2582	697.9077	754.4543	803.1171	(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	8.2700	12.6762	0.7600	0.7000	0.7700	38.6490 (74)

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Northeast			1.3600		13.7534		0.7600		0.7000		0.7700		6.8960 (75)
Southeast			13.9700		42.4133		0.7600		0.7000		0.7700		218.4458 (77)
Northwest			1.3600		13.7534		0.7600		0.7000		0.7700		6.8960 (81)

Solar gains	270.8868	422.3990	611.4471	856.3490	990.9948	1095.9778	1023.0963	893.6126	731.6058	509.1836	330.0347	231.6713 (83)
Total gains	1096.8270	1244.4916	1405.0640	1598.2823	1681.2003	1737.2111	1637.7762	1513.4126	1378.8640	1207.0913	1084.4891	1034.7884 (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	44.3528	45.4627	45.8256	46.5388	46.5388	47.5724	47.2332	47.9058	47.9058	46.8885	47.2332	45.8256
alpha	3.9569	4.0308	4.0550	4.1026	4.1026	4.1715	4.1489	4.1937	4.1937	4.1259	4.1489	4.0550
util living area	0.9961	0.9933	0.9847	0.9570	0.8808	0.7018	0.5627	0.5698	0.8469	0.9653	0.9923	0.9969 (86)
MIT	19.1638	19.3619	19.7262	20.1894	20.6263	20.9059	20.9704	20.9717	20.7768	20.3069	19.7102	19.1918 (87)
Th 2	19.6775	19.7053	19.7141	19.7311	19.7311	19.7550	19.7473	19.7625	19.7625	19.7393	19.7473	19.7141 (88)
util rest of house	0.9947	0.9909	0.9787	0.9390	0.8261	0.5829	0.4008	0.3993	0.7602	0.9456	0.9890	0.9958 (89)
MIT 2	18.0468	18.2637	18.6310	19.0939	19.4922	19.7182	19.7414	19.7574	19.6480	19.2204	18.6418	18.1011 (90)
Living area fraction									fLA = Living area / (4) =			0.1914 (91)
MIT	18.2606	18.4739	18.8406	19.3035	19.7093	19.9455	19.9766	19.9898	19.8640	19.4283	18.8463	18.3098 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.1106	18.3239	18.6906	19.1535	19.5593	19.7955	19.8266	19.8398	19.7140	19.2783	18.6963	18.1598 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9921	0.9871	0.9719	0.9279	0.8169	0.5872	0.4118	0.4107	0.7560	0.9354	0.9847	0.9937 (94)
Useful gains	1088.2137	1228.4232	1365.5388	1483.0764	1373.3939	1020.1046	674.4211	621.5136	1042.4191	1129.0742	1067.8935	1028.2448 (95)
Ext temp.	5.0000	5.4000	7.1000	9.4000	12.5000	15.3000	17.0000	17.2000	14.6000	11.6000	7.9000	5.0000 (96)
Heat loss rate W	3384.9153	3255.2500	2896.3142	2399.9038	1736.9627	1082.1086	685.2728	630.9994	1222.4244	1875.1978	2617.4188	3288.4306 (97)
Space heating kWh	1708.7460	1362.0277	1138.8969	660.1157	270.4952	0.0000	0.0000	0.0000	0.0000	555.1160	1115.6582	1681.5783 (98a)
Space heating requirement - total per year (kWh/year)												8492.6338
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	1708.7460	1362.0277	1138.8969	660.1157	270.4952	0.0000	0.0000	0.0000	0.0000	555.1160	1115.6582	1681.5783 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												8492.6338
Space heating per m2										(98c) / (4) =		49.7781 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												84.0000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	1708.7460	1362.0277	1138.8969	660.1157	270.4952	0.0000	0.0000	0.0000	0.0000	555.1160	1115.6582	1681.5783 (98)
Space heating efficiency (main heating system 1)	84.0000	84.0000	84.0000	84.0000	84.0000	0.0000	0.0000	0.0000	0.0000	84.0000	84.0000	84.0000 (210)
Space heating fuel (main heating system)	2034.2214	1621.4615	1355.8296	785.8520	322.0181	0.0000	0.0000	0.0000	0.0000	660.8524	1328.1645	2001.8789 (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	333.6661	295.0367	312.7644	272.7493	263.0068	235.4244	230.9342	240.7995	244.2641	274.3029	294.1159	329.6750 (64)
Efficiency of water heater (217)m	82.3849	82.2428	81.8830	81.1527	79.3083	75.0000	75.0000	75.0000	75.0000	80.7936	81.9484	75.0000 (216)
Fuel for water heating, kWh/month	405.0088	358.7386	381.9652	336.0939	331.6258	313.8992	307.9122	321.0660	325.6855	339.5106	358.9037	400.1901 (219)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	3.4822	3.1452	3.4822	3.3699	3.4822	3.3699	3.4822	3.4822	3.3699	3.4822	3.3699	3.4822 (231)
Lighting	47.0539	37.7484	33.9882	24.9012	19.2344	15.7147	17.5463	22.8073	29.6244	38.8689	43.9023	48.3616 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												10110.2784 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												75.0000
Water heating fuel used												4180.5994 (219)

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Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
central heating pump	41.0000 (230c)
Total electricity for the above, kWh/year	41.0000 (231)
Electricity for lighting (calculated in Appendix L)	379.7516 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	0.0000 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	14711.6293 (238)

10a. Fuel costs - using BEDF prices (538)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	10110.2784	6.1900	625.8262 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	4180.5994	6.1900	258.7791 (247)
Energy for instantaneous electric shower(s)	0.0000	25.1600	0.0000 (247a)
Pumps, fans and electric keep-hot	41.0000	25.1600	10.3156 (249)
Energy for lighting	379.7516	25.1600	95.5455 (250)
Additional standing charges			102.0000 (251)
Total energy cost			1092.4664 (255)

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	10110.2784	0.2100	2123.1585 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	4180.5994	0.2100	877.9259 (264)
Space and water heating			3001.0843 (265)
Pumps, fans and electric keep-hot	41.0000	0.1387	5.6872 (267)
Energy for lighting	379.7516	0.1443	54.8099 (268)
Total CO2, kg/year			3061.5814 (272)

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	10110.2784	1.1300	11424.6145 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	4180.5994	1.1300	4724.0773 (278)
Space and water heating			16148.6919 (279)
Pumps, fans and electric keep-hot	41.0000	1.5128	62.0248 (281)
Energy for lighting	379.7516	1.5338	582.4757 (282)
Total Primary energy kWh/year			16793.1923 (286)

SAP 10 EPC IMPROVEMENTS

Lean

Current energy efficiency rating:	C 79
Current environmental impact rating:	C 78

N Solar water heating	Not applicable
U Solar photovoltaic panels	Not applicable
V2 Wind turbine	Not applicable

Recommended measures: (none)	SAP change	Cost change	CO2 change
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Recommended measures (none)	Typical annual savings		Energy efficiency	Environmental impact
	Total Savings	£0	0.00 kg/m²	

Potential energy efficiency rating:	C 79
Potential environmental impact rating:	C 78

Fuel prices for cost data on this page from database revision number 538 TEST (29 Feb 2024)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, South East England):

	Current	Potential	Saving
Electricity	£106	£106	£0
Mains gas	£987	£987	£0
Space heating	£738	£738	£0
Water heating	£259	£259	£0
Lighting	£96	£96	£0
Total cost of fuels	£1093	£1093	£0
Total cost of uses	£1093	£1093	£0
Delivered energy	86 kWh/m²	86 kWh/m²	0 kWh/m²
Carbon dioxide emissions	3.1 tonnes	3.1 tonnes	0.0 tonnes
CO2 emissions per m²	18 kg/m²	18 kg/m²	0 kg/m²

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Primary energy 98 kWh/m² 98 kWh/m² 0 kWh/m²

SAP 10 WORKSHEET FOR Conversion (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m²)		Storey height (m)		Volume (m³)	
Ground floor	5.3000 (1b)	x	3.0500 (2b)	=	16.1650 (1b) - (3b)	
First floor	86.1000 (1c)	x	2.8600 (2c)	=	246.2460 (1c) - (3c)	
Second floor	79.2100 (1d)	x	2.7600 (2d)	=	218.6196 (1d) - (3d)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	170.6100				(4)	
Dwelling volume					(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	481.0306 (5)

2. Ventilation rate

		m³ per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)	
Number of open flues	0 * 20 =	0.0000 (6b)	
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)	
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)	
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)	
Number of blocked chimneys	0 * 20 =	0.0000 (6f)	
Number of intermittent extract fans	2 * 10 =	20.0000 (7a)	
Number of passive vents	0 * 10 =	0.0000 (7b)	
Number of flueless gas fires	0 * 40 =	0.0000 (7c)	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.0416 (8)	
Pressure test	No		
Pressure Test Method	Blower Door		
Measured/design AP50	15.0000	(17)	
Infiltration rate	0.7916	(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) =	0.7322 (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	0.9336	0.9153	0.8970	0.8054	0.7871	0.6956	0.6956	0.6773	0.7322	0.7871	0.8237	0.8603	(22b)
Effective ac	0.9358	0.9189	0.9023	0.8244	0.8098	0.7419	0.7419	0.7294	0.7681	0.8098	0.8393	0.8701	(25)

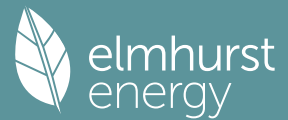
3. Heat losses and heat loss parameter

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	
New windows (Uw = 1.30)			24.9600	1.2357	30.8441			(27)
Ground floor			5.3000	0.2500	1.3250	110.0000	583.0000	(28a)
Existing upg	103.3400	24.9600	78.3800	0.2800	21.9464	17.0000	1332.4600	(29a)
External Wall NEW	62.2800		62.2800	0.1700	10.5876	60.0000	3736.8000	(29a)
Existing pitched	41.7300		41.7300	0.1600	6.6768	9.0000	375.5700	(30)
Existing plane	23.7600		23.7600	0.1300	3.0888	9.0000	213.8400	(30)
New pitched	18.1100		18.1100	0.1500	2.7165	9.0000	162.9900	(30)
New plane	18.2300		18.2300	0.1300	2.3699	9.0000	164.0700	(30)
Total net area of external elements Aum(A, m²)			272.7500					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	79.5551			(33)
Party Wall 1			56.8800	0.0000	0.0000	180.0000	10238.4000	(32)
Party Floor 1			80.8000			30.0000	2424.0000	(32d)
Internal Wall 1			204.4300			100.0000	20443.0000	(32c)
Internal Floor 1			86.1000			18.0000	1549.8000	(32d)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	41223.9300	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K							241.6267	(35)
Thermal bridges (Default value 0.200 * total exposed area)							54.5500	(36)
Point Thermal bridges						(36a) =	0.0000	
Total fabric heat loss						(33) + (36) + (36a) =	134.1051	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	148.5447	145.8586	143.2257	130.8588	128.5450	117.7738	117.7738	115.7792	121.9227	128.5450	133.2258	138.1193	(38)
Average = Sum(39)m / 12 =	282.6499	279.9637	277.3308	264.9639	262.6501	251.8789	251.8789	249.8843	256.0278	262.6501	267.3309	272.2244	(39)
												264.9528	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.6567	1.6410	1.6255	1.5530	1.5395	1.4763	1.4763	1.4647	1.5007	1.5395	1.5669	1.5956	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

