FALCON ENERGY LIMITED

Energy Conservation Specialists

30 Grove Place
Hampstead, London
NW3 1JR

Energy Statement

Client: Egg Limited

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Report By: Neil Vanson

Checked By: Neil Vanson

Reference: Falcon/101356

Date: June 2024

30 Grove Place, Hampstead, London, NW3 1JR
Energy Statement

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Energy/ Sustainability Statement

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Rev	Date	Purpose/Status	Document ref	QA
0	July 2024	Planning	NV-101356	NV OCDEA M057-0001

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. Executive Summary

The Council will require all new developments, and where possible via a retrofitting process in existing developments to address the causes and impacts of climate change by minimising energy use; supplying energy efficiently; and using energy generated from renewable sources in line with London Plan and national policy. The Council will support appropriate measures to mitigate and adapt to the impacts of climate change and will reduce emissions of carbon dioxide as part of development proposals, in line with the London Plan. The Council will set local standards and targets, based on an understanding of local potential and opportunities for renewable or low carbon energy and existing or planned decentralised energy infrastructure. Where opportunities are identified, development will be required to contribute towards realising these opportunities subject to the Council and its partners undertaking further work that is required to explore the feasibility and development potential of projects or strategies in order to take them forward. The Council, working with its partners, will seek to ensure that Camdens future energy infrastructure needs are managed effectively by ensuring that the necessary infrastructure is in place to accommodate the levels of growth anticipated within the Borough.

To assist the application of an energy assessment shall be submitted to and approved in writing by the Local Planning Authority. The assessment shall:

1 - set out the annualised baseline energy demand (kWhr) and CO2 levels (KgCO2) of the development built to SAP 10.
2 - set out the design measures and features that reduce the baseline emissions relative to the London Plan Hierarchy (be lean, be clean, be green)
3 - provide the impacts of the measures and features from [2] on the baseline energy demand and emissions [1]
4 - provide full details, including (but not limited to), of types of lighting, boiler specifications, Combined Heat and Power networks and plant technology, zero carbon technology including roof plans and PV specifications.
5 - methods to monitor and maintain the development to ensure the targets are achieved and met consistently Thereafter, the development shall be carried out and completed in accordance with the approved assessment.

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REASON

To ensure the development contributes to a reduction in CO2, in accordance with London Plan (2021) and Camden Local Plan (2017)

The energy strategy for the proposed development scheme has been assessed using the Energy Hierarchy to demonstrate compliance with the London Borough of Camden's requirements for a CO2 reduction beyond Building Regulations SAP 10.

An energy efficient scheme has been proposed that has reduced the CO2 emissions through passive design measures, increasing insulation in the building fabric to reduce heat loss, improved heating and lighting systems and controls. These measures have resulted in predicted CO2 emissions that are achieving SAP 10 baseline requirement.

We have achieved an 88.87% carbon reduction by improving the building fabric, then installing 1.5 kWp of solar PV panels to the scheme and the introduction of an ASHP to supply the heating and hot water.

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2. Introduction

The application put forward to the London Borough of Camden is for the construction of a basement and extensive refurbishment to the existing house with thermal upgrades to the walls and roof with low carbon renewable heating systems installed with Solar PV.

Figure 1, Location plan

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3.0 Planning Policy (London Plan)

The London Plan Spatial Development Strategy for Greater London, July 2011, in Chapter 5 London's Response to Climate Change, requires in Policy 5.2 for all buildings to reduce their carbon dioxide emissions beyond building regulations, following the Energy Hierarchy:
Be lean: use less energy
Be clean: supply energy efficiently
Be green: use renewable energy
The London Plan includes strategic targets for carbon dioxide reduction to enable the Mayors Climate Change Mitigation targets to be met (Policy 5.1). The current target requirement is to reduce carbon dioxide emissions by 35% beyond Building Regulations SAP 10.

Residential buildings:	
Year	**Improvement on 2010 Building Regulations**
2010 – 2013	25 per cent (Code for Sustainable Homes level 4)
2013 – 2016	40 per cent
2016 – 2031	Zero carbon

Non-domestic buildings:	
Year	**Improvement on 2010 Building Regulations**
2010 – 2013	25 per cent
2013 – 2016	40 per cent
2016 – 2019	As per building regulations requirements
2019 – 2031	Zero carbon

4.0 Design targets

The Energy Assessment shall demonstrate how the proposed development shall try and meet the targets of both the Local Plan of Camden and the London Plan. The requirements are:

Improvement on SAP 10 Building Regulations

5.0 Baseline SAPs

To determine the baseline CO2 emissions for the development the following was undertaken for the Flats within the proposed scheme. SAP calculation demonstrating compliance with Part L SAP 10 were undertaken on the dwellings using the Notional U values.

Baseline Assessment Results

Baseline	Tonnes/CO2 per year
Baseline House	6.74
Total	**6.74**

6.0 Be Lean-Energy Efficient Scheme

The first step of the energy hierarchy is to improve the design of the building fabric and services to maximise the energy efficiency and minimise the energy requirements. To reduce the CO2 emissions from the residential flats, the following improvements were made to the building design. The heat loss from the dwellings have been reduced by increasing the levels of insulation in the building fabric to achieve U-values significantly better than SAP 10 performance standards, shown in Table 6.1. This shall reduce the energy requirement for heating and therefore the energy consumption and CO2 emissions associated with the heating.

	Target SAP 10 U Value Lean Specification W/M2 K	***SAP 2013 Baseline (Notional)***
Basement		
External Walls	***0.18***	***0.28***
Floor	***0.18***	***0.22***
Glazing (including roof lights)	***1.4***	***1.6***
Existing House		
External Walls	***0.30***	***1.7***
Roof	***0.16***	***2.3***
Glazing (including roof lights)	***1.4***	***2.6***

Table 6.1

Natural ventilation shall be maintained for the dwelling with energy efficient extract provided to the kitchen and bathrooms only. This shall have very low specific fan powers and shall only operate when the kitchen or bathroom is occupied, to minimise energy consumption.
100% energy efficient lighting will be installed throughout. The lighting will in the common ways shall be controlled via PIR sensors to enable the lighting to only be switched on in areas where it is required. This shall enable the energy consumption associated with lighting to remain as low as practicable. Energy display devices shall be provided to each dwelling to enable occupants to review and understand their energy consumption and therefore take steps to minimise energy in use of the dwelling. The energy display devices shall measure and transmit energy consumption data to a visual display unit. The visual display unit shall display the following information as a minimum:

- Local time
- Current mains energy consumption (kilowatts and kilowatt hours)
- Current emissions (g/kg CO2)
- Current tariff
- Current cost
- Display accurate account balance information (amount in credit or debit)

• Visual presentation of data (i.e. non-numeric) to allow consumers to easily identify high and low level of usage
• Historical consumption data

7.0 Be Lean Assessment Results

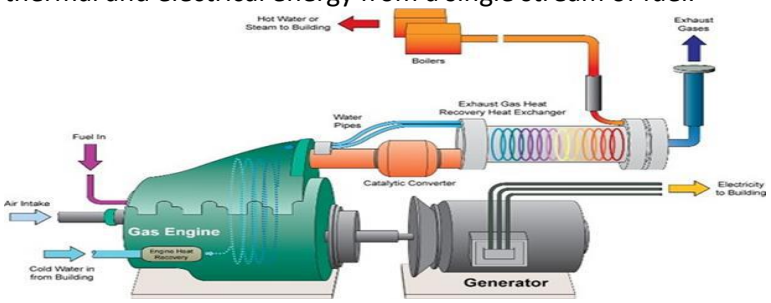
The energy demand and resulting CO2 emissions for the energy efficient Be Lean scheme are presented in Table 6.2 and show the CO2 emissions are reduced by 2.86 t/yr

Be Lean Assessment Results

Lean	Tonnes/CO2 per year
Lean house	3.88
Total	**3.88**

8.0 Be Clean

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.
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 residential scheme, 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.

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In the London Plan Policy 5.5 Decentralised Energy Networks, the Mayor expects 35% of the heat and power used in London to be generated through the use of localised decentralised energy systems by 2025. 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.

9.0 Be Green use of renewable energy

The following low and zero carbon technologies have been considered for the scheme:

10.0 Ground Source Heat Pumps

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.
Providing the space heating requirement only using ground source heat pumps would provide 20.7% CO2 reduction over the lean building. This would require approximately 12 boreholes across the site, spaced between 25m to 50m centres, or horizontal coils would require an area of approximately 7,400m2. Using GSHP for 100% of the space heating will only provide a 21.8% reduction ion predicted CO2 emissions, due to the high CO2 emissions associated with grid supplied electricity. This is an expensive technology with low CO2 reductions that will not meet the London Plan requirements without additional LZC technologies. **Therefore, this is not considered to be viable for this project.**

11.0 Air Source Heat Pumps

Air Source Heat Pumps extracts heat from the outside air using an external condenser unit and transfers 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 by 19% from the Lean building. This system would require 1 condenser unit to be located external to each plot, the units proposed are the following. The Ultra Quiet Eco-dan air source heat pump 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 ASHP’s will be offset with Solar P.V panels. As ASHP’s are run by electricity this is the most efficient way to offset the carbon used to power the system.

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 300-litre cylinder.

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8.5Kw Ecodan ASHP

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

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 Hea
OPTIONAL SIMPLIFIED WIRELESS ROOM THERMOSTAT AND WIRELESS RECEIVER			PAR-WT50-E Controller and

12.0 Biomass

Waste timber, in the form of wood chips and pellets, is used as fuel in boilers providing heating to buildings. Biomass generates about the same amount of carbon dioxide as fossil fuels, however, with new plant/tree growth this carbon dioxide is actually removed from the atmosphere making the Biomass system carbon neutral. Wood chips and pellets present no risk if accidentally released into the environment and there are no harmful by-products. The flue gas is smoke-free and the ash content of between 0.5% and 3% by volume (depending on material), is minimal.
When sizing biomass is standard practice the biomass boilers would meet a significant proportion of the heating load and gas condensing boilers would assist with providing load trimming to reduce the amount of on/off cycling of the biomass boilers. The provision of biomass boilers to meet all the domestic hot water demand and 30% of the annual energy demand for space heating only would reduce the carbon emissions of the building by 40%.
The provision of biomass boilers for this site would require a central energy centre to be provided sized to allow for at least one biomass boiler and gas backup boiler(s). The number of boilers would be dependent upon detailed analysis of the demand load profiles during detail design stage. Storage of the biomass fuel is required on site, sized to accommodate at least one peak month of heating. Based on the predicted domestic hot water and 30% heating requirements, this would require 30m3 storage for wood pellets or 135m3 of woodchip, depending upon the boiler selection. The store would need to be easily accessed by a large delivery vehicle, similarly, sized to a petrol tanker and therefore there may be issues surrounding vehicular access to the site.
The space and access requirements for the energy centre and biomass store are **unlikely to be viable on this site.** Furthermore, the biomass boiler(s) would require a large flue and careful consideration of its sizing, location and the potential impact of local air quality would be required in this residential area.