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Assumed occupancy												2.9634 (42)
Hot water usage for mixer showers	101.6210	100.0938	97.8684	93.6105	90.4684	86.9642	84.9724	87.1810	89.6020	93.3643	97.7137	101.2316 (42a)
Hot water usage for baths	31.9053	31.4314	30.7642	29.5339	28.6126	27.5911	27.0393	27.7019	28.4234	29.5164	30.7721	31.7974 (42b)
Hot water usage for other uses	44.9781	43.3425	41.7069	40.0714	38.4358	36.8002	36.8002	38.4358	40.0714	41.7069	43.3425	44.9781 (42c)
Average daily hot water use (litres/day)												164.1615 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	178.5043	174.8677	170.3395	163.2158	157.5168	151.3556	148.8120	153.3187	158.0967	164.5877	171.8282	178.0071 (44)
Energy content	282.7072	249.0093	261.8055	223.4343	212.0479	186.1093	179.9752	189.8406	194.9490	223.3440	244.8008	278.7161 (45)
Energy content (annual)											Total = Sum(45)m =	2726.7393
Distribution loss (46)m = 0.15 x (45)m	42.4061	37.3514	39.2708	33.5151	31.8072	27.9164	26.9963	28.4761	29.2424	33.5016	36.7201	41.8074 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month	333.6661	295.0367	312.7644	272.7493	263.0068	235.4244	230.9342	240.7995	244.2641	274.3029	294.1159	329.6750 (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	333.6661	295.0367	312.7644	272.7493	263.0068	235.4244	230.9342	240.7995	244.2641	274.3029	294.1159	329.6750 (64)
	Total per year (kWh/year) = Sum(64)m =											3326.7393 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
	Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =											0.0000 (64a)
Heat gains from water heating, kWh/month	106.7399	94.3025	99.7901	86.6207	83.2456	74.2101	72.5815	75.8617	77.1493	87.0016	93.7250	105.4128 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	177.8034	177.8034	177.8034	177.8034	177.8034	177.8034	177.8034	177.8034	177.8034	177.8034	177.8034	177.8034 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	53.7578	47.7472	38.8306	29.3973	21.9748	18.5521	20.0461	26.0567	34.9733	44.4066	51.8291	55.2519 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	510.7034	516.0029	502.6484	474.2181	438.3299	404.6001	382.0665	376.7670	390.1216	418.5519	454.4400	488.1699 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.7437	55.7437	55.7437	55.7437	55.7437	55.7437	55.7437	55.7437	55.7437	55.7437	55.7437	55.7437 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-118.5356	-118.5356	-118.5356	-118.5356	-118.5356	-118.5356	-118.5356	-118.5356	-118.5356	-118.5356	-118.5356	-118.5356 (71)
Water heating gains (Table 5)	143.4676	140.3310	134.1264	120.3065	111.8893	103.0696	97.5558	101.9647	107.1518	116.9376	130.1737	141.6839 (72)
Total internal gains	825.9403	822.0927	793.6169	741.9333	690.2055	641.2332	614.6799	619.7999	647.2582	697.9077	754.4543	803.1171 (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				8.2700	10.6334		0.7600		0.7000		0.7700		32.4207 (74)
Northeast				1.3600	11.2829		0.7600		0.7000		0.7700		5.6573 (75)
Southeast				13.9700	36.7938		0.7600		0.7000		0.7700		189.5031 (77)
Northwest				1.3600	11.2829		0.7600		0.7000		0.7700		5.6573 (81)
Solar gains	233.2383	407.7825	588.4363	784.4934	932.3594	950.0493	905.7203	791.1225	655.3689	458.6542	281.2127		198.4426 (83)
Total gains	1059.1786	1229.8752	1382.0532	1526.4267	1622.5649	1591.2825	1520.4002	1410.9224	1302.6271	1156.5618	1035.6670		1001.5598 (84)

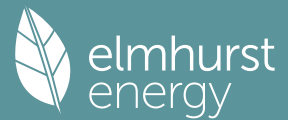
7. Mean internal temperature (heating season)

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	40.5133	40.9021	41.2904	43.2176	43.5983	45.4627	45.4627	45.8256	44.7260	43.5983	42.8349	42.0649
alpha	3.7009	3.7268	3.7527	3.8812	3.9066	4.0308	4.0308	4.0550	3.9817	3.9066	3.8557	3.8043
util living area	0.9969	0.9942	0.9880	0.9698	0.9215	0.8064	0.6595	0.7128	0.9000	0.9796	0.9948	0.9976 (86)
MIT	18.8398	19.0584	19.4260	19.9643	20.4301	20.8000	20.9358	20.9123	20.6401	20.0383	19.3921	18.8707 (87)
Th 2	19.5720	19.5834	19.5947	19.6480	19.6580	19.7053	19.7053	19.7141	19.6870	19.6580	19.6377	19.6166 (88)
util rest of house	0.9958	0.9922	0.9833	0.9567	0.8831	0.7082	0.4967	0.5570	0.8348	0.9684	0.9925	0.9967 (89)
MIT 2	17.6491	17.8748	18.2478	18.8152	19.2626	19.6086	19.6889	19.6883	19.4793	18.9006	18.2464	17.7111 (90)
Living area fraction	17.8770	18.1013	18.4733	19.0351	19.4860	19.8366	19.9275	19.9226	19.7014	19.1183	18.4657	17.9330 (91)
MIT	17.8770	18.1013	18.4733	19.0351	19.4860	19.8366	19.9275	19.9226	19.7014	19.1183	18.4657	17.9330 (92)
Temperature adjustment												-0.1500
adjusted MIT	17.7270	17.9513	18.3233	18.8851	19.3360	19.6866	19.7775	19.7726	19.5514	18.9683	18.3157	17.7830 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	1052.3758	1215.6915	1350.2846	1444.4494	1413.1239	1124.2367	770.6324	797.4134	1075.7939	1109.9555	1024.3509	996.4745 (94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)

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Heat loss rate W	3795.1274	3653.8909	3278.9531	2645.7024	2005.5972	1281.2057	800.3439	842.7546	1395.7188	2197.9408	2998.2938	3697.6286 (97)
Space heating kWh	2040.6072	1638.4700	1434.9293	864.9022	440.8001	0.0000	0.0000	0.0000	0.0000	809.4611	1421.2389	2009.6586 (98a)
Space heating requirement - total per year (kWh/year)												10660.0674
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	2040.6072	1638.4700	1434.9293	864.9022	440.8001	0.0000	0.0000	0.0000	0.0000	809.4611	1421.2389	2009.6586 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												10660.0674
Space heating per m2												(98c) / (4) = 62.4821 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												84.0000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2040.6072	1638.4700	1434.9293	864.9022	440.8001	0.0000	0.0000	0.0000	0.0000	0.0000	809.4611	1421.2389	2009.6586 (98)
Space heating efficiency (main heating system 1)	84.0000	84.0000	84.0000	84.0000	84.0000	0.0000	0.0000	0.0000	0.0000	84.0000	84.0000	84.0000 (210)
Space heating fuel (main heating system)	2429.2943	1950.5595	1708.2492	1029.6454	524.7621	0.0000	0.0000	0.0000	0.0000	963.6441	1691.9511	2392.4507 (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	333.6661	295.0367	312.7644	272.7493	263.0068	235.4244	230.9342	240.7995	244.2641	274.3029	294.1159	329.6750 (64)
Efficiency of water heater	82.6069	82.4895	82.2340	81.6509	80.3949	75.0000	75.0000	75.0000	75.0000	81.5239	82.3065	75.0000 (216)
Fuel for water heating, kWh/month	403.9203	357.6656	380.3346	334.0431	327.1438	313.8992	307.9122	321.0660	325.6855	336.4691	357.3422	399.1074 (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)
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	3.4822	3.1452	3.4822	3.3699	3.4822	3.3699	3.4822	3.4822	3.3699	3.4822	3.3699	3.4822 (231)
Lighting	47.0539	37.7484	33.9882	24.9012	19.2344	15.7147	17.5463	22.8073	29.6244	38.8689	43.9023	48.3616 (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)
(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)	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)
(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)	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)
(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)	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)
(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)	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)
(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)	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)
(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)	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)
(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)	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)
(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												12690.5564 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												75.0000
Water heating fuel used												4164.5890 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
central heating pump												41.0000 (230c)
Total electricity for the above, kWh/year												41.0000 (231)
Electricity for lighting (calculated in Appendix L)												379.7516 (232)

Energy saving/generation technologies (Appendices M ,N and Q)

PV generation			0.0000 (233)
Wind generation			0.0000 (234)
Hydro-electric generation (Appendix N)			0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)			0.0000 (235)
Appendix Q - special features			
Energy saved or generated			-0.0000 (236)
Energy used			0.0000 (237)
Total delivered energy for all uses			17275.8971 (238)

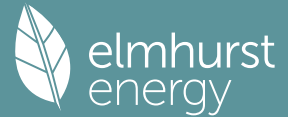
10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	12690.5564	3.6400	461.9363 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	4164.5890	3.6400	151.5910 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Pumps, fans and electric keep-hot	41.0000	16.4900	6.7609 (249)
Energy for lighting	379.7516	16.4900	62.6210 (250)
Additional standing charges			92.0000 (251)
Total energy cost			774.9092 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.2939 (257)

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SAP value
SAP rating (Section 12)
SAP band

79.0267
79 (258)
C

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	12690.5564	0.2100	2665.0169	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	4164.5890	0.2100	874.5637	(264)
Space and water heating			3539.5805	(265)
Pumps, fans and electric keep-hot	41.0000	0.1387	5.6872	(267)
Energy for lighting	379.7516	0.1443	54.8099	(268)
Total CO2, kg/year			3600.0776	(272)
CO2 emissions per m2			21.1000	(273)
EI value			77.6258	
EI rating			78	(274)
EI band			C	

SAP 10 WORKSHEET FOR Conversion (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Ground floor	5.3000 (1b)	x 3.0500 (2b)	= 16.1650	(1b) - (3b)
First floor	86.1000 (1c)	x 2.8600 (2c)	= 246.2460	(1c) - (3c)
Second floor	79.2100 (1d)	x 2.7600 (2d)	= 218.6196	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	170.6100			(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	481.0306	(5)

2. Ventilation rate

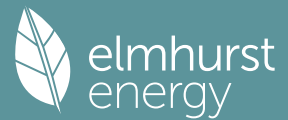
	m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	2 * 10 =	20.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	Air changes per hour 20.0000 / (5) =	0.0416 (8)
Pressure test	No	
Pressure Test Method	Blower Door	
Measured/design AP50	15.0000	(17)
Infiltration rate	0.7916	(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) =	0.7322 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.1000	3.8000	3.7000	3.5000	3.5000	3.2000	3.3000	3.1000	3.1000	3.4000	3.3000	3.7000	(22)
Wind factor	1.0250	0.9500	0.9250	0.8750	0.8750	0.8000	0.8250	0.7750	0.7750	0.8500	0.8250	0.9250	(22a)
Adj infilt rate	0.7505	0.6956	0.6773	0.6407	0.6407	0.5858	0.6041	0.5675	0.5675	0.6224	0.6041	0.6773	(22b)
Effective ac	0.7816	0.7419	0.7294	0.7052	0.7052	0.6716	0.6825	0.6610	0.6610	0.6937	0.6825	0.7294	(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	
New windows (Uw = 1.30)			24.9600	1.2357	30.8441			(27)
Ground floor			5.3000	0.2500	1.3250	110.0000	583.0000	(28a)
Existing upg	103.3400	24.9600	78.3800	0.2800	21.9464	17.0000	1332.4600	(29a)
External Wall NEW	62.2800		62.2800	0.1700	10.5876	60.0000	3736.8000	(29a)
Existing pitched	41.7300		41.7300	0.1600	6.6768	9.0000	375.5700	(30)
Existing plane	23.7600		23.7600	0.1300	3.0888	9.0000	213.8400	(30)
New pitched	18.1100		18.1100	0.1500	2.7165	9.0000	162.9900	(30)
New plane	18.2300		18.2300	0.1300	2.3699	9.0000	164.0700	(30)
Total net area of external elements Aum(A, m2)			272.7500					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	79.5551			(33)
Party Wall 1			56.8800	0.0000	0.0000	180.0000	10238.4000	(32)
Party Floor 1			80.8000			30.0000	2424.0000	(32d)
Internal Wall 1			204.4300			100.0000	20443.0000	(32c)
Internal Floor 1			86.1000			18.0000	1549.8000	(32d)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	41223.9300	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							241.6267	(35)
Thermal bridges (Default value 0.200 * total exposed area)							54.5500	(36)
Point Thermal bridges						(36a) =	0.0000	

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Total fabric heat loss

(33) + (36) + (36a) = 134.1051 (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	124.0770	117.7738	115.7792	111.9494	111.9494	106.6038	108.3325	104.9283	104.9283	110.1144	108.3325	115.7792	(38)
Heat transfer coeff	258.1821	251.8789	249.8843	246.0545	246.0545	240.7089	242.4376	239.0334	239.0334	244.2195	242.4376	249.8843	(39)
Average = Sum(39)m / 12 =												245.8174	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.5133	1.4763	1.4647	1.4422	1.4422	1.4109	1.4210	1.4011	1.4011	1.4314	1.4210	1.4647	(40)
HLP (average)												1.4408	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.9634 (42)
Hot water usage for mixer showers													
101.6210	100.0938	97.8684	93.6105	90.4684	86.9642	84.9724	87.1810	89.6020	93.3643	97.7137	101.2316	101.2316	(42a)
Hot water usage for baths													
31.9053	31.4314	30.7642	29.5339	28.6126	27.5911	27.0393	27.7019	28.4234	29.5164	30.7721	31.7974	31.7974	(42b)
Hot water usage for other uses													
44.9781	43.3425	41.7069	40.0714	38.4358	36.8002	36.8002	38.4358	40.0714	41.7069	43.3425	44.9781	44.9781	(42c)
Average daily hot water use (litres/day)												164.1615	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	178.5043	174.8677	170.3395	163.2158	157.5168	151.3556	148.8120	153.3187	158.0967	164.5877	171.8282	178.0071	(44)
Energy conte	282.7072	249.0093	261.8055	223.4343	212.0479	186.1093	179.9752	189.8406	194.9490	223.3440	244.8008	278.7161	(45)
Energy content (annual)													
Distribution loss (46)m = 0.15 x (45)m													
42.4061	37.3514	39.2708	33.5151	31.8072	27.9164	26.9963	28.4761	29.2424	33.5016	36.7201	41.8074	41.8074	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	50.9589	46.0274	50.9589	49.3151	50.9589	49.3151	50.9589	50.9589	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month													
333.6661	295.0367	312.7644	272.7493	263.0068	235.4244	230.9342	240.7995	244.2641	274.3029	294.1159	329.6750	329.6750	(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													
333.6661	295.0367	312.7644	272.7493	263.0068	235.4244	230.9342	240.7995	244.2641	274.3029	294.1159	329.6750	329.6750	(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	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													
106.7399	94.3025	99.7901	86.6207	83.2456	74.2101	72.5815	75.8617	77.1493	87.0016	93.7250	105.4128	105.4128	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	177.8034	177.8034	177.8034	177.8034	177.8034	177.8034	177.8034	177.8034	177.8034	177.8034	177.8034	177.8034	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
53.7578	47.7472	38.8306	29.3973	21.9748	18.5521	20.0461	26.0567	34.9733	44.4066	51.8291	55.2519	55.2519	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
510.7034	516.0029	502.6484	474.2181	438.3299	404.6001	382.0665	376.7670	390.1216	418.5519	454.4400	488.1699	488.1699	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
55.7437	55.7437	55.7437	55.7437	55.7437	55.7437	55.7437	55.7437	55.7437	55.7437	55.7437	55.7437	55.7437	(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)													
-118.5356	-118.5356	-118.5356	-118.5356	-118.5356	-118.5356	-118.5356	-118.5356	-118.5356	-118.5356	-118.5356	-118.5356	-118.5356	(71)
Water heating gains (Table 5)													
143.4676	140.3310	134.1264	120.3065	111.8893	103.0696	97.5558	101.9647	107.1518	116.9376	130.1737	141.6839	141.6839	(72)
Total internal gains													
825.9403	822.0927	793.6169	741.9333	690.2055	641.2332	614.6799	619.7999	647.2582	697.9077	754.4543	803.1171	803.1171	(73)

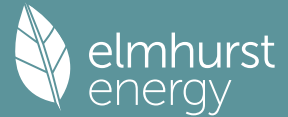
6. Solar gains

[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				8.2700	12.6762		0.7600		0.7000		0.7700		38.6490 (74)
Northeast				1.3600	13.7534		0.7600		0.7000		0.7700		6.8960 (75)
Southeast				13.9700	42.4133		0.7600		0.7000		0.7700		218.4458 (77)
Northwest				1.3600	13.7534		0.7600		0.7000		0.7700		6.8960 (81)
Solar gains	270.8868	422.3990	611.4471	856.3490	990.9948	1095.9778	1023.0963	893.6126	731.6058	509.1836	330.0347	231.6713	(83)
Total gains	1096.8270	1244.4916	1405.0640	1598.2823	1681.2003	1737.2111	1637.7762	1513.4126	1378.8640	1207.0913	1084.4891	1034.7884	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	44.3528	45.4627	45.8256	46.5388	46.5388	47.5724	47.2332	47.9058	47.9058	46.8885	47.2332	45.8256	
alpha	3.9569	4.0308	4.0550	4.1026	4.1026	4.1715	4.1489	4.1937	4.1937	4.1259	4.1489	4.0550	
util living area													
0.9961	0.9933	0.9847	0.9570	0.8808	0.7018	0.5627	0.5698	0.8469	0.8469	0.9653	0.9923	0.9969	(86)

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MIT	19.1638	19.3619	19.7262	20.1894	20.6263	20.9059	20.9704	20.9717	20.7768	20.3069	19.7102	19.1918 (87)
Th 2	19.6775	19.7053	19.7141	19.7311	19.7311	19.7550	19.7473	19.7625	19.7625	19.7393	19.7473	19.7141 (88)
util rest of house												
	0.9947	0.9909	0.9787	0.9390	0.8261	0.5829	0.4008	0.3993	0.7602	0.9456	0.9890	0.9958 (89)
MIT 2	18.0468	18.2637	18.6310	19.0939	19.4922	19.7182	19.7414	19.7574	19.6480	19.2204	18.6418	18.1011 (90)
Living area fraction									fLA =	Living area /	(4) =	0.1914 (91)
MIT	18.2606	18.4739	18.8406	19.3035	19.7093	19.9455	19.9766	19.9898	19.8640	19.4283	18.8463	18.3098 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.1106	18.3239	18.6906	19.1535	19.5593	19.7955	19.8266	19.8398	19.7140	19.2783	18.6963	18.1598 (93)

8. Space heating requirement

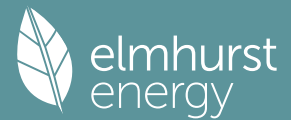
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9921	0.9871	0.9719	0.9279	0.8169	0.5872	0.4118	0.4107	0.7560	0.9354	0.9847	0.9937	(94)
Useful gains	1088.2137	1228.4232	1365.5388	1483.0764	1373.3939	1020.1046	674.4211	621.5136	1042.4191	1129.0742	1067.8935	1028.2448	(95)
Ext temp.	5.0000	5.4000	7.1000	9.4000	12.5000	15.3000	17.0000	17.2000	14.6000	11.6000	7.9000	5.0000	(96)
Heat loss rate W													
Space heating kWh	3384.9153	3255.2500	2896.3142	2399.9038	1736.9627	1082.1086	685.2728	630.9994	1222.4244	1875.1978	2617.4188	3288.4306	(97)
Space heating requirement - total per year (kWh/year)													
Solar heating kWh													
Solar heating contribution - total per year (kWh/year)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Space heating kWh	1708.7460	1362.0277	1138.8969	660.1157	270.4952	0.0000	0.0000	0.0000	0.0000	555.1160	1115.6582	1681.5783	(98a)
Space heating requirement after solar contribution - total per year (kWh/year)												8492.6338	
Space heating per m2												49.7781	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													84.0000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement	1708.7460	1362.0277	1138.8969	660.1157	270.4952	0.0000	0.0000	0.0000	0.0000	555.1160	1115.6582	1681.5783	(98)
Space heating efficiency (main heating system 1)	84.0000	84.0000	84.0000	84.0000	84.0000	0.0000	0.0000	0.0000	0.0000	84.0000	84.0000	84.0000	(210)
Space heating fuel (main heating system)	2034.2214	1621.4615	1355.8296	785.8520	322.0181	0.0000	0.0000	0.0000	0.0000	660.8524	1328.1645	2001.8789	(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	333.6661	295.0367	312.7644	272.7493	263.0068	235.4244	230.9342	240.7995	244.2641	274.3029	294.1159	329.6750	(64)
Efficiency of water heater (217)m	82.3849	82.2428	81.8830	81.1527	79.3083	75.0000	75.0000	75.0000	75.0000	80.7936	81.9484	82.3796	(216)
Fuel for water heating, kWh/month	405.0088	358.7386	381.9652	336.0939	331.6258	313.8992	307.9122	321.0660	325.6855	339.5106	358.9037	400.1901	(219)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	3.4822	3.1452	3.4822	3.3699	3.4822	3.3699	3.4822	3.3699	3.4822	3.3699	3.3699	3.4822	(231)
Lighting	47.0539	37.7484	33.9882	24.9012	19.2344	15.7147	17.5463	22.8073	29.6244	38.8689	43.9023	48.3616	(232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												10110.2784	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												75.0000	
Water heating fuel used												4180.5994	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans: central heating pump												41.0000	(230c)
Total electricity for the above, kWh/year												41.0000	(231)
Electricity for lighting (calculated in Appendix L)												379.7516	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												14711.6293	(238)