13.0 Solar thermal

Solar water heating systems use the energy from the sun to heat water, most commonly in the UK for hot water needs. The systems use a heat collector, generally mounted on the roof in which a fluid is heated by the sun. This fluid is passed through a heat exchanger and used to heat up water which is stored in either a separate hot water cylinder or a twin coil hot water cylinder inside the building. There are two types of collectors used for solar water heating applications - flat plate collectors and evacuated tube collectors. Evacuated tube collectors are generally more expensive due to a more complex manufacturing process (to achieve the vacuum) but manufacturers generally claim better winter performance we decided on solar P.V so Solar thermal **was felt not viable.**

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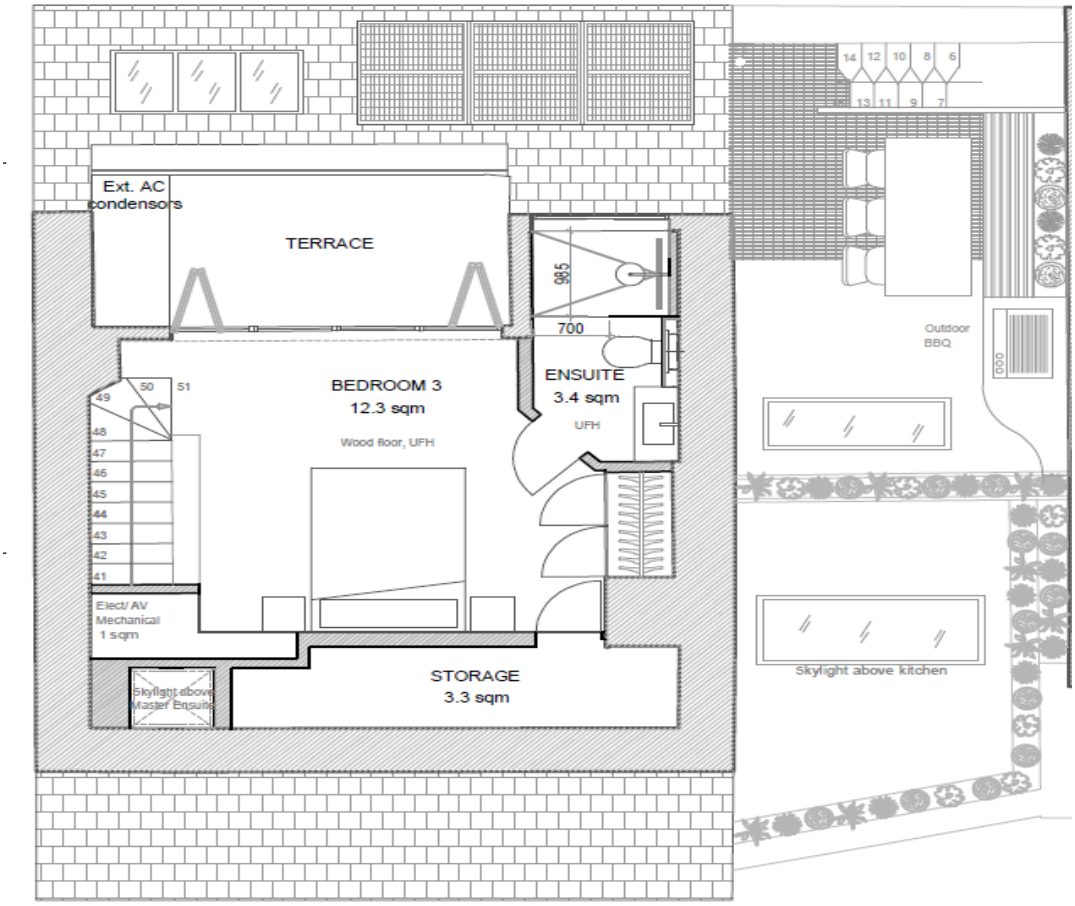
14.0 Photovoltaics

Solar photovoltaic (PV) technology is a semi-conductor-based technology that converts the energy in sunlight into electricity. The term describes a solid-state electronic cell that produces direct current electrical energy from the radiant energy of the sun. When sunlight strikes the surface of a PV cell, this electrical field provides momentum and direction to light-stimulated electrons, resulting in a flow of current when the solar cell is connected to an electrical load. The PV system should be unshaded. Shading even over a small area of the panel, can significantly reduce performance. Excess energy can be exported to the grid; and feed-in tariffs are available. This was felt most viable as approximately 3 panels would be required totalling 4.32 sqm and providing 1.5 kWp for the site utilising 0.50 kWp panels.



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Be Green Assessment Results

Be Green Assessment Results

Green House	Tonnes/CO2 per year	PV amount
Green House	0.75	1.5 kWp
Total	**0.75**	**1.5 kWp**

15.0 Summary of CO2 Emission Reduction for Scheme

The energy strategy for the proposed development scheme has been assessed using the Energy Hierarchy:

Be Lean: use less energy
Be Green: use renewable energy

	Tonnes/CO2 per year	Tonnes/CO2 per year Reduction	Reductions at each stage	Reduction from Baseline
Baseline	**6.74**	**-**	**-**	**-**
Be lean	**3.88**	**2.86**	**42.43%**	**42.43%**
Be Green	**0.75**	**5.99**	**80.67%**	**88.87%**

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16.0 Sustainable Design

Part G water calculation

Site Information	
Site Name	
Reg Number	
Street 1	30
Street 2	Grove Place
Area	
Town or City	Hampstead
Post Code	NW3 1JR

Installation Type	Average Capacity/Flow Rate	Litres/Person/Day
Single Flush WC's	0	0
Dual Flush WC's	4.66	20.6
All WC's	4.66	20.6
Kitchen/Utility Room Taps	7	13.44
Other Taps	6	11.06
Baths	140	15.4
Showers	7	30.59
Dishwashers	1.13	4.07
Washing Machines	8.13	17.07
Water Softener		
Waste Disposal Unit	Not Present	0
Total Water Use	112.23 Litres/Person/Day	
Contribution from Rain Water	0 Litres/Person/Day	
Contribution from Grey Water	0 Litres/Person/Day	
Normalisation Factor	0.91 Litres/Person/Day	

Code for Sustainable Homes - Consumptions & Credits	
Water Consumption (Code for Sustainable Homes)	102.1 Litres/Person/Day
Credits Scored	3

Building Regulations 2000 AD Part G (2010 Ed) - Consumption	
External Water Use	5 Litres/Person/Day
Water Consumption (Building Regulation 17 K)	107.1 Litres/Person/Day

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Sustainable materials and construction

The design team are committed to ensuring that at least 5 elements of the 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.

17.0 Conclusion

The units have all been based on the current building regulations, the process carried out was to produce SAP calculations to ascertain a baseline CO2 output for each apartment, we then upgraded the fabric first to improved U values and finally added solar PV and an ASHP to achieve a 88.87% reduction under the Part L SAP 10.

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18.0 SAP Worksheets

Full SAP Calculation Printout

Property Reference	30 Grove Place	**Issued on Date**	28/06/2024
Assessment Reference	Baseline	**Prop Type Ref**	Energy assessment
Property	30 Grove Place, LONDON, NW3 1JR		

SAP Rating	66 D	**DER**		**TER**	
Environmental	60 D	**% DER < TER**			N/A
CO_2 Emissions (t/year)	6.74	**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 Existing dwelling (SAP) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Basement floor	62.9400	(1a)	x 2.9100	(2a) =	183.1554	(1a) - (3a)
Ground floor	76.6800	(1b)	x 2.8300	(2b) =	217.0044	(1b) - (3b)
First floor	46.9400	(1c)	x 2.7800	(2c) =	130.4932	(1c) - (3c)
Second floor	22.7400	(1d)	x 2.3200	(2d) =	52.7568	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	209.3000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		583.4098	(5)

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2. Ventilation rate

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	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	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)

	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Number of storeys in the dwelling (ns)		4 (9)
Additional infiltration	[(9) - 1] x 0.1 =	0.3000 (10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0.3500 (11)
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0.0000 (12)
If no draught lobby, enter 0.05, else enter 0		0.0500 (13)
Percentage of windows and doors draught stripped		100.0000 (14)
Window infiltration	0.25 - [0.2 * (14) / 100] =	0.0500 (15)

Pressure test		No
Pressure Test Method		Blower Door
Measured/design AP50		15.0000 (17)
Infiltration rate		0.7500 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.6375 (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	0.8128	0.7969	0.7809	0.7013	0.6853	0.6056	0.6056	0.5897	0.6375	0.6853	0.7172	0.7491	(22b)
Effective ac	0.8303	0.8175	0.8049	0.7459	0.7348	0.6834	0.6834	0.6739	0.7032	0.7348	0.7572	0.7805	(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	
Exist (Uw = 2.60)			34.2600	2.3551	80.6848			(27)
NW			1.3200	2.3551	3.1087			(27a)
Opening			2.3600	2.3551	5.5580			(27a)
Heatloss Floor 1			24.4900	0.2200	5.3878			(28a)
Heatloss Floor 2			12.4000	1.2000	14.8800			(28b)
Existing walls	161.7000	34.2600	127.4400	1.7000	216.6480			(29a)
Basement	71.9300		71.9300	0.2800	20.1404			(29a)
External Roof 1	28.2500	1.3200	26.9300	0.4000	10.7720			(30)

External Roof 2	29.2800	2.3600	26.9200	0.4000	10.7680		(30)
External Roof unins	24.4900		24.4900	2.3000	56.3270		(30)
Total net area of external elements Aum(A, m2)			352.5400				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		424.2746		(33)
Party Wall 1			85.8500	0.0000	0.0000		(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Default value 0.200 * total exposed area)	70.5080	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	494.7826	(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	159.8599	157.3903	154.9697	143.5999	141.4727	131.5700	131.5700	129.7361	135.3843	141.4727	145.7761	150.2751	(38)
Heat transfer coeff	654.6425	652.1730	649.7523	638.3826	636.2553	626.3526	626.3526	624.5188	630.1670	636.2553	640.5587	645.0577	(39)
Average = Sum(39)m / 12 =												638.3724	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	3.1278	3.1160	3.1044	3.0501	3.0399	2.9926	2.9926	2.9838	3.0108	3.0399	3.0605	3.0820	(40)
HLP (average)												3.0500	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	3.0140	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	102.7882	101.2435	98.9925	94.6857	91.5075	87.9631	85.9484	88.1823	90.6311	94.4367	98.8360	102.3943	(42a)
Hot water usage for baths	33.9688	33.4643	32.7539	31.4440	30.4632	29.3756	28.7881	29.4936	30.2617	31.4254	32.7623	33.8539	(42b)
Hot water usage for other uses	47.8911	46.1496	44.4081	42.6666	40.9251	39.1836	39.1836	40.9251	42.6666	44.4081	46.1496	47.8911	(42c)
Average daily hot water use (litres/day)												169.7990	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	184.6480	180.8573	176.1545	168.7963	162.8957	156.5223	153.9202	158.6010	163.5594	170.2702	177.7479	184.1394	(44)
Energy conte	292.4373	257.5384	270.7429	231.0738	219.2890	192.4624	186.1531	196.3812	201.6851	231.0551	253.2344	288.3177	(45)
Energy content (annual)										Total = Sum(45)m =		2820.3705	
Distribution loss (46)m = 0.15 x (45)m	43.8656	38.6308	40.6114	34.6611	32.8933	28.8694	27.9230	29.4572	30.2528	34.6583	37.9852	43.2477	(46)

Water storage loss:		
Store volume	210.0000	(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	0.8298	(52)
Temperature factor from Table 2b	0.5400	(53)
Enter (49) or (54) in (55)	1.4290	(55)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Total storage loss	44.2978	40.0109	44.2978	42.8688	44.2978	42.8688	44.2978	44.2978	42.8688	44.2978	42.8688	44.2978	(56)
If cylinder contains dedicated solar storage	44.2978	40.0109	44.2978	42.8688	44.2978	42.8688	44.2978	44.2978	42.8688	44.2978	42.8688	44.2978	(57)
Primary loss	41.3081	37.3106	41.3081	39.9756	41.3081	39.9756	41.3081	41.3081	39.9756	41.3081	39.9756	41.3081	(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	378.0433	334.8599	356.3488	313.9182	304.8949	275.3068	271.7590	281.9871	284.5295	316.6610	336.0789	373.9237	(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	378.0433	334.8599	356.3488	313.9182	304.8949	275.3068	271.7590	281.9871	284.5295	316.6610	336.0789	373.9237	(64)
										Total per year (kWh/year) = Sum(64)m =		3828.3112	(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	165.7202	147.4887	158.5067	143.1076	141.3983	130.2693	130.3806	133.7815	133.3358	145.3106	150.4760	164.3504	(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	180.8410	180.8410	180.8410	180.8410	180.8410	180.8410	180.8410	180.8410	180.8410	180.8410	180.8410	180.8410	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	56.3087	50.0129	40.6732	30.7923	23.0176	19.4324	20.9974	27.2932	36.6329	46.5139	54.2886	57.8737	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	566.8662	572.7485	557.9253	526.3685	486.5336	449.0945	424.0829	418.2006	433.0238	464.5806	504.4154	541.8546	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	56.0981	56.0981	56.0981	56.0981	56.0981	56.0981	56.0981	56.0981	56.0981	56.0981	56.0981	56.0981	(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)	-120.5607	-120.5607	-120.5607	-120.5607	-120.5607	-120.5607	-120.5607	-120.5607	-120.5607	-120.5607	-120.5607	-120.5607	(71)
Water heating gains (Table 5)	222.7421	219.4773	213.0467	198.7605	190.0515	180.9296	175.2428	179.8138	185.1887	195.3099	208.9944	220.9011	(72)
Total internal gains	965.2955	961.6171	931.0237	875.2997	818.9812	765.8349	736.7015	741.6861	771.2238	825.7828	887.0769	940.0078	(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	
Southeast	12.2800	36.7938	0.7600	0.7000	0.7700	166.5782	(77)
Southwest	14.8200	36.7938	0.7600	0.7000	0.7700	201.0333	(79)
Northwest	7.1600	11.2829	0.7600	0.7000	0.7700	29.7838	(81)
Southwest	2.3600	26.0000	0.7600	0.7000	1.0000	29.3792	(82)
Northwest	1.3200	18.0708	0.7600	0.7000	1.0000	11.4211	(82)

Solar gains	438.1956	771.8158	1119.3563	1486.2821	1750.5190	1774.2692	1695.5299	1493.6999	1246.1435	870.4965	529.5850	371.8904	(83)
Total gains	1403.4912	1733.4329	2050.3800	2361.5818	2569.5001	2540.1042	2432.2314	2235.3859	2017.3673	1696.2794	1416.6619	1311.8983	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	22.2025	22.2866	22.3696	22.7680	22.8442	23.2053	23.2053	23.2735	23.0649	22.8442	22.6907	22.5324	
alpha	2.4802	2.4858	2.4913	2.5179	2.5229	2.5470	2.5470	2.5516	2.5377	2.5229	2.5127	2.5022	
util living area	0.9946	0.9905	0.9824	0.9643	0.9272	0.8571	0.7614	0.8016	0.9182	0.9758	0.9917	0.9955	(86)
MIT	17.4092	17.6877	18.2022	18.9274	19.6532	20.2976	20.6533	20.5850	20.0453	19.1095	18.1508	17.3892	(87)
Th 2	18.6875	18.6931	18.6987	18.7252	18.7302	18.7537	18.7537	18.7581	18.7446	18.7302	18.7201	18.7096	(88)
util rest of house	0.9924	0.9865	0.9742	0.9449	0.8775	0.7266	0.4918	0.5585	0.8349	0.9589	0.9874	0.9937	(89)
MIT 2	15.6655	15.9456	16.4594	17.1877	17.8850	18.4638	18.6951	18.6720	18.2693	17.3790	16.4234	15.6576	(90)
Living area fraction										fLA = Living area / (4) =		0.2824	(91)
MIT	16.1580	16.4376	16.9516	17.6791	18.3844	18.9817	19.2481	19.2123	18.7709	17.8677	16.9113	16.1466	(92)
Temperature adjustment												-0.1500	
adjusted MIT	16.0080	16.2876	16.8016	17.5291	18.2344	18.8317	19.0981	19.0623	18.6209	17.7177	16.7613	15.9966	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9878	0.9793	0.9630	0.9287	0.8611	0.7332	0.5490	0.6061	0.8276	0.9458	0.9809	0.9898	(94)
Useful gains	1386.4310	1697.5013	1974.5315	2193.1067	2212.4923	1862.3527	1335.2644	1354.9434	1669.5223	1604.3217	1389.6307	1298.5215	(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	7664.5246	7426.6702	6693.4968	5508.6370	4157.5408	2650.5379	1564.7178	1662.6594	2848.8979	4528.6663	6188.6088	7609.4883	(97)
Space heating kWh	4670.9016	3850.0015	3510.9101	2387.1818	1447.1161	0.0000	0.0000	0.0000	0.0000	2175.7124	3455.2642	4695.3593	(98a)
Space heating requirement - total per year (kWh/year)												26192.4471	
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	4670.9016	3850.0015	3510.9101	2387.1818	1447.1161	0.0000	0.0000	0.0000	0.0000	2175.7124	3455.2642	4695.3593	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												26192.4471	
Space heating per m2											(98c) / (4) =	125.1431	(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	4670.9016	3850.0015	3510.9101	2387.1818	1447.1161	0.0000	0.0000	0.0000	0.0000	2175.7124	3455.2642	4695.3593	(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)	5560.5972	4583.3351	4179.6549	2841.8831	1722.7573	0.0000	0.0000	0.0000	0.0000	2590.1338	4113.4098	5589.7135	(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	378.0433	334.8599	356.3488	313.9182	304.8949	275.3068	271.7590	281.9871	284.5295	316.6610	336.0789	373.9237	(64)
Efficiency of water heater												74.0000	(216)
(217)m	83.1586	83.1014	82.9669	82.7012	82.0700	74.0000	74.0000	74.0000	74.0000	82.5821	83.0057	83.1710	(217)
Fuel for water heating, kWh/month	454.6053	402.9533	429.5072	379.5814	371.5061	372.0363	367.2419	381.0637	384.4994	383.4498	404.8866	449.5844	(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	49.2867	39.5396	35.6010	26.0829	20.1471	16.4604	18.3789	23.8896	31.0302	40.7133	45.9856	50.6565	(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 31181.4847 (211)

Space heating fuel - main system 2 0.0000 (213)

Space heating fuel - secondary 0.0000 (215)

Efficiency of water heater 74.0000

Water heating fuel used 4780.9153 (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)	397.7719	(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	36401.1719	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	31181.4847	3.6400	1135.0060	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	4780.9153	3.6400	174.0253	(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	397.7719	16.4900	65.5926	(250)
Additional standing charges			92.0000	(251)
Total energy cost			1473.3848	(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] =	2.0858	(257)
SAP value		66.1892	
SAP rating (Section 12)		66	(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	31181.4847	0.2100	6548.1118	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	4780.9153	0.2100	1003.9922	(264)
Space and water heating			7552.1040	(265)
Pumps, fans and electric keep-hot	41.0000	0.1387	5.6872	(267)
Energy for lighting	397.7719	0.1443	57.4108	(268)
Total CO2, kg/year			7615.2020	(272)
CO2 emissions per m2			36.3800	(273)
EI value			59.7482	
EI rating			60	(274)
EI band			D	

SAP 10 WORKSHEET FOR Existing dwelling (SAP) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Basement floor	62.9400 (1a)	x	2.9100 (2a)	=	183.1554	(1a) - (3a)
Ground floor	76.6800 (1b)	x	2.8300 (2b)	=	217.0044	(1b) - (3b)
First floor	46.9400 (1c)	x	2.7800 (2c)	=	130.4932	(1c) - (3c)
Second floor	22.7400 (1d)	x	2.3200 (2d)	=	52.7568	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 209.3000						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		583.4098	(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	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Number of storeys in the dwelling (ns)		4	(9)
Additional infiltration	[(9) - 1] x 0.1 =	0.3000	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0.3500	(11)
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0.0000	(12)
If no draught lobby, enter 0.05, else enter 0		0.0500	(13)
Percentage of windows and doors draught stripped		100.0000	(14)

Window infiltration	0.25 - [0.2 * (14) / 100] =	0.0500 (15)
Pressure test		No
Pressure Test Method		Blower Door
Measured/design AP50		15.0000 (17)
Infiltration rate		0.7500 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.6375 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.5000	4.4000	4.1000	4.1000	3.7000	3.8000	3.7000	3.7000	4.0000	3.9000	4.3000	(22)
Wind factor	1.1500	1.1250	1.1000	1.0250	1.0250	0.9250	0.9500	0.9250	0.9250	1.0000	0.9750	1.0750	(22a)
Adj infilt rate	0.7331	0.7172	0.7013	0.6534	0.6534	0.5897	0.6056	0.5897	0.5897	0.6375	0.6216	0.6853	(22b)
Effective ac	0.7687	0.7572	0.7459	0.7135	0.7135	0.6739	0.6834	0.6739	0.6739	0.7032	0.6932	0.7348	(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	
Exist (Uw = 2.60)			34.2600	2.3551	80.6848			(27)
NW			1.3200	2.3551	3.1087			(27a)
Opening			2.3600	2.3551	5.5580			(27a)
Heatloss Floor 1			24.4900	0.2200	5.3878			(28a)
Heatloss Floor 2			12.4000	1.2000	14.8800			(28b)
Existing walls	161.7000	34.2600	127.4400	1.7000	216.6480			(29a)
Basement	71.9300		71.9300	0.2800	20.1404			(29a)
External Roof 1	28.2500	1.3200	26.9300	0.4000	10.7720			(30)
External Roof 2	29.2800	2.3600	26.9200	0.4000	10.7680			(30)
External Roof unins	24.4900		24.4900	2.3000	56.3270			(30)
Total net area of external elements Aum(A, m2)			352.5400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	424.2746			(33)
Party Wall 1			85.8500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000 (35)
Thermal bridges (Default value 0.200 * total exposed area)	70.5080 (36)
Point Thermal bridges (36a) =	0.0000
Total fabric heat loss (33) + (36) + (36a) =	494.7826 (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	148.0011	145.7761	143.5999	137.3649	137.3649	129.7361	131.5700	129.7361	129.7361	135.3843	133.4527	141.4727	(38)
Heat transfer coeff	642.7838	640.5587	638.3826	632.1475	632.1475	624.5188	626.3526	624.5188	624.5188	630.1670	628.2354	636.2553	(39)
Average = Sum(39)m / 12 =												631.7156	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	3.0711	3.0605	3.0501	3.0203	3.0203	2.9838	2.9926	2.9838	2.9838	3.0108	3.0016	3.0399	(40)
HLP (average)												3.0182	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		3.0140 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	102.7882	101.2435	98.9925	94.6857	91.5075	87.9631	85.9484	88.1823	90.6311	94.4367	98.8360	102.3943	(42a)
Hot water usage for baths	33.9688	33.4643	32.7539	31.4440	30.4632	29.3756	28.7881	29.4936	30.2617	31.4254	32.7623	33.8539	(42b)
Hot water usage for other uses	47.8911	46.1496	44.4081	42.6666	40.9251	39.1836	39.1836	40.9251	42.6666	44.4081	46.1496	47.8911	(42c)
Average daily hot water use (litres/day)												169.7990	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	184.6480	180.8573	176.1545	168.7963	162.8957	156.5223	153.9202	158.6010	163.5594	170.2702	177.7479	184.1394	(44)
Energy conte	292.4373	257.5384	270.7429	231.0738	219.2890	192.4624	186.1531	196.3812	201.6851	231.0551	253.2344	288.3177	(45)
Energy content (annual)										Total = Sum(45)m =		2820.3705	
Distribution loss (46)m = 0.15 x (45)m	43.8656	38.6308	40.6114	34.6611	32.8933	28.8694	27.9230	29.4572	30.2528	34.6583	37.9852	43.2477	(46)

Water storage loss:	
Store volume	210.0000 (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	0.8298 (52)
Temperature factor from Table 2b	0.5400 (53)
Enter (49) or (54) in (55)	1.4290 (55)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Total storage loss	44.2978	40.0109	44.2978	42.8688	44.2978	42.8688	44.2978	44.2978	42.8688	44.2978	42.8688	44.2978	(56)
If cylinder contains dedicated solar storage	44.2978	40.0109	44.2978	42.8688	44.2978	42.8688	44.2978	44.2978	42.8688	44.2978	42.8688	44.2978	(57)
Primary loss	41.3081	37.3106	41.3081	39.9756	41.3081	39.9756	41.3081	41.3081	39.9756	41.3081	39.9756	41.3081	(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	378.0433	334.8599	356.3488	313.9182	304.8949	275.3068	271.7590	281.9871	284.5295	316.6610	336.0789	373.9237	(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	378.0433	334.8599	356.3488	313.9182	304.8949	275.3068	271.7590	281.9871	284.5295	316.6610	336.0789	373.9237	(64)
										Total per year (kWh/year) = Sum(64)m =		3828.3112	(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	165.7202	147.4887	158.5067	143.1076	141.3983	130.2693	130.3806	133.7815	133.3358	145.3106	150.4760	164.3504	(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	180.8410	180.8410	180.8410	180.8410	180.8410	180.8410	180.8410	180.8410	180.8410	180.8410	180.8410	180.8410	(66)

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

	56.3087	50.0129	40.6732	30.7923	23.0176	19.4324	20.9974	27.2932	36.6329	46.5139	54.2886	57.8737	(67)

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

	566.8662	572.7485	557.9253	526.3685	486.5336	449.0945	424.0829	418.2006	433.0238	464.5806	504.4154	541.8546	(68)

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

	56.0981	56.0981	56.0981	56.0981	56.0981	56.0981	56.0981	56.0981	56.0981	56.0981	56.0981	56.0981	(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)

	-120.5607	-120.5607	-120.5607	-120.5607	-120.5607	-120.5607	-120.5607	-120.5607	-120.5607	-120.5607	-120.5607	-120.5607	(71)

Water heating gains (Table 5)

	222.7421	219.4773	213.0467	198.7605	190.0515	180.9296	175.2428	179.8138	185.1887	195.3099	208.9944	220.9011	(72)