10a. Fuel costs - using BEDF prices (538)

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	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	10110.2784	6.1900	625.8262 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	4180.5994	6.1900	258.7791 (247)
Energy for instantaneous electric shower(s)	0.0000	25.1600	0.0000 (247a)
Pumps, fans and electric keep-hot	41.0000	25.1600	10.3156 (249)
Energy for lighting	379.7516	25.1600	95.5455 (250)
Additional standing charges			102.0000 (251)
Total energy cost			1092.4664 (255)

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	10110.2784	0.2100	2123.1585 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	4180.5994	0.2100	877.9259 (264)
Space and water heating			3001.0843 (265)
Pumps, fans and electric keep-hot	41.0000	0.1387	5.6872 (267)
Energy for lighting	379.7516	0.1443	54.8099 (268)
Total CO2, kg/year			3061.5814 (272)

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	10110.2784	1.1300	11424.6145 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	4180.5994	1.1300	4724.0773 (278)
Space and water heating			16148.6919 (279)
Pumps, fans and electric keep-hot	41.0000	1.5128	62.0248 (281)
Energy for lighting	379.7516	1.5338	582.4757 (282)
Total Primary energy kWh/year			16793.1923 (286)

Property Reference	126 Hurstpierpoint			Issued on Date	17/03/2024
Assessment Reference	Green	Prop Type Ref	Conversion		
Property	126 High Street, Hurstpierpoint, Hassocks, BN6 9PX				
SAP Rating	63 D	DER		TER	
Environmental	92 A	% DER < TER			N/A
CO ₂ Emissions (t/year)	1.05	DFEE		TFEE	
Compliance Check	See BREL	% DFEE < TFEE			
% DPER < TPER		DPER		TPER	
Assessor Details	Mr. Adam Hicks			Assessor ID	AY20-0001
Client					

SAP 10 WORKSHEET FOR Conversion (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

1. Overall dwelling characteristics

	Area (m ²)		Storey height (m)		Volume (m ³)
Ground floor	5.3000 (1b)	x	3.0500 (2b)	=	16.1650 (1b) - (3b)
First floor	86.1000 (1c)	x	2.8600 (2c)	=	246.2460 (1c) - (3c)
Second floor	79.2100 (1d)	x	2.7600 (2d)	=	218.6196 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)... (1n)	170.6100				(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)... (3n)	=	481.0306 (5)

2. Ventilation rate

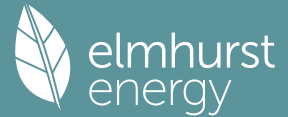
		m3 per hour
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	2 * 10 =	20.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		Air changes per hour
Pressure test	20.0000 / (5) =	0.0416 (8)
Pressure Test Method		No
Measured/design AP50		Blower Door
Infiltration rate		15.0000 (17)
Number of sides sheltered		0.7916 (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) =	0.7322 (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												
	0.9336	0.9153	0.8970	0.8054	0.7871	0.6956	0.6956	0.6773	0.7322	0.7871	0.8237	0.8603 (22b)
Effective ac	0.9358	0.9189	0.9023	0.8244	0.8098	0.7419	0.7419	0.7294	0.7681	0.8098	0.8393	0.8701 (25)

3. Heat losses and heat loss parameter

[illegible]

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Point Thermal bridges
Total fabric heat loss

(33) + (36) + (36a) = 0.0000
134.1051 (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	148.5447	145.8586	143.2257	130.8588	128.5450	117.7738	117.7738	115.7792	121.9227	128.5450	133.2258	138.1193	(38)
Heat transfer coeff	282.6499	279.9637	277.3308	264.9639	262.6501	251.8789	251.8789	249.8843	256.0278	262.6501	267.3309	272.2244	(39)
Average = Sum(39)m / 12 =												264.9528	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.6567	1.6410	1.6255	1.5530	1.5395	1.4763	1.4763	1.4647	1.5007	1.5395	1.5669	1.5956	(40)
HLP (average)												1.5530	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.9634 (42)
Hot water usage for mixer showers	64.6679	63.6960	62.2799	59.5703	57.5708	55.3409	54.0734	55.4788	57.0194	59.4137	62.1814	64.4201	(42a)
Hot water usage for baths	31.9053	31.4314	30.7642	29.5339	28.6126	27.5911	27.0393	27.7019	28.4234	29.5164	30.7721	31.7974	(42b)
Hot water usage for other uses	44.9781	43.3425	41.7069	40.0714	38.4358	36.8002	36.8002	38.4358	40.0714	41.7069	43.3425	44.9781	(42c)
Average daily hot water use (litres/day)												130.0920	(43)
Daily hot water use	141.5512	138.4700	134.7510	129.1756	124.6192	119.7322	117.9130	121.6165	125.5142	130.6370	136.2960	141.1956	(44)
Energy conte	224.1826	197.1794	207.1073	176.8349	167.7614	147.2247	142.6055	150.5867	154.7715	177.2732	194.1787	221.0782	(45)
Energy content (annual)										Total = Sum(45)m =		2160.7841	
Distribution loss (46)m = 0.15 x (45)m	33.6274	29.5769	31.0661	26.5252	25.1642	22.0837	21.3908	22.5880	23.2157	26.5910	29.1268	33.1617	(46)
Water storage loss:													
Store volume												180.0000	(47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152	(51)
Volume factor from Table 2a												0.8736	(52)
Temperature factor from Table 2b												0.5400	(53)
Enter (49) or (54) in (55)												1.2894	(55)
Total storage loss	39.9715	36.1033	39.9715	38.6821	39.9715	38.6821	39.9715	39.9715	38.6821	39.9715	38.6821	39.9715	(56)
If cylinder contains dedicated solar storage	39.9715	36.1033	39.9715	38.6821	39.9715	38.6821	39.9715	39.9715	38.6821	39.9715	38.6821	39.9715	(57)
Primary loss	37.2980	33.6885	37.2980	36.0948	36.0948	36.0948	37.2980	37.2980	36.0948	37.2980	36.0948	37.2980	(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	301.4521	266.9712	284.3768	251.6119	245.0309	222.0017	219.8750	227.8562	229.5485	254.5427	268.9556	298.3477	(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	301.4521	266.9712	284.3768	251.6119	245.0309	222.0017	219.8750	227.8562	229.5485	254.5427	268.9556	298.3477	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000	(64a)
Heat gains from water heating, kWh/month	136.3563	121.3956	130.6788	118.6192	117.5963	108.7738	109.2319	111.8857	111.2831	120.7590	124.3860	135.3241	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	177.8034	177.8034	177.8034	177.8034	177.8034	177.8034	177.8034	177.8034	177.8034	177.8034	177.8034	177.8034	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	48.7151	43.2683	35.1881	26.6397	19.9135	16.8118	18.1657	23.6125	31.6927	40.2411	46.9673	50.0690	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	510.7034	516.0029	502.6484	474.2181	438.3299	404.6001	382.0665	376.7670	390.1216	418.5519	454.4400	488.1699	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.7437	55.7437	55.7437	55.7437	55.7437	55.7437	55.7437	55.7437	55.7437	55.7437	55.7437	55.7437	(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)	-118.5356	-118.5356	-118.5356	-118.5356	-118.5356	-118.5356	-118.5356	-118.5356	-118.5356	-118.5356	-118.5356	-118.5356	(71)
Water heating gains (Table 5)	183.2746	180.6482	175.6435	164.7488	158.0595	151.0747	146.8171	150.3840	154.5598	162.3104	172.7583	181.8872	(72)
Total internal gains	860.7046	857.9310	831.4915	783.6181	734.3144	687.4981	662.0608	665.7750	691.3856	739.1149	792.1772	838.1376	(73)

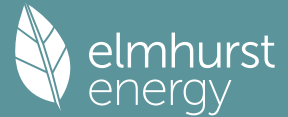
6. Solar gains

[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					8.2700	10.6334		0.7600	0.7000	0.7700		32.4207 (74)	
Northeast					1.3600	11.2829		0.7600	0.7000	0.7700		5.6573 (75)	
Southeast					13.9700	36.7938		0.7600	0.7000	0.7700		189.5031 (77)	
Northwest					1.3600	11.2829		0.7600	0.7000	0.7700		5.6573 (81)	
Solar gains	233.2383	407.7825	588.4363	784.4934	932.3594	950.0493	905.7203	791.1225	655.3689	458.6542	281.2127	198.4426	(83)
Total gains	1093.9429	1265.7135	1419.9279	1568.1115	1666.6738	1637.5473	1567.7811	1456.8974	1346.7545	1197.7691	1073.3899	1036.5803	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	21.0000	(85)
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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	40.5133	40.9021	41.2904	43.2176	43.5983	45.4627	45.4627	45.8256	44.7260	43.5983	42.8349	42.0649
alpha	3.7009	3.7268	3.7527	3.8812	3.9066	4.0308	4.0308	4.0550	3.9817	3.9066	3.8557	3.8043
util living area	0.9966	0.9937	0.9869	0.9672	0.9157	0.7949	0.6449	0.6978	0.8912	0.9772	0.9941	0.9973 (86)
MIT	18.8600	19.0791	19.4472	19.9861	20.4487	20.8112	20.9409	20.9190	20.6569	20.0609	19.4141	18.9913 (87)
Th 2	19.5720	19.5834	19.5947	19.6480	19.6580	19.7053	19.7053	19.7141	19.6870	19.6580	19.6377	19.6166 (88)
util rest of house	0.9953	0.9914	0.9818	0.9531	0.8753	0.6948	0.4833	0.5421	0.8226	0.9648	0.9915	0.9963 (89)
MIT 2	17.1303	17.4171	17.8931	18.6058	19.1706	19.5897	19.6862	19.6841	19.4363	18.7136	17.8804	17.1979 (90)
Living area fraction	17.1303	17.4171	17.8931	18.6058	19.1706	19.5897	19.6862	19.6841	19.4363	18.7136	17.8804	17.1979 (90)
MIT	17.4613	17.7352	18.1905	18.8700	19.4152	19.8234	19.9263	19.9204	19.6699	18.9714	18.1739	17.5219 (92)
Temperature adjustment												0.0000
adjusted MIT	17.4613	17.7352	18.1905	18.8700	19.4152	19.8234	19.9263	19.9204	19.6699	18.9714	18.1739	17.5219 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9924	0.9866	0.9741	0.9417	0.8658	0.7055	0.5136	0.5703	0.8215	0.9553	0.9872	0.9939 (94)
Useful gains	1085.5886	1248.8081	1383.1896	1476.7647	1443.0764	1155.3146	805.2197	830.8235	1106.2995	1144.2270	1059.5997	1030.2514 (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	3720.0512	3593.3858	3242.1348	2641.6799	2026.4043	1315.6767	837.8187	879.6992	1426.0486	2198.7481	2960.3956	3626.5563 (97)
Space heating kWh	1960.0402	1575.5562	1383.0552	838.7389	433.9959	0.0000	0.0000	0.0000	0.0000	784.5637	1368.5730	1931.6508 (98a)
Space heating requirement - total per year (kWh/year)												10276.1741
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	1960.0402	1575.5562	1383.0552	838.7389	433.9959	0.0000	0.0000	0.0000	0.0000	784.5637	1368.5730	1931.6508 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												10276.1741
Space heating per m2										(98c) / (4) =		60.2320 (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 %)												170.0000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	1960.0402	1575.5562	1383.0552	838.7389	433.9959	0.0000	0.0000	0.0000	0.0000	784.5637	1368.5730	1931.6508 (98)
Space heating efficiency (main heating system 1)	170.0000	170.0000	170.0000	170.0000	170.0000	0.0000	0.0000	0.0000	0.0000	170.0000	170.0000	170.0000 (210)
Space heating fuel (main heating system)	1152.9648	926.7978	813.5619	493.3759	255.2917	0.0000	0.0000	0.0000	0.0000	461.5081	805.0430	1136.2652 (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	301.4521	266.9712	284.3768	251.6119	245.0309	222.0017	219.8750	227.8562	229.5485	254.5427	268.9556	298.3477 (64)
Efficiency of water heater (217)m	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000 (216)
Fuel for water heating, kWh/month	177.3247	157.0419	167.2805	148.0070	144.1358	130.5892	129.3382	134.0331	135.0285	149.7310	158.2092	175.4986 (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	42.6400	34.2074	30.8000	22.5654	17.4302	14.2406	15.9004	20.6679	26.8456	35.2228	39.7841	43.8251 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												6044.8083 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												170.0000
Water heating fuel used												1806.2178 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
Total electricity for the above, kWh/year												0.0000 (231)
Electricity for lighting (calculated in Appendix L)												344.1294 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												0.0000 (233)
Wind generation												0.0000 (234)
Hydro-electric generation (Appendix N)												0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)												0.0000 (235)
Appendix Q - special features												
Energy saved or generated												-0.0000 (236)
Energy used												0.0000 (237)

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Total delivered energy for all uses

8195.1555 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	6044.8083	16.4900	996.7889 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1806.2178	16.4900	297.8453 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (249)
Energy for lighting	344.1294	16.4900	56.7469 (250)
Additional standing charges			0.0000 (251)
Total energy cost			1351.3811 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):	0.3600 (256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] = 2.2564 (257)
SAP value	63.4241
SAP rating (Section 12)	63 (258)
SAP band	D

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	6044.8083	0.1546	934.4849 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1806.2178	0.1407	254.1872 (264)
Space and water heating			1188.6721 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	344.1294	0.1443	49.6685 (268)
Total CO2, kg/year			1238.3407 (272)
CO2 emissions per m2			7.2600 (273)
EI value			92.3038
EI rating			92 (274)
EI band			A

SAP 10 WORKSHEET FOR Conversion (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

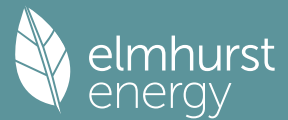
	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	5.3000 (1b)	x 3.0500 (2b)	= 16.1650 (1b) - (3b)
First floor	86.1000 (1c)	x 2.8600 (2c)	= 246.2460 (1c) - (3c)
Second floor	79.2100 (1d)	x 2.7600 (2d)	= 218.6196 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	170.6100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	481.0306 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.0416 (8)
Pressure Test	No
Pressure Test Method	Blower Door
Measured/design AP50	15.0000 (17)
Infiltration rate	0.7916 (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) = 0.7322 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.1000	3.8000	3.7000	3.5000	3.5000	3.2000	3.3000	3.1000	3.1000	3.4000	3.3000	3.7000 (22)
Wind factor	1.0250	0.9500	0.9250	0.8750	0.8750	0.8000	0.8250	0.7750	0.7750	0.8500	0.8250	0.9250 (22a)
Adj infilt rate	0.7505	0.6956	0.6773	0.6407	0.6407	0.5858	0.6041	0.5675	0.5675	0.6224	0.6041	0.6773 (22b)
Effective ac	0.7816	0.7419	0.7294	0.7052	0.7052	0.6716	0.6825	0.6610	0.6610	0.6937	0.6825	0.7294 (25)

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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						
New windows (Uw = 1.30)			24.9600	1.2357	30.8441			(27)					
Ground floor			5.3000	0.2500	1.3250	110.0000	583.0000	(28a)					
Existing upg	103.3400	24.9600	78.3800	0.2800	21.9464	17.0000	1332.4600	(29a)					
External Wall NEW	62.2800		62.2800	0.1700	10.5876	60.0000	3736.8000	(29a)					
Existing pitched	41.7300		41.7300	0.1600	6.6768	9.0000	375.5700	(30)					
Existing plane	23.7600		23.7600	0.1300	3.0888	9.0000	213.8400	(30)					
New pitched	18.1100		18.1100	0.1500	2.7165	9.0000	162.9900	(30)					
New plane	18.2300		18.2300	0.1300	2.3699	9.0000	164.0700	(30)					
Total net area of external elements Aum(A, m2)			272.7500					(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		79.5551			(33)					
Party Wall 1			56.8800	0.0000	0.0000	180.0000	10238.4000	(32)					
Party Floor 1			80.8000			30.0000	2424.0000	(32d)					
Internal Wall 1			204.4300			100.0000	20443.0000	(32c)					
Internal Floor 1			86.1000			18.0000	1549.8000	(32d)					
Heat capacity Cm = Sum(A x k)						(28) ... (30) + (32) + (32a) ... (32e) =	41223.9300	(34)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							241.6267	(35)					
Thermal bridges (Default value 0.200 * total exposed area)							54.5500	(36)					
Point Thermal bridges						(36a) =	0.0000						
Total fabric heat loss						(33) + (36) + (36a) =	134.1051	(37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 124.0770	Feb 117.7738	Mar 115.7792	Apr 111.9494	May 111.9494	Jun 106.6038	Jul 108.3325	Aug 104.9283	Sep 104.9283	Oct 110.1144	Nov 108.3325	Dec 115.7792	(38)
Heat transfer coeff	258.1821	251.8789	249.8843	246.0545	246.0545	240.7089	242.4376	239.0334	239.0334	244.2195	242.4376	249.8843	(39)
Average = Sum(39)m / 12 =												245.8174	
HLP	Jan 1.5133	Feb 1.4763	Mar 1.4647	Apr 1.4422	May 1.4422	Jun 1.4109	Jul 1.4210	Aug 1.4011	Sep 1.4011	Oct 1.4314	Nov 1.4210	Dec 1.4647	(40)
HLP (average)												1.4408	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

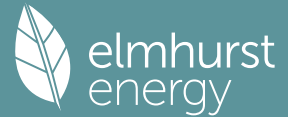
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.9634	(42)
Hot water usage for mixer showers	64.6679	63.6960	62.2799	59.5703	57.5708	55.3409	54.0734	55.4788	57.0194	59.4137	62.1814	64.4201	(42a)	
Hot water usage for baths	31.9053	31.4314	30.7642	29.5339	28.6126	27.5911	27.0393	27.7019	28.4234	29.5164	30.7721	31.7974	(42b)	
Hot water usage for other uses	44.9781	43.3425	41.7069	40.0714	38.4358	36.8002	36.8002	38.4358	40.0714	41.7069	43.3425	44.9781	(42c)	
Average daily hot water use (litres/day)													130.0920	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Daily hot water use	141.5512	138.4700	134.7510	129.1756	124.6192	119.7322	117.9130	121.6165	125.5142	130.6370	136.2960	141.1956	(44)	
Energy conte	224.1826	197.1794	207.1073	176.8349	167.7614	147.2247	142.6055	150.5867	154.7715	177.2732	194.1787	221.0782	(45)	
Energy content (annual)										Total = Sum(45)m =		2160.7841		
Distribution loss (46)m = 0.15 x (45)m	33.6274	29.5769	31.0661	26.5252	25.1642	22.0837	21.3908	22.5880	23.2157	26.5910	29.1268	33.1617	(46)	
Water storage loss:														
Store volume													180.0000	(47)
b) If manufacturer declared loss factor is not known :														
Hot water storage loss factor from Table 2 (kWh/litre/day)													0.0152	(51)
Volume factor from Table 2a													0.8736	(52)
Temperature factor from Table 2b													0.5400	(53)
Enter (49) or (54) in (55)													1.2894	(55)
Total storage loss	39.9715	36.1033	39.9715	38.6821	39.9715	38.6821	39.9715	39.9715	38.6821	39.9715	38.6821	39.9715	(56)	
If cylinder contains dedicated solar storage	39.9715	36.1033	39.9715	38.6821	39.9715	38.6821	39.9715	39.9715	38.6821	39.9715	38.6821	39.9715	(57)	
Primary loss	37.2980	33.6885	37.2980	36.0948	37.2980	36.0948	37.2980	37.2980	36.0948	37.2980	36.0948	37.2980	(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	301.4521	266.9712	284.3768	251.6119	245.0309	222.0017	219.8750	227.8562	229.5485	254.5427	268.9556	298.3477	(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	301.4521	266.9712	284.3768	251.6119	245.0309	222.0017	219.8750	227.8562	229.5485	254.5427	268.9556	298.3477	(64)	
Electric shower(s)									Total per year (kWh/year) = Sum(64)m =			3070.5702	(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)	
													0.0000	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =														
Heat gains from water heating, kWh/month	136.3563	121.3956	130.6788	118.6192	117.5963	108.7738	109.2319	111.8857	111.2831	120.7590	124.3860	135.3241	(65)	

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

Metabolic gains (Table 5), Watts													
(66)m	Jan 177.8034	Feb 177.8034	Mar 177.8034	Apr 177.8034	May 177.8034	Jun 177.8034	Jul 177.8034	Aug 177.8034	Sep 177.8034	Oct 177.8034	Nov 177.8034	Dec 177.8034	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	48.7151	43.2683	35.1881	26.6397	19.9135	16.8118	18.1657	23.6125	31.6927	40.2411	46.9673	50.0690	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	510.7034	516.0029	502.6484	474.2181	438.3299	404.6001	382.0665	376.7670	390.1216	418.5519	454.4400	488.1699	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.7437	55.7437	55.7437	55.7437	55.7437	55.7437	55.7437	55.7437	55.7437	55.7437	55.7437	55.7437	(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)	-118.5356	-118.5356	-118.5356	-118.5356	-118.5356	-118.5356	-118.5356	-118.5356	-118.5356	-118.5356	-118.5356	-118.5356	(71)
Water heating gains (Table 5)	183.2746	180.6482	175.6435	164.7488	158.0595	151.0747	146.8171	150.3840	154.5598	162.3104	172.7583	181.8872	(72)
Total internal gains	860.7046	857.9310	831.4915	783.6181	734.3144	687.4981	662.0608	665.7750	691.3856	739.1149	792.1772	838.1376	(73)