Total internal gains

	965.2955	961.6171	931.0237	875.2997	818.9812	765.8349	736.7015	741.6861	771.2238	825.7828	887.0769	940.0078	(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	
Southeast	12.2800	39.1209	0.7600	0.7000	0.7700	177.1137	(77)
Southwest	14.8200	39.1209	0.7600	0.7000	0.7700	213.7480	(79)
Northwest	7.1600	12.4928	0.7600	0.7000	0.7700	32.9774	(81)
Southwest	2.3600	29.0000	0.7600	0.7000	1.0000	32.7691	(82)
Northwest	1.3200	20.1646	0.7600	0.7000	1.0000	12.7444	(82)

Solar gains	469.3526	743.1905	1085.4467	1494.6687	1718.9212	1862.3162	1774.2692	1599.1073	1329.1602	916.4314	585.9563	390.9740	(83)
Total gains	1434.6482	1704.8076	2016.4704	2369.9684	2537.9024	2628.1511	2510.9708	2340.7934	2100.3840	1742.2142	1473.0332	1330.9818	(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, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	22.6121	22.6907	22.7680	22.9926	22.9926	23.2735	23.2053	23.2735	23.2735	23.0649	23.1358	22.8442	
alpha	2.5075	2.5127	2.5179	2.5328	2.5328	2.5516	2.5470	2.5516	2.5516	2.5377	2.5424	2.5229	
util living area	0.9936	0.9898	0.9794	0.9541	0.8978	0.7569	0.5669	0.6216	0.8659	0.9656	0.9891	0.9947	(86)
MIT	17.6876	17.9174	18.5209	19.2557	20.0109	20.6368	20.8974	20.8633	20.3795	19.4500	18.4781	17.6742	(87)
Th 2	18.7149	18.7201	18.7252	18.7399	18.7399	18.7581	18.7537	18.7581	18.7581	18.7446	18.7492	18.7302	(88)
util rest of house	0.9909	0.9852	0.9690	0.9262	0.8156	0.5118	0.1128	0.1739	0.7069	0.9377	0.9829	0.9924	(89)
MIT 2	15.9582	16.1894	16.7906	17.5161	18.2169	18.6851	18.7533	18.7566	18.5470	17.7196	16.7654	15.9534	(90)
Living area fraction									fLA = Living area / (4) =			0.2824	(91)
MIT	16.4466	16.6774	17.2793	18.0074	18.7236	19.2363	19.3588	19.3515	19.0645	18.2083	17.2491	16.4394	(92)
Temperature adjustment												-0.1500	
adjusted MIT	16.2966	16.5274	17.1293	17.8574	18.5736	19.0863	19.2088	19.2015	18.9145	18.0583	17.0991	16.2894	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9856	0.9776	0.9567	0.9091	0.8066	0.5605	0.2227	0.2846	0.7239	0.9233	0.9750	0.9879	(94)
Useful gains	1414.0274	1666.6971	1929.1975	2154.4991	2046.9729	1473.0298	559.1569	666.2939	1520.3647	1608.5561	1436.1717	1314.8728	(95)
Ext temp.	5.2000	5.7000	7.7000	10.2000	13.3000	16.3000	18.3000	18.1000	15.5000	11.9000	8.2000	5.2000	(96)
Heat loss rate W	7132.7304	6935.5775	6019.4909	4840.6179	3333.6733	1740.1022	569.2555	687.9253	2132.4248	3880.7623	5590.7500	7055.6855	(97)
Space heating kWh	4254.7150	3540.6877	3043.1783	1934.0056	957.3050	0.0000	0.0000	0.0000	0.0000	1690.5214	2991.2963	4271.1647	(98a)
Space heating requirement - total per year (kWh/year)												22682.8740	
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	4254.7150	3540.6877	3043.1783	1934.0056	957.3050	0.0000	0.0000	0.0000	0.0000	1690.5214	2991.2963	4271.1647	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												22682.8740	
Space heating per m2											(98c) / (4) =	108.3749	(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	4254.7150	3540.6877	3043.1783	1934.0056	957.3050	0.0000	0.0000	0.0000	0.0000	1690.5214	2991.2963	4271.1647	(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)	5065.1369	4215.1044	3622.8313	2302.3876	1139.6488	0.0000	0.0000	0.0000	0.0000	2012.5255	3561.0671	5084.7199	(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

	378.0433	334.8599	356.3488	313.9182	304.8949	275.3068	271.7590	281.9871	284.5295	316.6610	336.0789	373.9237	(64)

Efficiency of water heater												74.0000	(216)
(217)m	83.0838	83.0305	82.8267	82.4442	81.3447	74.0000	74.0000	74.0000	74.0000	82.2465	82.8689	83.0961	(217)
Fuel for water heating, kWh/month													
	455.0144	403.2974	430.2340	380.7646	374.8185	372.0363	367.2419	381.0637	384.4994	385.0144	405.5549	449.9896	(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	49.2867	39.5396	35.6010	26.0829	20.1471	16.4604	18.3789	23.8896	31.0302	40.7133	45.9856	50.6565	(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	27003.4215	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	74.0000	
Water heating fuel used	4789.5290	(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)	397.7719	(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	32231.7224	(238)

10a. Fuel costs - using BEDF prices (547)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	27003.4215	5.6000	1512.1916	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	4789.5290	5.6000	268.2136	(247)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000	(247a)
Pumps, fans and electric keep-hot	41.0000	26.0600	10.6846	(249)
Energy for lighting	397.7719	26.0600	103.6594	(250)
Additional standing charges			99.0000	(251)
Total energy cost			1993.7492	(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	27003.4215	0.2100	5670.7185	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	4789.5290	0.2100	1005.8011	(264)
Space and water heating			6676.5196	(265)
Pumps, fans and electric keep-hot	41.0000	0.1387	5.6872	(267)
Energy for lighting	397.7719	0.1443	57.4108	(268)
Total CO2, kg/year			6739.6176	(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	27003.4215	1.1300	30513.8663	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	4789.5290	1.1300	5412.1678	(278)
Space and water heating			35926.0340	(279)
Pumps, fans and electric keep-hot	41.0000	1.5128	62.0248	(281)
Energy for lighting	397.7719	1.5338	610.1159	(282)
Total Primary energy kWh/year			36598.1747	(286)

SAP 10 EPC IMPROVEMENTS

Baseline

Current energy efficiency rating:	D 66
Current environmental impact rating:	D 60

N	Solar water heating	SAP increase too small
U	Solar photovoltaic panels	Recommended
V2	Wind turbine	Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
U Solar photovoltaic panels	+ 3.4	-£ 237	-122 kg (1.8%)

Measures omitted - SAP change or cost saving too small:

N Solar water heating	+ 0.7	-£ 50	-255 kg (3.8%)

	Typical annual savings		Energy efficiency	Environmental impact
Recommended measures				
Solar photovoltaic panels	£237	0.58 kg/m²	C 70	D 60
Total Savings	£237	0.58 kg/m²		

Potential energy efficiency rating: C 70
Potential environmental impact rating: D 60

Fuel prices for cost data on this page from database revision number 547 TEST (31 May 2024)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£114	£114	£0
Mains gas	£1879	£1879	£0
Space heating	£1622	£1622	£0
Water heating	£268	£268	£0
Lighting	£104	£104	£0
Generated (PV)	-£0	-£237	£237
Total cost of fuels	£1993	£1756	£237
Total cost of uses	£1994	£1757	£237
Delivered energy	154 kWh/m²	150 kWh/m²	4 kWh/m²
Carbon dioxide emissions	6.7 tonnes	6.6 tonnes	0.1 tonnes
CO2 emissions per m²	32 kg/m²	32 kg/m²	1 kg/m²
Primary energy	175 kWh/m²	168 kWh/m²	6 kWh/m²

SAP 10 WORKSHEET FOR Existing dwelling (SAP) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Basement floor	62.9400	(1a) x	2.9100	(2a) =	183.1554	(1a) - (3a)
Ground floor	76.6800	(1b) x	2.8300	(2b) =	217.0044	(1b) - (3b)
First floor	46.9400	(1c) x	2.7800	(2c) =	130.4932	(1c) - (3c)
Second floor	22.7400	(1d) x	2.3200	(2d) =	52.7568	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	209.3000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	583.4098	(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	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Number of storeys in the dwelling (ns)		4	(9)
Additional infiltration	[(9) - 1] x 0.1 =	0.3000	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0.3500	(11)
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0.0000	(12)
If no draught lobby, enter 0.05, else enter 0		0.0500	(13)
Percentage of windows and doors draught stripped		100.0000	(14)
Window infiltration	0.25 - [0.2 * (14) / 100] =	0.0500	(15)

Pressure test		No	
Pressure Test Method		Blower Door	
Measured/design AP50		15.0000	(17)
Infiltration rate		0.7500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.6375	(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	0.8128	0.7969	0.7809	0.7013	0.6853	0.6056	0.6056	0.5897	0.6375	0.6853	0.7172	0.7491	(22b)
Effective ac	0.8303	0.8175	0.8049	0.7459	0.7348	0.6834	0.6834	0.6739	0.7032	0.7348	0.7572	0.7805	(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	
Exist (Uw = 2.60)			34.2600	2.3551	80.6848			(27)
NW			1.3200	2.3551	3.1087			(27a)
Opening			2.3600	2.3551	5.5580			(27a)
Heatloss Floor 1			24.4900	0.2200	5.3878			(28a)
Heatloss Floor 2			12.4000	1.2000	14.8800			(28b)
Existing walls	161.7000	34.2600	127.4400	1.7000	216.6480			(29a)
Basement	71.9300		71.9300	0.2800	20.1404			(29a)
External Roof 1	28.2500	1.3200	26.9300	0.4000	10.7720			(30)
External Roof 2	29.2800	2.3600	26.9200	0.4000	10.7680			(30)
External Roof unins	24.4900		24.4900	2.3000	56.3270			(30)
Total net area of external elements Aum(A, m2)			352.5400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	424.2746			(33)
Party Wall 1			85.8500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		250.0000 (35)
Thermal bridges (Default value 0.200 * total exposed area)		70.5080 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	494.7826 (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	159.8599	157.3903	154.9697	143.5999	141.4727	131.5700	131.5700	129.7361	135.3843	141.4727	145.7761	150.2751	(38)
Heat transfer coeff	654.6425	652.1730	649.7523	638.3826	636.2553	626.3526	626.3526	624.5188	630.1670	636.2553	640.5587	645.0577	(39)
Average = Sum(39)m / 12 =												638.3724	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	3.1278	3.1160	3.1044	3.0501	3.0399	2.9926	2.9926	2.9838	3.0108	3.0399	3.0605	3.0820	(40)
HLP (average)												3.0500	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		3.0140 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
102.7882	101.2435	98.9925	94.6857	91.5075	87.9631	85.9484	88.1823	90.6311	94.4367	98.8360	102.3943	(42a)

Hot water usage for baths

33.9688	33.4643	32.7539	31.4440	30.4632	29.3756	28.7881	29.4936	30.2617	31.4254	32.7623	33.8539	(42b)

Hot water usage for other uses

47.8911	46.1496	44.4081	42.6666	40.9251	39.1836	39.1836	40.9251	42.6666	44.4081	46.1496	47.8911	(42c)

Average daily hot water use (litres/day)		169.7990 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	184.6480	180.8573	176.1545	168.7963	162.8957	156.5223	153.9202	158.6010	163.5594	170.2702	177.7479	184.1394	(44)
Energy conte	292.4373	257.5384	270.7429	231.0738	219.2890	192.4624	186.1531	196.3812	201.6851	231.0551	253.2344	288.3177	(45)
Energy content (annual)										Total = Sum(45)m =		2820.3705	
Distribution loss (46)m = 0.15 x (45)m													
	43.8656	38.6308	40.6114	34.6611	32.8933	28.8694	27.9230	29.4572	30.2528	34.6583	37.9852	43.2477	(46)

Water storage loss:		
Store volume		210.0000 (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		0.8298 (52)
Temperature factor from Table 2b		0.5400 (53)
Enter (49) or (54) in (55)		1.4290 (55)

Total storage loss

44.2978	40.0109	44.2978	42.8688	44.2978	42.8688	44.2978	44.2978	42.8688	44.2978	42.8688	44.2978	(56)

If cylinder contains dedicated solar storage

44.2978	40.0109	44.2978	42.8688	44.2978	42.8688	44.2978	44.2978	42.8688	44.2978	42.8688	44.2978	(57)
Primary loss 41.3081	37.3106	41.3081	39.9756	41.3081	39.9756	41.3081	41.3081	39.9756	41.3081	39.9756	41.3081	(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