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6. Solar gains

[Jan]	Area m2		Solar flux Table 6a W/m2		Specific data or Table 6b		Specific data or Table 6c		Access factor Table 6d		Gains W	
North	8.2700		12.6762		0.7600		0.7000		0.7700		38.6490 (74)	
Northeast	1.3600		13.7534		0.7600		0.7000		0.7700		6.8960 (75)	
Southeast	13.9700		42.4133		0.7600		0.7000		0.7700		218.4458 (77)	
Northwest	1.3600		13.7534		0.7600		0.7000		0.7700		6.8960 (81)	
Solar gains	270.8868	422.3990	611.4471	856.3490	990.9948	1095.9778	1023.0963	893.6126	731.6058	509.1836	330.0347	231.6713 (83)
Total gains	1131.5914	1280.3299	1442.9386	1639.9671	1725.3092	1783.4759	1685.1571	1559.3876	1422.9913	1248.2986	1122.2119	1069.8089 (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	44.3528	45.4627	45.8256	46.5388	46.5388	47.5724	47.2332	47.9058	47.9058	46.8885	47.2332	45.8256
alpha	3.9569	4.0308	4.0550	4.1026	4.1026	4.1715	4.1489	4.1937	4.1937	4.1259	4.1489	4.0550
util living area	0.9957	0.9926	0.9832	0.9534	0.8729	0.6893	0.5493	0.5557	0.8355	0.9614	0.9913	0.9965 (86)
MIT	19.1845	19.3830	19.7476	20.2102	20.6417	20.9121	20.9729	20.9742	20.7899	20.3283	19.7325	19.2128 (87)
Th 2	19.6775	19.7053	19.7141	19.7311	19.7311	19.7550	19.7473	19.7625	19.7393	19.7473	19.7473	19.7141 (88)
util rest of house	0.9941	0.9900	0.9767	0.9342	0.8162	0.5703	0.3901	0.3880	0.7460	0.9399	0.9876	0.9952 (89)
MIT 2	17.6113	17.8822	18.3511	18.9381	19.4398	19.7114	19.7405	19.7566	19.6261	19.0985	18.3569	17.6711 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	17.9123	18.1694	18.6184	19.1815	19.6698	19.9412	19.9763	19.9896	19.8488	19.3338	18.6201	17.9661 (92)
Temperature adjustment	0.0000											
adjusted MIT	17.9123	18.1694	18.6184	19.1815	19.6698	19.9412	19.9763	19.9896	19.8488	19.3338	18.6201	17.9661 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9908	0.9852	0.9687	0.9231	0.8129	0.5899	0.4208	0.4206	0.7535	0.9302	0.9823	0.9925 (94)
Useful gains	1121.1456	1261.3366	1397.8071	1513.8691	1402.4486	1052.0780	709.1881	655.8603	1072.2745	1161.2171	1102.3888	1061.7661 (95)
Ext temp.	5.0000	5.4000	7.1000	9.4000	12.5000	15.3000	17.0000	17.2000	14.6000	11.6000	7.9000	5.0000 (96)
Heat loss rate W	3333.7342	3216.3532	2878.2571	2406.7850	1764.1571	1117.1803	721.5700	666.8184	1254.6485	1888.7543	2598.9644	3240.0367 (97)
Space heating kWh	1646.1659	1313.7712	1101.4548	642.8994	269.1112	0.0000	0.0000	0.0000	0.0000	541.2877	1077.5345	1620.6333 (98a)
Space heating requirement - total per year (kWh/year)	8212.8579											
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	1646.1659	1313.7712	1101.4548	642.8994	269.1112	0.0000	0.0000	0.0000	0.0000	541.2877	1077.5345	1620.6333 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	8212.8579											
Space heating per m2	(98c) / (4) = 48.1382 (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 %)												170.0000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	1646.1659	1313.7712	1101.4548	642.8994	269.1112	0.0000	0.0000	0.0000	0.0000	541.2877	1077.5345	1620.6333 (98)
Space heating efficiency (main heating system 1)	170.0000	170.0000	170.0000	170.0000	170.0000	0.0000	0.0000	0.0000	0.0000	170.0000	170.0000	170.0000 (210)
Space heating fuel (main heating system)	968.3329	772.8066	647.9146	378.1761	158.3007	0.0000	0.0000	0.0000	0.0000	318.4045	633.8438	953.3137 (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	301.4521	266.9712	284.3768	251.6119	245.0309	222.0017	219.8750	227.8562	229.5485	254.5427	268.9556	298.3477 (64)
Efficiency of water heater	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000 (216)
Fuel for water heating, kWh/month	177.3247	157.0419	167.2805	148.0070	144.1358	130.5892	129.3382	134.0331	135.0285	149.7310	158.2092	175.4986 (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	42.6400	34.2074	30.8000	22.5654	17.4302	14.2406	15.9004	20.6679	26.8456	35.2228	39.7841	43.8251 (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)												

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(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												4831.0929	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												170.0000	
Water heating fuel used												1806.2178	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												344.1294	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												6981.4401	(238)

10a. Fuel costs - using BEDF prices (538)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	4831.0929	25.1600	1215.5030	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1806.2178	25.1600	454.4444	(247)
Energy for instantaneous electric shower(s)	0.0000	25.1600	0.0000	(247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(249)
Energy for lighting	344.1294	25.1600	86.5830	(250)
Additional standing charges			0.0000	(251)
Total energy cost			1756.5303	(255)

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	4831.0929	0.1552	749.9967	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1806.2178	0.1407	254.1872	(264)
Space and water heating			1004.1839	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	344.1294	0.1443	49.6685	(268)
Total CO2, kg/year			1053.8524	(272)

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	4831.0929	1.5748	7607.8071	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1806.2178	1.5204	2746.0946	(278)
Space and water heating			10353.9017	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	344.1294	1.5338	527.8372	(282)
Total Primary energy kWh/year			10881.7389	(286)

SAP 10 EPC IMPROVEMENTS

Green

Current energy efficiency rating: D 63
Current environmental impact rating: A 92

N Solar water heating Not applicable
U Solar photovoltaic panels Not applicable
V2 Wind turbine Not applicable

Recommended measures: SAP change Cost change CO2 change
(none)

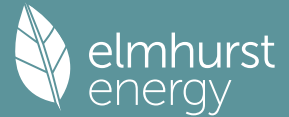
Recommended measures Typical annual savings Energy Environmental
(none) efficiency impact
Total Savings £0 0.00 kg/m²

Potential energy efficiency rating: D 63
Potential environmental impact rating: A 92

Fuel prices for cost data on this page from database revision number 538 TEST (29 Feb 2024)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, South East England):
Electricity Current Potential Saving
£1757 £1757 £0

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Space heating	£1216	£1216	£0
Water heating	£454	£454	£0
Lighting	£87	£87	£0
Total cost of fuels	£1757	£1757	£0
Total cost of uses	£1757	£1757	£0
Delivered energy	41 kWh/m²	41 kWh/m²	0 kWh/m²
Carbon dioxide emissions	1.1 tonnes	1.1 tonnes	0.0 tonnes
CO2 emissions per m²	6 kg/m²	6 kg/m²	0 kg/m²
Primary energy	64 kWh/m²	64 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR Conversion (As Designed) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m²)	Storey height (m)	Volume (m³)
Ground floor	5.3000 (1b)	x 3.0500 (2b)	= 16.1650 (1b) - (3b)
First floor	86.1000 (1c)	x 2.8600 (2c)	= 246.2460 (1c) - (3c)
Second floor	79.2100 (1d)	x 2.7600 (2d)	= 218.6196 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	170.6100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 481.0306 (5)

2. Ventilation rate

Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	2 * 10 =	20.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.0416 (8)
Pressure test	No	
Pressure Test Method	Blower Door	
Measured/design AP50	15.0000	(17)
Infiltration rate	0.7916	(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) =	0.7322 (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	0.9336	0.9153	0.8970	0.8054	0.7871	0.6956	0.6956	0.6773	0.7322	0.7871	0.8237	0.8603 (22b)
Effective ac	0.9358	0.9189	0.9023	0.8244	0.8098	0.7419	0.7419	0.7294	0.7681	0.8098	0.8393	0.8701 (25)

3. Heat losses and heat loss parameter

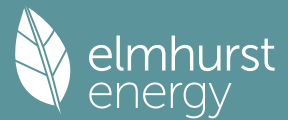
Element	Gross m²	Openings m²	NetArea m²	U-value W/m²K	A x U W/K	K-value kJ/m²K	A x K kJ/K
New windows (Uw = 1.30)			24.9600	1.2357	30.8441		
Ground floor			5.3000	0.2500	1.3250	110.0000	583.0000 (27)
Existing upg	103.3400	24.9600	78.3800	0.2800	21.9464	17.0000	1332.4600 (28a)
External Wall NEW	62.2800		62.2800	0.1700	10.5876	60.0000	3736.8000 (29a)
Existing pitched	41.7300		41.7300	0.1600	6.6768	9.0000	375.5700 (30)
Existing plane	23.7600		23.7600	0.1300	3.0888	9.0000	213.8400 (30)
New pitched	18.1100		18.1100	0.1500	2.7165	9.0000	162.9900 (30)
New plane	18.2300		18.2300	0.1300	2.3699	9.0000	164.0700 (30)
Total net area of external elements Aum(A, m²)			272.7500				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	79.5551			(33)
Party Wall 1			56.8800	0.0000	0.0000	180.0000	10238.4000 (32)
Party Floor 1			80.8000			30.0000	2424.0000 (32d)
Internal Wall 1			204.4300			100.0000	20443.0000 (32c)
Internal Floor 1			86.1000			18.0000	1549.8000 (32d)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	41223.9300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K		241.6267 (35)
Thermal bridges (Default value 0.200 * total exposed area)		54.5500 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	134.1051 (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	148.5447	145.8586	143.2257	130.8588	128.5450	117.7738	117.7738	115.7792	121.9227	128.5450	133.2258	138.1193 (38)
Heat transfer coeff	282.6499	279.9637	277.3308	264.9639	262.6501	251.8789	251.8789	249.8843	256.0278	262.6501	267.3309	272.2244 (39)
Average = Sum(39)m / 12 =												264.9528
HLP	1.6567	1.6410	1.6255	1.5530	1.5395	1.4763	1.4763	1.4647	1.5007	1.5395	1.5669	1.5956 (40)

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HLP (average)	31	28	31	30	31	30	31	31	30	31	30	1.5530
Days in mont												31

4. Water heating energy requirements (kWh/year)												

Assumed occupancy												2.9634 (42)
Hot water usage for mixer showers												
64.6679	63.6960	62.2799	59.5703	57.5708	55.3409	54.0734	55.4788	57.0194	59.4137	62.1814	64.4201	(42a)
Hot water usage for baths												
31.9053	31.4314	30.7642	29.5339	28.6126	27.5911	27.0393	27.7019	28.4234	29.5164	30.7721	31.7974	(42b)
Hot water usage for other uses												
44.9781	43.3425	41.7069	40.0714	38.4358	36.8002	36.8002	38.4358	40.0714	41.7069	43.3425	44.9781	(42c)
Average daily hot water use (litres/day)												130.0920 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use												
141.5512	138.4700	134.7510	129.1756	124.6192	119.7322	117.9130	121.6165	125.5142	130.6370	136.2960	141.1956	(44)
Energy conte	224.1826	197.1794	207.1073	176.8349	167.7614	147.2247	142.6055	150.5867	154.7715	177.2732	194.1787	221.0782 (45)
Energy content (annual)												
Distribution loss	(46)m = 0.15 x (45)m											2160.7841
33.6274	29.5769	31.0661	26.5252	25.1642	22.0837	21.3908	22.5880	23.2157	26.5910	29.1268	33.1617	(46)
Water storage loss:												
Store volume												180.0000 (47)
b) If manufacturer declared loss factor is not known :												
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152 (51)
Volume factor from Table 2a												0.8736 (52)
Temperature factor from Table 2b												0.5400 (53)
Enter (49) or (54) in (55)												1.2894 (55)
Total storage loss												
39.9715	36.1033	39.9715	38.6821	39.9715	38.6821	39.9715	39.9715	38.6821	39.9715	38.6821	39.9715	(56)
If cylinder contains dedicated solar storage												
39.9715	36.1033	39.9715	38.6821	39.9715	38.6821	39.9715	39.9715	38.6821	39.9715	38.6821	39.9715	(57)
Primary loss	37.2980	33.6885	37.2980	36.0948	37.2980	36.0948	37.2980	36.0948	37.2980	36.0948	37.2980	(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	(61)
Total heat required for water heating calculated for each month												
301.4521	266.9712	284.3768	251.6119	245.0309	222.0017	219.8750	227.8562	229.5485	254.5427	268.9556	298.3477	(62)
WWHRS	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	(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	(63c)
FGHRS	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	301.4521	266.9712	284.3768	251.6119	245.0309	222.0017	219.8750	227.8562	229.5485	254.5427	268.9556	298.3477 (64)
												3070.5702 (64)
Electric shower(s)												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
												0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												
Heat gains from water heating, kWh/month												
136.3563	121.3956	130.6788	118.6192	117.5963	108.7738	109.2319	111.8857	111.2831	120.7590	124.3860	135.3241	(65)

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

Metabolic gains (Table 5), Watts												
(66)m	177.8034	177.8034	177.8034	177.8034	177.8034	177.8034	177.8034	177.8034	177.8034	177.8034	177.8034	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
48.7151	43.2683	35.1881	26.6397	19.9135	16.8118	18.1657	23.6125	31.6927	40.2411	46.9673	50.0690	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
510.7034	516.0029	502.6484	474.2181	438.3299	404.6001	382.0665	376.7670	390.1216	418.5519	454.4400	488.1699	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
55.7437	55.7437	55.7437	55.7437	55.7437	55.7437	55.7437	55.7437	55.7437	55.7437	55.7437	55.7437	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)												
-118.5356	-118.5356	-118.5356	-118.5356	-118.5356	-118.5356	-118.5356	-118.5356	-118.5356	-118.5356	-118.5356	-118.5356	(71)
Water heating gains (Table 5)												
183.2746	180.6482	175.6435	164.7488	158.0595	151.0747	146.8171	150.3840	154.5598	162.3104	172.7583	181.8872	(72)
Total internal gains												
860.7046	857.9310	831.4915	783.6181	734.3144	687.4981	662.0608	665.7750	691.3856	739.1149	792.1772	838.1376	(73)

6. Solar gains												

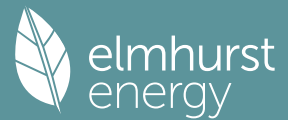
[Jan]												
			Area		Solar flux		g		FF		Access	Gains
			m2		Table 6a		or Table 6b		Specific data		factor	W
					W/m2				or Table 6c		Table 6d	
North			8.2700		10.6334		0.7600		0.7000		0.7700	32.4207 (74)
Northeast			1.3600		11.2829		0.7600		0.7700		0.7700	5.6573 (75)
Southeast			13.9700		36.7938		0.7600		0.7000		0.7700	189.5031 (77)
Northwest			1.3600		11.2829		0.7600		0.7000		0.7700	5.6573 (81)

Solar gains	233.2383	407.7825	588.4363	784.4934	932.3594	950.0493	905.7203	791.1225	655.3689	458.6542	281.2127	198.4426 (83)
Total gains	1093.9429	1265.7135	1419.9279	1568.1115	1666.6738	1637.5473	1567.7811	1456.8974	1346.7545	1197.7691	1073.3899	1036.5803 (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	40.5133	40.9021	41.2904	43.2176	43.5983	45.4627	45.4627	45.8256	44.7260	43.5983	42.8349	42.0649
alpha	3.7009	3.7268	3.7527	3.8812	3.9066	4.0308	4.0308	4.0550	3.9817	3.9066	3.8557	3.8043
util living area												
0.9966	0.9937	0.9869	0.9672	0.9157	0.7949	0.6449	0.6978	0.8912	0.9772	0.9941	0.9973	(86)
MIT	18.8600	19.0791	19.4472	19.9861	20.4487	20.8112	20.9409	20.9190	20.6569	20.0609	19.4141	18.8913 (87)
Th 2	19.5720	19.5834	19.5947	19.6480	19.6580	19.7053	19.7053	19.7141	19.6870	19.6580	19.6377	19.6166 (88)
util rest of house												
0.9953	0.9914	0.9818	0.9531	0.8753	0.6948	0.4833	0.5421	0.8226	0.9648	0.9915	0.9963	(89)
MIT 2	17.1303	17.4171	17.8931	18.6058	19.1706	19.5897	19.6862	19.6841	19.4363	18.7136	17.8804	17.1979 (90)

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Living area fraction									fLA = Living area / (4) =	0.1914 (91)		
MIT	17.4613	17.7352	18.1905	18.8700	19.4152	19.8234	19.9263	19.9204	19.6699	18.9714	18.1739	17.5219 (92)
Temperature adjustment												0.0000
adjusted MIT	17.4613	17.7352	18.1905	18.8700	19.4152	19.8234	19.9263	19.9204	19.6699	18.9714	18.1739	17.5219 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9924	0.9866	0.9741	0.9417	0.8658	0.7055	0.5136	0.5703	0.8215	0.9553	0.9872	0.9939	(94)
Useful gains	1085.5886	1248.8081	1383.1896	1476.7647	1443.0764	1155.3146	805.2197	830.8235	1106.2995	1144.2270	1059.5997	1030.2514	(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	3720.0512	3593.3858	3242.1348	2641.6799	2026.4043	1315.6767	837.8187	879.6992	1426.0486	2198.7481	2960.3956	3626.5563	(97)
Space heating kWh	1960.0402	1575.5562	1383.0552	838.7389	433.9959	0.0000	0.0000	0.0000	0.0000	784.5637	1368.5730	1931.6508	(98a)
Space heating requirement - total per year (kWh/year)												10276.1741	
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	1960.0402	1575.5562	1383.0552	838.7389	433.9959	0.0000	0.0000	0.0000	0.0000	784.5637	1368.5730	1931.6508	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												10276.1741	
Space heating per m2										(98c) / (4) =		60.2320	(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 %)													170.0000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	1960.0402	1575.5562	1383.0552	838.7389	433.9959	0.0000	0.0000	0.0000	0.0000	784.5637	1368.5730	1931.6508	(98)
Space heating efficiency (main heating system 1)	170.0000	170.0000	170.0000	170.0000	170.0000	0.0000	0.0000	0.0000	0.0000	170.0000	170.0000	170.0000	(210)
Space heating fuel (main heating system)	1152.9648	926.7978	813.5619	493.3759	255.2917	0.0000	0.0000	0.0000	0.0000	461.5081	805.0430	1136.2652	(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	301.4521	266.9712	284.3768	251.6119	245.0309	222.0017	219.8750	227.8562	229.5485	254.5427	268.9556	298.3477	(64)
Efficiency of water heater	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	(216)
Fuel for water heating, kWh/month	177.3247	157.0419	167.2805	148.0070	144.1358	130.5892	129.3382	134.0331	135.0285	149.7310	158.2092	175.4986	(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	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	42.6400	34.2074	30.8000	22.5654	17.4302	14.2406	15.9004	20.6679	26.8456	35.2228	39.7841	43.8251	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												6044.8083	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												170.0000	
Water heating fuel used												1806.2178	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												0.0000	(231)
Electricity for lighting (calculated in Appendix L)												344.1294	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												8195.1555	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	6044.8083	16.4900	996.7889	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1806.2178	16.4900	297.8453	(247)

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Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (249)
Energy for lighting	344.1294	16.4900	56.7469 (250)
Additional standing charges			0.0000 (251)
Total energy cost			1351.3811 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	2.2564 (257)
SAP value		63.4241
SAP rating (Section 12)		63 (258)
SAP band		D

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	6044.8083	0.1546	934.4849 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1806.2178	0.1407	254.1872 (264)
Space and water heating			1188.6721 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	344.1294	0.1443	49.6685 (268)
Total CO2, kg/year			1238.3407 (272)
CO2 emissions per m2			7.2600 (273)
EI value			92.3038
EI rating			92 (274)
EI band			A

SAP 10 WORKSHEET FOR Conversion (As Designed) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	5.3000 (1b)	x 3.0500 (2b)	= 16.1650 (1b) - (3b)
First floor	86.1000 (1c)	x 2.8600 (2c)	= 246.2460 (1c) - (3c)
Second floor	79.2100 (1d)	x 2.7600 (2d)	= 218.6196 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	170.6100		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	481.0306 (5)

2. Ventilation rate

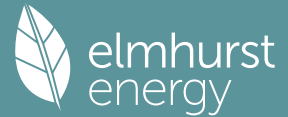
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.0416 (8)
Pressure test	No
Pressure Test Method	Blower Door
Measured/design AP50	15.0000 (17)
Infiltration rate	0.7916 (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) = 0.7322 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.1000	3.8000	3.7000	3.5000	3.5000	3.2000	3.3000	3.1000	3.1000	3.4000	3.3000	3.7000 (22)
Wind factor	1.0250	0.9500	0.9250	0.8750	0.8750	0.8000	0.8250	0.7750	0.7750	0.8500	0.8250	0.9250 (22a)
Adj infilt rate	0.7505	0.6956	0.6773	0.6407	0.6407	0.5858	0.6041	0.5675	0.5675	0.6224	0.6041	0.6773 (22b)
Effective ac	0.7816	0.7419	0.7294	0.7052	0.7052	0.6716	0.6825	0.6610	0.6610	0.6937	0.6825	0.7294 (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
New windows (Uw = 1.30)			24.9600	1.2357	30.8441		583.0000 (27)
Ground floor			5.3000	0.2500	1.3250	110.0000	1332.4600 (28a)
Existing upg	103.3400	24.9600	78.3800	0.2800	21.9464	17.0000	3736.8000 (29a)
External Wall NEW	62.2800		62.2800	0.1700	10.5876	60.0000	375.5700 (30)
Existing pitched	41.7300		41.7300	0.1600	6.6768	9.0000	

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Existing plane	23.7600	23.7600	0.1300	3.0888	9.0000	213.8400 (30)
New pitched	18.1100	18.1100	0.1500	2.7165	9.0000	162.9900 (30)
New plane	18.2300	18.2300	0.1300	2.3699	9.0000	164.0700 (30)
Total net area of external elements Aum(A, m2)	272.7500					(31)
Fabric heat loss, W/K = Sum (A x U)	(26)...(30) + (32) =	79.5551				(33)
Party Wall 1	56.8800	0.0000	0.0000	180.0000	10238.4000	(32)
Party Floor 1	80.8000			30.0000	2424.0000	(32d)
Internal Wall 1	204.4300			100.0000	20443.0000	(32c)
Internal Floor 1	86.1000			18.0000	1549.8000	(32d)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	41223.9300	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		241.6267	(35)
Thermal bridges (Default value 0.200 * total exposed area)		54.5500	(36)
Point Thermal bridges	(36a) =	0.0000	
Total fabric heat loss	(33) + (36) + (36a) =	134.1051	(37)