378.0433	334.8599	356.3488	313.9182	304.8949	275.3068	271.7590	281.9871	284.5295	316.6610	336.0789	373.9237	(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

378.0433	334.8599	356.3488	313.9182	304.8949	275.3068	271.7590	281.9871	284.5295	316.6610	336.0789	373.9237	(64)

	Total per year (kWh/year) = Sum(64)m =	3828.3112 (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

165.7202	147.4887	158.5067	143.1076	141.3983	130.2693	130.3806	133.7815	133.3358	145.3106	150.4760	164.3504	(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	180.8410	180.8410	180.8410	180.8410	180.8410	180.8410	180.8410	180.8410	180.8410	180.8410	180.8410	180.8410	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	56.3087	50.0129	40.6732	30.7923	23.0176	19.4324	20.9974	27.2932	36.6329	46.5139	54.2886	57.8737	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	566.8662	572.7485	557.9253	526.3685	486.5336	449.0945	424.0829	418.2006	433.0238	464.5806	504.4154	541.8546	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	56.0981	56.0981	56.0981	56.0981	56.0981	56.0981	56.0981	56.0981	56.0981	56.0981	56.0981	56.0981	(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)	-120.5607	-120.5607	-120.5607	-120.5607	-120.5607	-120.5607	-120.5607	-120.5607	-120.5607	-120.5607	-120.5607	-120.5607	(71)
Water heating gains (Table 5)	222.7421	219.4773	213.0467	198.7605	190.0515	180.9296	175.2428	179.8138	185.1887	195.3099	208.9944	220.9011	(72)
Total internal gains	965.2955	961.6171	931.0237	875.2997	818.9812	765.8349	736.7015	741.6861	771.2238	825.7828	887.0769	940.0078	(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	
Southeast	12.2800	36.7938	0.7600	0.7000	0.7700	166.5782	(77)
Southwest	14.8200	36.7938	0.7600	0.7000	0.7700	201.0333	(79)
Northwest	7.1600	11.2829	0.7600	0.7000	0.7700	29.7838	(81)
Southwest	2.3600	26.0000	0.7600	0.7000	1.0000	29.3792	(82)
Northwest	1.3200	18.0708	0.7600	0.7000	1.0000	11.4211	(82)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	438.1956	771.8158	1119.3563	1486.2821	1750.5190	1774.2692	1695.5299	1493.6999	1246.1435	870.4965	529.5850	371.8904	(83)
Total gains	1403.4912	1733.4329	2050.3800	2361.5818	2569.5001	2540.1042	2432.2314	2235.3859	2017.3673	1696.2794	1416.6619	1311.8983	(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	22.2025	22.2866	22.3696	22.7680	22.8442	23.2053	23.2053	23.2735	23.0649	22.8442	22.6907	22.5324	
alpha	2.4802	2.4858	2.4913	2.5179	2.5229	2.5470	2.5470	2.5516	2.5377	2.5229	2.5127	2.5022	
util living area	0.9946	0.9905	0.9824	0.9643	0.9272	0.8571	0.7614	0.8016	0.9182	0.9758	0.9917	0.9955	(86)
MIT	17.4092	17.6877	18.2022	18.9274	19.6532	20.2976	20.6533	20.5850	20.0453	19.1095	18.1508	17.3892	(87)
Th 2	18.6875	18.6931	18.6987	18.7252	18.7302	18.7537	18.7537	18.7581	18.7446	18.7302	18.7201	18.7096	(88)
util rest of house	0.9924	0.9865	0.9742	0.9449	0.8775	0.7266	0.4918	0.5585	0.8349	0.9589	0.9874	0.9937	(89)
MIT 2	15.6655	15.9456	16.4594	17.1877	17.8850	18.4638	18.6951	18.6720	18.2693	17.3790	16.4234	15.6576	(90)
Living area fraction										fLA = Living area / (4) =		0.2824	(91)
MIT	16.1580	16.4376	16.9516	17.6791	18.3844	18.9817	19.2481	19.2123	18.7709	17.8677	16.9113	16.1466	(92)
Temperature adjustment												-0.1500	
adjusted MIT	16.0080	16.2876	16.8016	17.5291	18.2344	18.8317	19.0981	19.0623	18.6209	17.7177	16.7613	15.9966	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9878	0.9793	0.9630	0.9287	0.8611	0.7332	0.5490	0.6061	0.8276	0.9458	0.9809	0.9898	(94)
Useful gains	1386.4310	1697.5013	1974.5315	2193.1067	2212.4923	1862.3527	1335.2644	1354.9434	1669.5223	1604.3217	1389.6307	1298.5215	(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	7664.5246	7426.6702	6693.4968	5508.6370	4157.5408	2650.5379	1564.7178	1662.6594	2848.8979	4528.6663	6188.6088	7609.4883	(97)
Space heating kWh	4670.9016	3850.0015	3510.9101	2387.1818	1447.1161	0.0000	0.0000	0.0000	0.0000	2175.7124	3455.2642	4695.3593	(98a)
Space heating requirement - total per year (kWh/year)												26192.4471	
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	4670.9016	3850.0015	3510.9101	2387.1818	1447.1161	0.0000	0.0000	0.0000	0.0000	2175.7124	3455.2642	4695.3593	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												26192.4471	
Space heating per m2										(98c) / (4) =		125.1431	(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	4670.9016	3850.0015	3510.9101	2387.1818	1447.1161	0.0000	0.0000	0.0000	0.0000	2175.7124	3455.2642	4695.3593	(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)	5560.5972	4583.3351	4179.6549	2841.8831	1722.7573	0.0000	0.0000	0.0000	0.0000	2590.1338	4113.4098	5589.7135	(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	378.0433	334.8599	356.3488	313.9182	304.8949	275.3068	271.7590	281.9871	284.5295	316.6610	336.0789	373.9237	(64)
Efficiency of water heater												74.0000	(216)
(217)m	83.1586	83.1014	82.9669	82.7012	82.0700	74.0000	74.0000	74.0000	74.0000	82.5821	83.0057	83.1710	(217)
Fuel for water heating, kWh/month	454.6053	402.9533	429.5072	379.5814	371.5061	372.0363	367.2419	381.0637	384.4994	383.4498	404.8866	449.5844	(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	49.2867	39.5396	35.6010	26.0829	20.1471	16.4604	18.3789	23.8896	31.0302	40.7133	45.9856	50.6565	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-36.4016	-53.9776	-81.6304	-96.5755	-108.1007	-102.2163	-100.8165	-93.1417	-80.3205	-63.6820	-40.9044	-31.1527	(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	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	31181.4847	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	74.0000	
Water heating fuel used	4780.9153	(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)	397.7719	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-888.9200	(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	35512.2519	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	31181.4847	3.6400	1135.0060	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	4780.9153	3.6400	174.0253	(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	397.7719	16.4900	65.5926	(250)
Additional standing charges			92.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-888.9200	16.4900	-146.5829	
PV Unit electricity exported	0.0000	5.5900	0.0000	
Total			-146.5829	(252)
Total energy cost			1326.8019	(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] =	1.8783	(257)
SAP value		69.5529	
SAP rating (Section 12)		70	(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	31181.4847	0.2100	6548.1118	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	4780.9153	0.2100	1003.9922	(264)
Space and water heating			7552.1040	(265)
Pumps, fans and electric keep-hot	41.0000	0.1387	5.6872	(267)
Energy for lighting	397.7719	0.1443	57.4108	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-888.9200	0.1336	-118.7417	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-118.7417	(269)
Total CO2, kg/year			7496.4603	(272)
CO2 emissions per m2			35.8200	(273)
EI value			60.3966	
EI rating			60	(274)
EI band			D	

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Basement floor	62.9400 (1a)	x	2.9100 (2a)	=	183.1554	(1a) - (3a)
Ground floor	76.6800 (1b)	x	2.8300 (2b)	=	217.0044	(1b) - (3b)
First floor	46.9400 (1c)	x	2.7800 (2c)	=	130.4932	(1c) - (3c)
Second floor	22.7400 (1d)	x	2.3200 (2d)	=	52.7568	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	209.3000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	583.4098	(5)

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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	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Number of storeys in the dwelling (ns)		4	(9)
Additional infiltration	[(9) - 1] x 0.1 =	0.3000	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0.3500	(11)
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0.0000	(12)
If no draught lobby, enter 0.05, else enter 0		0.0500	(13)
Percentage of windows and doors draught stripped		100.0000	(14)
Window infiltration	0.25 - [0.2 * (14) / 100] =	0.0500	(15)
Pressure test		No	
Pressure Test Method		Blower Door	
Measured/design AP50		15.0000	(17)
Infiltration rate		0.7500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.6375	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.5000	4.4000	4.1000	4.1000	3.7000	3.8000	3.7000	3.7000	4.0000	3.9000	4.3000	(22)
Wind factor	1.1500	1.1250	1.1000	1.0250	1.0250	0.9250	0.9500	0.9250	0.9250	1.0000	0.9750	1.0750	(22a)
Adj infilt rate	0.7331	0.7172	0.7013	0.6534	0.6534	0.5897	0.6056	0.5897	0.5897	0.6375	0.6216	0.6853	(22b)
Effective ac	0.7687	0.7572	0.7459	0.7135	0.7135	0.6739	0.6834	0.6739	0.6739	0.7032	0.6932	0.7348	(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	
Exist (Uw = 2.60)			34.2600	2.3551	80.6848			(27)
NW			1.3200	2.3551	3.1087			(27a)
Opening			2.3600	2.3551	5.5580			(27a)
Heatloss Floor 1			24.4900	0.2200	5.3878			(28a)
Heatloss Floor 2			12.4000	1.2000	14.8800			(28b)
Existing walls	161.7000	34.2600	127.4400	1.7000	216.6480			(29a)
Basement	71.9300		71.9300	0.2800	20.1404			(29a)
External Roof 1	28.2500	1.3200	26.9300	0.4000	10.7720			(30)
External Roof 2	29.2800	2.3600	26.9200	0.4000	10.7680			(30)
External Roof unins	24.4900		24.4900	2.3000	56.3270			(30)
Total net area of external elements Aum(A, m2)			352.5400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		424.2746			(33)
Party Wall 1			85.8500	0.0000	0.0000			(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)
Thermal bridges (Default value 0.200 * total exposed area)							70.5080	(36)
Point Thermal bridges						(36a) =	0.0000	
Total fabric heat loss					(33) + (36) + (36a) =		494.7826	(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	148.0011	145.7761	143.5999	137.3649	137.3649	129.7361	131.5700	129.7361	129.7361	135.3843	133.4527	141.4727	(38)
Heat transfer coeff	642.7838	640.5587	638.3826	632.1475	632.1475	624.5188	626.3526	624.5188	624.5188	630.1670	628.2354	636.2553	(39)
Average = Sum(39)m / 12 =												631.7156	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	3.0711	3.0605	3.0501	3.0203	3.0203	2.9838	2.9926	2.9838	2.9838	3.0108	3.0016	3.0399	(40)
HLP (average)												3.0182	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												3.0140	(42)
Hot water usage for mixer showers	102.7882	101.2435	98.9925	94.6857	91.5075	87.9631	85.9484	88.1823	90.6311	94.4367	98.8360	102.3943	(42a)
Hot water usage for baths	33.9688	33.4643	32.7539	31.4440	30.4632	29.3756	28.7881	29.4936	30.2617	31.4254	32.7623	33.8539	(42b)
Hot water usage for other uses	47.8911	46.1496	44.4081	42.6666	40.9251	39.1836	39.1836	40.9251	42.6666	44.4081	46.1496	47.8911	(42c)
Average daily hot water use (litres/day)												169.7990	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	184.6480	180.8573	176.1545	168.7963	162.8957	156.5223	153.9202	158.6010	163.5594	170.2702	177.7479	184.1394	(44)
Energy conte	292.4373	257.5384	270.7429	231.0738	219.2890	192.4624	186.1531	196.3812	201.6851	231.0551	253.2344	288.3177	(45)
Energy content (annual)										Total = Sum(45)m =		2820.3705	
Distribution loss (46)m = 0.15 x (45)m	43.8656	38.6308	40.6114	34.6611	32.8933	28.8694	27.9230	29.4572	30.2528	34.6583	37.9852	43.2477	(46)
Water storage loss:													
Store volume												210.0000	(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												0.8298	(52)
Temperature factor from Table 2b												0.5400	(53)
Enter (49) or (54) in (55)												1.4290	(55)
Total storage loss	44.2978	40.0109	44.2978	42.8688	44.2978	42.8688	44.2978	44.2978	42.8688	44.2978	42.8688	44.2978	(56)