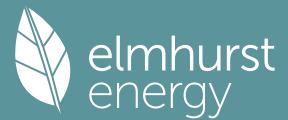
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	124.0770	117.7738	115.7792	111.9494	111.9494	106.6038	108.3325	104.9283	104.9283	110.1144	108.3325	115.7792	(38)
Average = Sum(39)m / 12 =	258.1821	251.8789	249.8843	246.0545	246.0545	240.7089	242.4376	239.0334	239.0334	244.2195	242.4376	249.8843	(39)
												245.8174	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.5133	1.4763	1.4647	1.4422	1.4422	1.4109	1.4210	1.4011	1.4011	1.4314	1.4210	1.4647	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)												
Assumed occupancy												2.9634 (42)
Hot water usage for mixer showers	64.6679	63.6960	62.2799	59.5703	57.5708	55.3409	54.0734	55.4788	57.0194	59.4137	62.1814	64.4201 (42a)
Hot water usage for baths	31.9053	31.4314	30.7642	29.5339	28.6126	27.5911	27.0393	27.7019	28.4234	29.5164	30.7721	31.7974 (42b)
Hot water usage for other uses	44.9781	43.3425	41.7069	40.0714	38.4358	36.8002	36.8002	38.4358	40.0714	41.7069	43.3425	44.9781 (42c)
Average daily hot water use (litres/day)												130.0920 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	141.5512	138.4700	134.7510	129.1756	124.6192	119.7322	117.9130	121.6165	125.5142	130.6370	136.2960	141.1956 (44)
Energy content (annual)	224.1826	197.1794	207.1073	176.8349	167.7614	147.2247	142.6055	150.5867	154.7715	177.2732	194.1787	221.0782 (45)
Distribution loss (46)m = 0.15 x (45)m												2160.7841
	33.6274	29.5769	31.0661	26.5252	25.1642	22.0837	21.3908	22.5880	23.2157	26.5910	29.1268	33.1617 (46)
Water storage loss:												
Store volume												180.0000 (47)
b) If manufacturer declared loss factor is not known :												
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152 (51)
Volume factor from Table 2a												0.8736 (52)
Temperature factor from Table 2b												0.5400 (53)
Enter (49) or (54) in (55)												1.2894 (55)
Total storage loss												
	39.9715	36.1033	39.9715	38.6821	39.9715	38.6821	39.9715	39.9715	38.6821	39.9715	38.6821	39.9715 (56)
If cylinder contains dedicated solar storage												
	39.9715	36.1033	39.9715	38.6821	39.9715	38.6821	39.9715	39.9715	38.6821	39.9715	38.6821	39.9715 (57)
Primary loss	37.2980	33.6885	37.2980	36.0948	37.2980	36.0948	37.2980	37.2980	36.0948	37.2980	36.0948	37.2980 (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												
	301.4521	266.9712	284.3768	251.6119	245.0309	222.0017	219.8750	227.8562	229.5485	254.5427	268.9556	298.3477 (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												
	301.4521	266.9712	284.3768	251.6119	245.0309	222.0017	219.8750	227.8562	229.5485	254.5427	268.9556	298.3477 (64)
Total per year (kWh/year) = Sum(64)m =												3070.5702 (64)
Electric shower(s)												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)
Heat gains from water heating, kWh/month												
	136.3563	121.3956	130.6788	118.6192	117.5963	108.7738	109.2319	111.8857	111.2831	120.7590	124.3860	135.3241 (65)

5. Internal gains (see Table 5 and 5a)												
Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	177.8034	177.8034	177.8034	177.8034	177.8034	177.8034	177.8034	177.8034	177.8034	177.8034	177.8034	177.8034 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	48.7151	43.2683	35.1881	26.6397	19.9135	16.8118	18.1657	23.6125	31.6927	40.2411	46.9673	50.0690 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	510.7034	516.0029	502.6484	474.2181	438.3299	404.6001	382.0665	376.7670	390.1216	418.5519	454.4400	488.1699 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.7437	55.7437	55.7437	55.7437	55.7437	55.7437	55.7437	55.7437	55.7437	55.7437	55.7437	55.7437 (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)	-118.5356	-118.5356	-118.5356	-118.5356	-118.5356	-118.5356	-118.5356	-118.5356	-118.5356	-118.5356	-118.5356	-118.5356 (71)
Water heating gains (Table 5)	183.2746	180.6482	175.6435	164.7488	158.0595	151.0747	146.8171	150.3840	154.5598	162.3104	172.7583	181.8872 (72)
Total internal gains	860.7046	857.9310	831.4915	783.6181	734.3144	687.4981	662.0608	665.7750	691.3856	739.1149	792.1772	838.1376 (73)

6. Solar gains												
[Jan]		Area	Solar flux	g	FF	Access	Gains					
		m2	Table 6a	Specific data	Specific data	factor	W					
			W/m2	or Table 6b	or Table 6c	Table 6d						
North		8.2700	12.6762	0.7600	0.7000	0.7700	38.6490 (74)					
Northeast		1.3600	13.7534	0.7600	0.7000	0.7700	6.8960 (75)					

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Southeast	13.9700	42.4133	0.7600	0.7000	0.7700	218.4458 (77)
Northwest	1.3600	13.7534	0.7600	0.7000	0.7700	6.8960 (81)

Solar gains	270.8868	422.3990	611.4471	856.3490	990.9948	1095.9778	1023.0963	893.6126	731.6058	509.1836	330.0347	231.6713 (83)
Total gains	1131.5914	1280.3299	1442.9386	1639.9671	1725.3092	1783.4759	1685.1571	1559.3876	1422.9913	1248.2986	1122.2119	1069.8089 (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	44.3528	45.4627	45.8256	46.5388	46.5388	47.5724	47.2332	47.9058	47.9058	46.8885	47.2332	45.8256
alpha	3.9569	4.0308	4.0550	4.1026	4.1026	4.1715	4.1489	4.1937	4.1937	4.1259	4.1489	4.0550
util living area	0.9957	0.9926	0.9832	0.9534	0.8729	0.6893	0.5493	0.5557	0.8355	0.9614	0.9913	0.9965 (86)
MIT	19.1845	19.3830	19.7476	20.2102	20.6417	20.9121	20.9729	20.9742	20.7899	20.3283	19.7325	19.2128 (87)
Th 2	19.6775	19.7053	19.7141	19.7311	19.7311	19.7550	19.7473	19.7625	19.7625	19.7393	19.7473	19.7141 (88)
util rest of house	0.9941	0.9900	0.9767	0.9342	0.8162	0.5703	0.3901	0.3880	0.7460	0.9399	0.9876	0.9952 (89)
MIT 2	17.6113	17.8822	18.3511	18.9381	19.4398	19.7114	19.7405	19.7566	19.6261	19.0985	18.3569	17.6711 (90)
Living area fraction									fLA = Living area / (4) =			0.1914 (91)
MIT	17.9123	18.1694	18.6184	19.1815	19.6698	19.9412	19.9763	19.9896	19.8488	19.3338	18.6201	17.9661 (92)
Temperature adjustment												0.0000
adjusted MIT	17.9123	18.1694	18.6184	19.1815	19.6698	19.9412	19.9763	19.9896	19.8488	19.3338	18.6201	17.9661 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9908	0.9852	0.9687	0.9231	0.8129	0.5899	0.4208	0.4206	0.7535	0.9302	0.9823	0.9925 (94)
Useful gains	1121.1456	1261.3366	1397.8071	1513.8691	1402.4486	1052.0780	709.1881	655.8603	1072.2745	1161.2171	1102.3888	1061.7661 (95)
Ext temp.	5.0000	5.4000	7.1000	9.4000	12.5000	15.3000	17.0000	17.2000	14.6000	11.6000	7.9000	5.0000 (96)
Heat loss rate W	3333.7342	3216.3532	2878.2571	2406.7850	1764.1571	1117.1803	721.5700	666.8184	1254.6485	1888.7543	2598.9644	3240.0367 (97)
Space heating kWh	1646.1659	1313.7712	1101.4548	642.8994	269.1112	0.0000	0.0000	0.0000	0.0000	541.2877	1077.5345	1620.6333 (98a)
Space heating requirement - total per year (kWh/year)												8212.8579
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	1646.1659	1313.7712	1101.4548	642.8994	269.1112	0.0000	0.0000	0.0000	0.0000	541.2877	1077.5345	1620.6333 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												8212.8579
Space heating per m2										(98c) / (4) =		48.1382 (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 %)												170.0000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	1646.1659	1313.7712	1101.4548	642.8994	269.1112	0.0000	0.0000	0.0000	0.0000	541.2877	1077.5345	1620.6333 (98)
Space heating efficiency (main heating system 1)	170.0000	170.0000	170.0000	170.0000	170.0000	0.0000	0.0000	0.0000	0.0000	170.0000	170.0000	170.0000 (210)
Space heating fuel (main heating system)	968.3329	772.8066	647.9146	378.1761	158.3007	0.0000	0.0000	0.0000	0.0000	318.4045	633.8438	953.3137 (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	301.4521	266.9712	284.3768	251.6119	245.0309	222.0017	219.8750	227.8562	229.5485	254.5427	268.9556	298.3477 (64)
Efficiency of water heater (217)m	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000	170.0000 (216)
Fuel for water heating, kWh/month	177.3247	157.0419	167.2805	148.0070	144.1358	130.5892	129.3382	134.0331	135.0285	149.7310	158.2092	175.4986 (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	42.6400	34.2074	30.8000	22.5654	17.4302	14.2406	15.9004	20.6679	26.8456	35.2228	39.7841	43.8251 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												4831.0929 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												170.0000
Water heating fuel used												1806.2178 (219)
Space cooling fuel												0.0000 (221)

Full SAP Calculation Printout



Electricity for pumps and fans:	
Total electricity for the above, kWh/year	0.0000 (231)
Electricity for lighting (calculated in Appendix L)	344.1294 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	0.0000 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	6981.4401 (238)

10a. Fuel costs - using BEDF prices (538)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	4831.0929	25.1600	1215.5030 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1806.2178	25.1600	454.4444 (247)
Energy for instantaneous electric shower(s)	0.0000	25.1600	0.0000 (247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (249)
Energy for lighting	344.1294	25.1600	86.5830 (250)
Additional standing charges			0.0000 (251)
Total energy cost			1756.5303 (255)

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	4831.0929	0.1552	749.9967 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1806.2178	0.1407	254.1872 (264)
Space and water heating			1004.1839 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	344.1294	0.1443	49.6685 (268)
Total CO2, kg/year			1053.8524 (272)

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	4831.0929	1.5748	7607.8071 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1806.2178	1.5204	2746.0946 (278)
Space and water heating			10353.9017 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	344.1294	1.5338	527.8372 (282)
Total Primary energy kWh/year			10881.7389 (286)