If cylinder contains dedicated solar storage

	44.2978	40.0109	44.2978	42.8688	44.2978	42.8688	44.2978	44.2978	42.8688	44.2978	42.8688	44.2978	(57)
Primary loss	41.3081	37.3106	41.3081	39.9756	41.3081	39.9756	41.3081	41.3081	39.9756	41.3081	39.9756	41.3081	(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

	378.0433	334.8599	356.3488	313.9182	304.8949	275.3068	271.7590	281.9871	284.5295	316.6610	336.0789	373.9237	(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

	378.0433	334.8599	356.3488	313.9182	304.8949	275.3068	271.7590	281.9871	284.5295	316.6610	336.0789	373.9237	(64)

Total per year (kWh/year) = Sum(64)m = 3828.3112 (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

	165.7202	147.4887	158.5067	143.1076	141.3983	130.2693	130.3806	133.7815	133.3358	145.3106	150.4760	164.3504	(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	180.8410	180.8410	180.8410	180.8410	180.8410	180.8410	180.8410	180.8410	180.8410	180.8410	180.8410	180.8410	(66)

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

	56.3087	50.0129	40.6732	30.7923	23.0176	19.4324	20.9974	27.2932	36.6329	46.5139	54.2886	57.8737	(67)

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

	566.8662	572.7485	557.9253	526.3685	486.5336	449.0945	424.0829	418.2006	433.0238	464.5806	504.4154	541.8546	(68)

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

	56.0981	56.0981	56.0981	56.0981	56.0981	56.0981	56.0981	56.0981	56.0981	56.0981	56.0981	56.0981	(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)

	-120.5607	-120.5607	-120.5607	-120.5607	-120.5607	-120.5607	-120.5607	-120.5607	-120.5607	-120.5607	-120.5607	-120.5607	(71)

Water heating gains (Table 5)

	222.7421	219.4773	213.0467	198.7605	190.0515	180.9296	175.2428	179.8138	185.1887	195.3099	208.9944	220.9011	(72)

Total internal gains

	965.2955	961.6171	931.0237	875.2997	818.9812	765.8349	736.7015	741.6861	771.2238	825.7828	887.0769	940.0078	(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	
Southeast	12.2800	39.1209	0.7600	0.7000	0.7700	177.1137	(77)
Southwest	14.8200	39.1209	0.7600	0.7000	0.7700	213.7480	(79)
Northwest	7.1600	12.4928	0.7600	0.7000	0.7700	32.9774	(81)
Southwest	2.3600	29.0000	0.7600	0.7000	1.0000	32.7691	(82)
Northwest	1.3200	20.1646	0.7600	0.7000	1.0000	12.7444	(82)

Solar gains	469.3526	743.1905	1085.4467	1494.6687	1718.9212	1862.3162	1774.2692	1599.1073	1329.1602	916.4314	585.9563	390.9740	(83)
Total gains	1434.6482	1704.8076	2016.4704	2369.9684	2537.9024	2628.1511	2510.9708	2340.7934	2100.3840	1742.2142	1473.0332	1330.9818	(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, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	22.6121	22.6907	22.7680	22.9926	22.9926	23.2735	23.2053	23.2735	23.2735	23.0649	23.1358	22.8442	
alpha	2.5075	2.5127	2.5179	2.5328	2.5328	2.5516	2.5470	2.5516	2.5516	2.5377	2.5424	2.5229	
util living area	0.9936	0.9898	0.9794	0.9541	0.8978	0.7569	0.5669	0.6216	0.8659	0.9656	0.9891	0.9947	(86)
MIT	17.6876	17.9174	18.5209	19.2557	20.0109	20.6368	20.8974	20.8633	20.3795	19.4500	18.4781	17.6742	(87)
Th 2	18.7149	18.7201	18.7252	18.7399	18.7399	18.7581	18.7537	18.7581	18.7581	18.7446	18.7492	18.7302	(88)
util rest of house	0.9909	0.9852	0.9690	0.9262	0.8156	0.5118	0.1128	0.1739	0.7069	0.9377	0.9829	0.9924	(89)
MIT 2	15.9582	16.1894	16.7906	17.5161	18.2169	18.6851	18.7533	18.7566	18.5470	17.7196	16.7654	15.9534	(90)
Living area fraction									fLA = Living area / (4) =			0.2824	(91)
MIT	16.4466	16.6774	17.2793	18.0074	18.7236	19.2363	19.3588	19.3515	19.0645	18.2083	17.2491	16.4394	(92)
Temperature adjustment												-0.1500	
adjusted MIT	16.2966	16.5274	17.1293	17.8574	18.5736	19.0863	19.2088	19.2015	18.9145	18.0583	17.0991	16.2894	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9856	0.9776	0.9567	0.9091	0.8066	0.5605	0.2227	0.2846	0.7239	0.9233	0.9750	0.9879	(94)
Useful gains	1414.0274	1666.6971	1929.1975	2154.4991	2046.9729	1473.0298	559.1569	666.2939	1520.3647	1608.5561	1436.1717	1314.8728	(95)
Ext temp.	5.2000	5.7000	7.7000	10.2000	13.3000	16.3000	18.3000	18.1000	15.5000	11.9000	8.2000	5.2000	(96)
Heat loss rate W	7132.7304	6935.5775	6019.4909	4840.6179	3333.6733	1740.1022	569.2555	687.9253	2132.4248	3880.7623	5590.7500	7055.6855	(97)
Space heating kWh	4254.7150	3540.6877	3043.1783	1934.0056	957.3050	0.0000	0.0000	0.0000	0.0000	1690.5214	2991.2963	4271.1647	(98a)

Space heating requirement - total per year (kWh/year) 22682.8740

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

	4254.7150	3540.6877	3043.1783	1934.0056	957.3050	0.0000	0.0000	0.0000	0.0000	1690.5214	2991.2963	4271.1647	(98c)

Space heating requirement after solar contribution - total per year (kWh/year) 22682.8740

Space heating per m2 (98c) / (4) = 108.3749 (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													
	4254.7150	3540.6877	3043.1783	1934.0056	957.3050	0.0000	0.0000	0.0000	0.0000	1690.5214	2991.2963	4271.1647	(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)													
	5065.1369	4215.1044	3622.8313	2302.3876	1139.6488	0.0000	0.0000	0.0000	0.0000	2012.5255	3561.0671	5084.7199	(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													
	378.0433	334.8599	356.3488	313.9182	304.8949	275.3068	271.7590	281.9871	284.5295	316.6610	336.0789	373.9237	(64)
Efficiency of water heater												74.0000	(216)
(217)m	83.0838	83.0305	82.8267	82.4442	81.3447	74.0000	74.0000	74.0000	74.0000	82.2465	82.8689	83.0961	(217)
Fuel for water heating, kWh/month													
	455.0144	403.2974	430.2340	380.7646	374.8185	372.0363	367.2419	381.0637	384.4994	385.0144	405.5549	449.9896	(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	49.2867	39.5396	35.6010	26.0829	20.1471	16.4604	18.3789	23.8896	31.0302	40.7133	45.9856	50.6565	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-38.9220	-52.8661	-80.3402	-97.2102	-107.0069	-105.1253	-103.5318	-97.2272	-84.1582	-66.6250	-44.7826	-32.8209	(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												27003.4215	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												74.0000	
Water heating fuel used												4789.5290	(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)												397.7719	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-910.6164	(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												31321.1060	(238)

10a. Fuel costs - using BEDF prices (547)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	27003.4215	5.6000	1512.1916	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	4789.5290	5.6000	268.2136	(247)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000	(247a)
Pumps, fans and electric keep-hot	41.0000	26.0600	10.6846	(249)
Energy for lighting	397.7719	26.0600	103.6594	(250)
Additional standing charges			99.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-910.6164	26.0600	-237.3066	
PV Unit electricity exported	0.0000	5.8100	0.0000	
Total			-237.3066	(252)
Total energy cost			1756.4426	(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	27003.4215	0.2100	5670.7185	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	4789.5290	0.2100	1005.8011	(264)
Space and water heating			6676.5196	(265)
Pumps, fans and electric keep-hot	41.0000	0.1387	5.6872	(267)
Energy for lighting	397.7719	0.1443	57.4108	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-910.6164	0.1335	-121.5577	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-121.5577	(269)
Total CO2, kg/year			6618.0599	(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	27003.4215	1.1300	30513.8663	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	4789.5290	1.1300	5412.1678	(278)
Space and water heating			35926.0340	(279)
Pumps, fans and electric keep-hot	41.0000	1.5128	62.0248	(281)
Energy for lighting	397.7719	1.5338	610.1159	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-910.6164	1.4933	-1359.8057	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-1359.8057	(283)
Total Primary energy kWh/year			35238.3690	(286)

Full SAP Calculation Printout

Property Reference	30 Grove Place	**Issued on Date**	28/06/2024
Assessment Reference	Green	**Prop Type Ref**	Energy assessment
Property	30 Grove Place, LONDON, NW3 1JR		

SAP Rating	78 C	**DER**		**TER**	
Environmental	95 A	**% DER < TER**			N/A
CO_2 Emissions (t/year)	0.75	**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 Existing dwelling (SAP) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Basement floor	62.9400	(1a)	x 2.9100	(2a) =	183.1554	(1a) - (3a)
Ground floor	76.6800	(1b)	x 2.8300	(2b) =	217.0044	(1b) - (3b)
First floor	46.9400	(1c)	x 2.7800	(2c) =	130.4932	(1c) - (3c)
Second floor	22.7400	(1d)	x 2.3200	(2d) =	52.7568	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	209.3000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		583.4098	(5)

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2. Ventilation rate

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		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	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Number of storeys in the dwelling (ns)		4	(9)
Additional infiltration	[(9) - 1] x 0.1 =	0.3000	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0.3500	(11)
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0.0000	(12)
If no draught lobby, enter 0.05, else enter 0		0.0500	(13)
Percentage of windows and doors draught stripped		100.0000	(14)
Window infiltration	0.25 - [0.2 * (14) / 100] =	0.0500	(15)

Pressure test	No	
Pressure Test Method	Blower Door	
Measured/design AP50	15.0000	(17)
Infiltration rate	0.7500	(18)
Number of sides sheltered	2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.6375 (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	0.8128	0.7969	0.7809	0.7013	0.6853	0.6056	0.6056	0.5897	0.6375	0.6853	0.7172	0.7491	(22b)
Effective ac	0.8303	0.8175	0.8049	0.7459	0.7348	0.6834	0.6834	0.6739	0.7032	0.7348	0.7572	0.7805	(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	
Exist (Uw = 1.40)			34.2600	1.3258	45.4205			(27)
NW			1.3200	1.3258	1.7500			(27a)
Opening			2.3600	1.3258	3.1288			(27a)
Heatloss Floor 1			24.4900	0.1800	4.4082			(28a)
Heatloss Floor 2			12.4000	1.2000	14.8800			(28b)
Existing walls	161.7000	34.2600	127.4400	0.3000	38.2320			(29a)
Basement	71.9300		71.9300	0.1800	12.9474			(29a)
External Roof 1	28.2500	1.3200	26.9300	0.4000	10.7720			(30)

External Roof 2	29.2800	2.3600	26.9200	0.4000	10.7680	(30)
External Roof unins	24.4900		24.4900	0.1600	3.9184	(30)
Total net area of external elements Aum(A, m2)			352.5400			(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		146.2252	(33)
Party Wall 1			85.8500	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000 (35)
Thermal bridges (Default value 0.200 * total exposed area)	70.5080 (36)
Point Thermal bridges (36a) =	0.0000
Total fabric heat loss (33) + (36) + (36a) =	216.7332 (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	159.8599	157.3903	154.9697	143.5999	141.4727	131.5700	131.5700	129.7361	135.3843	141.4727	145.7761	150.2751	(38)
Heat transfer coeff	376.5931	374.1236	371.7029	360.3332	358.2059	348.3032	348.3032	346.4694	352.1176	358.2059	362.5093	367.0083	(39)
Average = Sum(39)m / 12 =												360.3230	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.7993	1.7875	1.7759	1.7216	1.7114	1.6641	1.6641	1.6554	1.6824	1.7114	1.7320	1.7535	(40)
HLP (average)												1.7216	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	3.0140 (42)

Hot water usage for mixer showers

74.7550	73.6316	71.9946	68.8624	66.5509	63.9731	62.5079	64.1326	65.9135	68.6812	71.8807	74.4686	(42a)

Hot water usage for baths

33.9688	33.4643	32.7539	31.4440	30.4632	29.3756	28.7881	29.4936	30.2617	31.4254	32.7623	33.8539	(42b)

Hot water usage for other uses

47.8911	46.1496	44.4081	42.6666	40.9251	39.1836	39.1836	40.9251	42.6666	44.4081	46.1496	47.8911	(42c)

Average daily hot water use (litres/day)	143.9534 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	156.6149	153.2455	149.1565	142.9730	137.9392	132.5323	130.4797	134.5513	138.8418	144.5148	150.7926	156.2136	(44)
Energy conte	248.0397	218.2195	229.2480	195.7228	185.6926	162.9640	157.8039	166.6026	171.2059	196.1052	214.8317	244.5928	(45)
Energy content (annual)										Total = Sum(45)m =		2391.0288	
Distribution loss (46)m = 0.15 x (45)m	37.2060	32.7329	34.3872	29.3584	27.8539	24.4446	23.6706	24.9904	25.6809	29.4158	32.2248	36.6889	(46)

Water storage loss:	
Store volume	210.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):	2.0900 (48)
Temperature factor from Table 2b	0.5400 (49)
Enter (49) or (54) in (55)	1.1286 (55)

Total storage loss

34.9866	31.6008	34.9866	33.8580	34.9866	33.8580	34.9866	34.9866	33.8580	34.9866	33.8580	34.9866	(56)

If cylinder contains dedicated solar storage

34.9866	31.6008	34.9866	33.8580	34.9866	33.8580	34.9866	34.9866	33.8580	34.9866	33.8580	34.9866	(57)
Primary loss 41.3081	37.3106	41.3081	39.9756	41.3081	39.9756	41.3081	41.3081	39.9756	41.3081	39.9756	41.3081	(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

324.3344	287.1309	305.5428	269.5564	261.9873	236.7976	234.0986	242.8973	245.0395	272.3999	288.6653	320.8875	(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

324.3344	287.1309	305.5428	269.5564	261.9873	236.7976	234.0986	242.8973	245.0395	272.3999	288.6653	320.8875	(64)
									Total per year (kWh/year) = Sum(64)m =		3289.3376	(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

143.5090	127.6871	137.2607	124.1447	122.7786	113.2524	113.5056	116.4311	115.9928	126.2408	130.4984	142.3629	(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	180.8410	180.8410	180.8410	180.8410	180.8410	180.8410	180.8410	180.8410	180.8410	180.8410	180.8410	180.8410	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	56.3087	50.0129	40.6732	30.7923	23.0176	19.4324	20.9974	27.2932	36.6329	46.5139	54.2886	57.8737	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	566.8662	572.7485	557.9253	526.3685	486.5336	449.0945	424.0829	418.2006	433.0238	464.5806	504.4154	541.8546	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	56.0981	56.0981	56.0981	56.0981	56.0981	56.0981	56.0981	56.0981	56.0981	56.0981	56.0981	56.0981	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-120.5607	-120.5607	-120.5607	-120.5607	-120.5607	-120.5607	-120.5607	-120.5607	-120.5607	-120.5607	-120.5607	-120.5607	(71)
Water heating gains (Table 5)	192.8884	190.0105	184.4903	172.4232	165.0250	157.2950	152.5612	156.4935	161.1011	169.6784	181.2478	191.3480	(72)
Total internal gains	932.4418	929.1504	899.4673	845.9624	790.9546	742.2004	714.0200	718.3657	747.1363	797.1514	856.3303	907.4547	(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	
Southeast	12.2800	36.7938	0.7600	0.7000	0.7700	166.5782	(77)
Southwest	14.8200	36.7938	0.7600	0.7000	0.7700	201.0333	(79)
Northwest	7.1600	11.2829	0.7600	0.7000	0.7700	29.7838	(81)
Southwest	2.3600	26.0000	0.7600	0.7000	1.0000	29.3792	(82)
Northwest	1.3200	18.0708	0.7600	0.7000	1.0000	11.4211	(82)

Solar gains	438.1956	771.8158	1119.3563	1486.2821	1750.5190	1774.2692	1695.5299	1493.6999	1246.1435	870.4965	529.5850	371.8904	(83)
Total gains	1370.6374	1700.9662	2018.8235	2332.2445	2541.4736	2516.4696	2409.5498	2212.0656	1993.2798	1667.6479	1385.9152	1279.3452	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	38.5953	38.8501	39.1031	40.3369	40.5764	41.7301	41.7301	41.9510	41.2780	40.5764	40.0948	39.6033	
alpha	3.5730	3.5900	3.6069	3.6891	3.7051	3.7820	3.7820	3.7967	3.7519	3.7051	3.6730	3.6402	
util living area	0.9966	0.9923	0.9817	0.9511	0.8792	0.7405	0.5888	0.6473	0.8598	0.9712	0.9937	0.9974	(86)
Living	19.2227	19.4220	19.7395	20.1713	20.5345	20.7900	20.8785	20.8618	20.6672	20.1830	19.6443	19.2231	
Non living	17.4430	17.7031	18.1118	18.6776	19.1083	19.3911	19.4510	19.4505	19.2789	18.7073	18.0160	17.4661	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	11	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	20	28	7	0	0	0	0	0	0	0	0	31	
MIT	20.3506	20.1063	19.8629	20.1713	20.5345	20.7900	20.8785	20.8618	20.6672	20.1830	19.6443	19.9936	(87)
Th 2	19.4705	19.4788	19.4869	19.5254	19.5326	19.5666	19.5666	19.5730	19.5535	19.5326	19.5180	19.5027	(88)
util rest of house	0.9954	0.9895	0.9745	0.9304	0.8246	0.6250	0.4187	0.4788	0.7746	0.9551	0.9908	0.9965	(89)
MIT 2	18.8931	18.6950	18.2853	18.6776	19.1083	19.3911	19.4510	19.4505	19.2789	18.7073	18.0160	18.6038	(90)
Living area fraction										fLA = Living area / (4) =		0.2824	(91)
MIT	19.3047	19.0936	18.7308	19.0995	19.5111	19.7862	19.8541	19.8491	19.6710	19.1240	18.4759	18.9963	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3047	19.0936	18.7308	19.0995	19.5111	19.7862	19.8541	19.8491	19.6710	19.1240	18.4759	18.9963	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9952	0.9885	0.9695	0.9226	0.8236	0.6451	0.4556	0.5149	0.7832	0.9488	0.9878	0.9960	(94)
Useful gains	1364.0473	1681.4498	1957.3127	2151.6430	2093.1155	1623.4153	1097.8164	1139.0556	1561.1263	1582.1884	1369.0451	1274.2710	(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	5650.6792	5310.1600	4546.2313	3675.2094	2797.9842	1806.3678	1133.4229	1195.0095	1961.6439	3053.3555	4123.8673	5430.3651	(97)
Space heating kWh	3189.2541	2438.4932	1926.1554	1096.9678	524.4223	0.0000	0.0000	0.0000	0.0000	1094.5483	1983.4720	3092.1340	(98a)
Space heating requirement - total per year (kWh/year)												15345.4473	
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	3189.2541	2438.4932	1926.1554	1096.9678	524.4223	0.0000	0.0000	0.0000	0.0000	1094.5483	1983.4720	3092.1340	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												15345.4473	
Space heating per m2											(98c) / (4) =	73.3180	(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 %) 349.9356 (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	3189.2541	2438.4932	1926.1554	1096.9678	524.4223	0.0000	0.0000	0.0000	0.0000	1094.5483	1983.4720	3092.1340	(98)
Space heating efficiency (main heating system 1)	349.9356	349.9356	349.9356	349.9356	349.9356	0.0000	0.0000	0.0000	0.0000	349.9356	349.9356	349.9356	(210)
Space heating fuel (main heating system)	911.3830	696.8405	550.4313	313.4770	149.8625	0.0000	0.0000	0.0000	0.0000	312.7856	566.8105	883.6293	(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	324.3344	287.1309	305.5428	269.5564	261.9873	236.7976	234.0986	242.8973	245.0395	272.3999	288.6653	320.8875	(64)
Efficiency of water heater												178.4829	(216)
(217)m	178.4829	178.4829	178.4829	178.4829	178.4829	178.4829	178.4829	178.4829	178.4829	178.4829	178.4829	178.4829	(217)
Fuel for water heating, kWh/month	181.7174	160.8731	171.1889	151.0265	146.7857	132.6725	131.1603	136.0900	137.2902	152.6197	161.7328	179.7862	(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	49.2867	39.5396	35.6010	26.0829	20.1471	16.4604	18.3789	23.8896	31.0302	40.7133	45.9856	50.6565	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-26.2440	-41.2754	-65.3822	-79.8104	-89.7708	-81.0843	-79.9977	-72.6851	-60.6000	-48.8971	-29.9650	-22.1796	(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	-3.8079	-8.8725	-20.0255	-34.6528	-51.6389	-57.9439	-57.1932	-47.1793	-33.2779	-15.2104	-5.6809	-2.9687	(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 4385.2198 (211)

Space heating fuel - main system 2 0.0000 (213)

Space heating fuel - secondary 0.0000 (215)

Efficiency of water heater 178.4829

Water heating fuel used 1842.9432 (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)	397.7719	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1036.3436	(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	5589.5913	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	4385.2198	16.4900	723.1227	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1842.9432	16.4900	303.9013	(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	397.7719	16.4900	65.5926	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-697.8918	16.4900	-115.0824	
PV Unit electricity exported	-338.4519	5.5900	-18.9195	
Total			-134.0018	(252)
Total energy cost			958.6149	(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] =	1.3571	(257)
SAP value		78.0020	
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	4385.2198	0.1553	681.0338	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1842.9432	0.1408	259.4781	(264)
Space and water heating			940.5119	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	397.7719	0.1443	57.4108	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-697.8918	0.1334	-93.0818	
PV Unit electricity exported	-338.4519	0.1211	-40.9959	
Total			-134.0777	(269)
Total CO2, kg/year			863.8450	(272)
CO2 emissions per m2			4.1300	(273)
EI value			95.4481	
EI rating			95	(274)
EI band			A	

SAP 10 WORKSHEET FOR Existing dwelling (SAP) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Basement floor	62.9400	(1a)	x 2.9100	(2a) =	183.1554	(1a) - (3a)
Ground floor	76.6800	(1b)	x 2.8300	(2b) =	217.0044	(1b) - (3b)
First floor	46.9400	(1c)	x 2.7800	(2c) =	130.4932	(1c) - (3c)
Second floor	22.7400	(1d)	x 2.3200	(2d) =	52.7568	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	209.3000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		583.4098	(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	0 * 10 =	0.0000	(7a)

Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Number of storeys in the dwelling (ns)		4 (9)
Additional infiltration	[(9) - 1] x 0.1 =	0.3000 (10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0.3500 (11)
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0.0000 (12)
If no draught lobby, enter 0.05, else enter 0		0.0500 (13)
Percentage of windows and doors draught stripped		100.0000 (14)
Window infiltration	0.25 - [0.2 * (14) / 100] =	0.0500 (15)
Pressure test		No
Pressure Test Method		Blower Door
Measured/design AP50		15.0000 (17)
Infiltration rate		0.7500 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.6375 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.5000	4.4000	4.1000	4.1000	3.7000	3.8000	3.7000	3.7000	4.0000	3.9000	4.3000	(22)
Wind factor	1.1500	1.1250	1.1000	1.0250	1.0250	0.9250	0.9500	0.9250	0.9250	1.0000	0.9750	1.0750	(22a)
Adj infilt rate	0.7331	0.7172	0.7013	0.6534	0.6534	0.5897	0.6056	0.5897	0.5897	0.6375	0.6216	0.6853	(22b)
Effective ac	0.7687	0.7572	0.7459	0.7135	0.7135	0.6739	0.6834	0.6739	0.6739	0.7032	0.6932	0.7348	(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	
Exist (Uw = 1.40)			34.2600	1.3258	45.4205			(27)
NW			1.3200	1.3258	1.7500			(27a)
Opening			2.3600	1.3258	3.1288			(27a)
Heatloss Floor 1			24.4900	0.1800	4.4082			(28a)
Heatloss Floor 2			12.4000	1.2000	14.8800			(28b)
Existing walls	161.7000	34.2600	127.4400	0.3000	38.2320			(29a)
Basement	71.9300		71.9300	0.1800	12.9474			(29a)
External Roof 1	28.2500	1.3200	26.9300	0.4000	10.7720			(30)
External Roof 2	29.2800	2.3600	26.9200	0.4000	10.7680			(30)
External Roof unins	24.4900		24.4900	0.1600	3.9184			(30)
Total net area of external elements Aum(A, m2)			352.5400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	146.2252			(33)
Party Wall 1			85.8500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		250.0000 (35)
Thermal bridges (Default value 0.200 * total exposed area)		70.5080 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	216.7332 (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	148.0011	145.7761	143.5999	137.3649	137.3649	129.7361	131.5700	129.7361	129.7361	135.3843	133.4527	141.4727	(38)
Heat transfer coeff	364.7343	362.5093	360.3332	354.0981	354.0981	346.4694	348.3032	346.4694	346.4694	352.1176	350.1860	358.2059	(39)
Average = Sum(39)m / 12 =												353.6662	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.7426	1.7320	1.7216	1.6918	1.6918	1.6554	1.6641	1.6554	1.6554	1.6824	1.6731	1.7114	(40)
HLP (average)												1.6898	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		3.0140 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	74.7550	73.6316	71.9946	68.8624	66.5509	63.9731	62.5079	64.1326	65.9135	68.6812	71.8807	74.4686	(42a)
Hot water usage for baths	33.9688	33.4643	32.7539	31.4440	30.4632	29.3756	28.7881	29.4936	30.2617	31.4254	32.7623	33.8539	(42b)
Hot water usage for other uses	47.8911	46.1496	44.4081	42.6666	40.9251	39.1836	39.1836	40.9251	42.6666	44.4081	46.1496	47.8911	(42c)
Average daily hot water use (litres/day)												143.9534	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	156.6149	153.2455	149.1565	142.9730	137.9392	132.5323	130.4797	134.5513	138.8418	144.5148	150.7926	156.2136	(44)
Energy conte	248.0397	218.2195	229.2480	195.7228	185.6926	162.9640	157.8039	166.6026	171.2059	196.1052	214.8317	244.5928	(45)
Energy content (annual)										Total = Sum(45)m =		2391.0288	
Distribution loss (46)m = 0.15 x (45)m	37.2060	32.7329	34.3872	29.3584	27.8539	24.4446	23.6706	24.9904	25.6809	29.4158	32.2248	36.6889	(46)
Water storage loss:													
Store volume												210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												2.0900	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												1.1286	(55)
Total storage loss	34.9866	31.6008	34.9866	33.8580	34.9866	33.8580	34.9866	34.9866	33.8580	34.9866	33.8580	34.9866	(56)
If cylinder contains dedicated solar storage	34.9866	31.6008	34.9866	33.8580	34.9866	33.8580	34.9866	34.9866	33.8580	34.9866	33.8580	34.9866	(57)
Primary loss	41.3081	37.3106	41.3081	39.9756	41.3081	39.9756	41.3081	41.3081	39.9756	41.3081	39.9756	41.3081	(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	324.3344	287.1309	305.5428	269.5564	261.9873	236.7976	234.0986	242.8973	245.0395	272.3999	288.6653	320.8875	(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	324.3344	287.1309	305.5428	269.5564	261.9873	236.7976	234.0986	242.8973	245.0395	272.3999	288.6653	320.8875	(64)
										Total per year (kWh/year) = Sum(64)m =		3289.3376	(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

143.5090	127.6871	137.2607	124.1447	122.7786	113.2524	113.5056	116.4311	115.9928	126.2408	130.4984	142.3629	(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	180.8410	180.8410	180.8410	180.8410	180.8410	180.8410	180.8410	180.8410	180.8410	180.8410	180.8410	180.8410	(66)

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

56.3087	50.0129	40.6732	30.7923	23.0176	19.4324	20.9974	27.2932	36.6329	46.5139	54.2886	57.8737	(67)

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

566.8662	572.7485	557.9253	526.3685	486.5336	449.0945	424.0829	418.2006	433.0238	464.5806	504.4154	541.8546	(68)

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

56.0981	56.0981	56.0981	56.0981	56.0981	56.0981	56.0981	56.0981	56.0981	56.0981	56.0981	56.0981	(69)

Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

Losses e.g. evaporation (negative values) (Table 5)

-120.5607	-120.5607	-120.5607	-120.5607	-120.5607	-120.5607	-120.5607	-120.5607	-120.5607	-120.5607	-120.5607	-120.5607	(71)

Water heating gains (Table 5)

192.8884	190.0105	184.4903	172.4232	165.0250	157.2950	152.5612	156.4935	161.1011	169.6784	181.2478	191.3480	(72)

Total internal gains

932.4418	929.1504	899.4673	845.9624	790.9546	742.2004	714.0200	718.3657	747.1363	797.1514	856.3303	907.4547	(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	
Southeast	12.2800	39.1209	0.7600	0.7000	0.7700	177.1137	(77)
Southwest	14.8200	39.1209	0.7600	0.7000	0.7700	213.7480	(79)
Northwest	7.1600	12.4928	0.7600	0.7000	0.7700	32.9774	(81)
Southwest	2.3600	29.0000	0.7600	0.7000	1.0000	32.7691	(82)
Northwest	1.3200	20.1646	0.7600	0.7000	1.0000	12.7444	(82)

Solar gains	469.3526	743.1905	1085.4467	1494.6687	1718.9212	1862.3162	1774.2692	1599.1073	1329.1602	916.4314	585.9563	390.9740	(83)
Total gains	1401.7944	1672.3409	1984.9139	2340.6312	2509.8758	2604.5166	2488.2892	2317.4730	2076.2965	1713.5828	1442.2866	1298.4287	(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, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	39.8502	40.0948	40.3369	41.0472	41.0472	41.9510	41.7301	41.9510	41.9510	41.2780	41.5057	40.5764	
alpha	3.6567	3.6730	3.6891	3.7365	3.7365	3.7967	3.7820	3.7967	3.7967	3.7519	3.7670	3.7051	
util living area													
	0.9957	0.9914	0.9770	0.9313	0.8202	0.5812	0.3720	0.4231	0.7563	0.9532	0.9905	0.9967	(86)
Living	19.4016	19.5656	19.9238	20.3426	20.6840	20.8784	20.9132	20.9102	20.8008	20.3677	19.8471	19.3954	
Non living	17.7001	17.9143	18.3729	18.9015	19.2777	19.4562	19.4618	19.4682	19.4129	18.9490	18.3047	17.7080	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	10	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	21	28	3	0	0	0	0	0	0	0	0	31	
MIT	20.3868	20.1876	19.9689	20.3426	20.6840	20.8784	20.9132	20.9102	20.8008	20.3677	19.8471	20.0912	(87)
Th 2	19.5104	19.5180	19.5254	19.5467	19.5467	19.5730	19.5666	19.5730	19.5730	19.5535	19.5602	19.5326	(88)
util rest of house													
	0.9940	0.9881	0.9672	0.9005	0.7364	0.4247	0.1771	0.2197	0.6201	0.9246	0.9859	0.9954	(89)
MIT 2	18.9691	18.8101	18.4352	18.9015	19.2777	19.4562	19.4618	19.4682	19.4129	18.9490	18.3047	18.7273	(90)
Living area fraction										fLA = Living area / (4) =		0.2824	(91)
MIT	19.3695	19.1992	18.8684	19.3085	19.6748	19.8579	19.8717	19.8754	19.8049	19.3497	18.7403	19.1125	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3695	19.1992	18.8684	19.3085	19.6748	19.8579	19.8717	19.8754	19.8049	19.3497	18.7403	19.1125	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9938	0.9872	0.9612	0.8940	0.7452	0.4583	0.2194	0.2642	0.6459	0.9191	0.9821	0.9949	(94)
Useful gains	1393.1203	1650.8681	1907.9558	2092.5170	1870.2969	1193.6824	546.0259	612.1855	1341.0875	1574.9994	1416.4961	1291.8386	(95)
Ext temp.	5.2000	5.7000	7.7000	10.2000	13.3000	16.3000	18.3000	18.1000	15.5000	11.9000	8.2000	5.2000	(96)
Heat loss rate W													
	5168.1012	4893.5720	4024.3353	3225.3066	2257.3169	1232.6897	547.4182	615.1275	1491.4994	2623.1665	3691.0797	4983.5327	(97)
Space heating kWh													
	2808.5857	2179.0970	1574.5864	815.6085	287.9429	0.0000	0.0000	0.0000	0.0000	779.8363	1637.7003	2746.6204	(98a)
Space heating requirement - total per year (kWh/year)												12829.9775	
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													
	2808.5857	2179.0970	1574.5864	815.6085	287.9429	0.0000	0.0000	0.0000	0.0000	779.8363	1637.7003	2746.6204	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												12829.9775	
Space heating per m2											(98c) / (4) =	61.2995	(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 %)	348.2253	(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												

	2808.5857	2179.0970	1574.5864	815.6085	287.9429	0.0000	0.0000	0.0000	0.0000	779.8363	1637.7003	2746.6204 (98)
Space heating efficiency (main heating system 1)												
	348.2253	348.2253	348.2253	348.2253	348.2253	0.0000	0.0000	0.0000	0.0000	348.2253	348.2253	348.2253 (210)
Space heating fuel (main heating system)												
	806.5427	625.7722	452.1746	234.2186	82.6887	0.0000	0.0000	0.0000	0.0000	223.9459	470.2990	788.7481 (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												
	324.3344	287.1309	305.5428	269.5564	261.9873	236.7976	234.0986	242.8973	245.0395	272.3999	288.6653	320.8875 (64)
Efficiency of water heater												178.4138 (216)
(217)m	178.4138	178.4138	178.4138	178.4138	178.4138	178.4138	178.4138	178.4138	178.4138	178.4138	178.4138	178.4138 (217)
Fuel for water heating, kWh/month												
	181.7877	160.9354	171.2551	151.0850	146.8425	132.7238	131.2110	136.1427	137.3433	152.6787	161.7954	179.8558 (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	49.2867	39.5396	35.6010	26.0829	20.1471	16.4604	18.3789	23.8896	31.0302	40.7133	45.9856	50.6565 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-28.1360	-40.0678	-63.3826	-79.0538	-86.5225	-83.9828	-82.7038	-76.6181	-64.0404	-50.7552	-32.9199	-23.3950 (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	-4.4291	-8.7569	-20.1497	-36.5665	-52.5238	-61.9796	-60.9587	-52.0924	-36.7932	-17.4374	-6.9788	-3.3528 (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	3684.3898 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	178.4138
Water heating fuel used	1843.6564 (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)	397.7719 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-1073.5968 (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	4852.2213 (238)

10a. Fuel costs - using BEDF prices (547)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3684.3898	26.0600	960.1520	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1843.6564	26.0600	480.4569	(247)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000	(247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(249)
Energy for lighting	397.7719	26.0600	103.6594	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-711.5780	26.0600	-185.4372	
PV Unit electricity exported	-362.0189	5.8100	-21.0333	
Total			-206.4705	(252)
Total energy cost			1337.7977	(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	3684.3898	0.1561	575.2186	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1843.6564	0.1408	259.5785	(264)
Space and water heating			834.7971	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	397.7719	0.1443	57.4108	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-711.5780	0.1332	-94.7594	
PV Unit electricity exported	-362.0189	0.1208	-43.7445	
Total			-138.5040	(269)
Total CO2, kg/year			753.7040	(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	3684.3898	1.5780	5813.9513	(275)
Total CO2 associated with community systems			0.0000	(473)

Water heating (other fuel)	1843.6564	1.5206	2803.4741	(278)
Space and water heating			8617.4254	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	397.7719	1.5338	610.1159	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-711.5780	1.4921	-1061.7352	
PV Unit electricity exported	-362.0189	0.4432	-160.4377	
Total			-1222.1730	(283)
Total Primary energy kWh/year			8005.3683	(286)

SAP 10 EPC IMPROVEMENTS

Green

Current energy efficiency rating: C 78
Current environmental impact rating: A 95

N Solar water heating — Recommended
U Solar photovoltaic panels — Already installed
V2 Wind turbine — Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
N Solar water heating	+ 1.3	-£ 93	-45 kg (6.0%)

	Typical annual savings		Energy efficiency	Environmental impact
Recommended measures				
Solar water heating	£93	0.22 kg/m²	C 79	A 96
Total Savings	£93	0.22 kg/m²		

Potential energy efficiency rating: C 79
Potential environmental impact rating: A 96

Fuel prices for cost data on this page from database revision number 547 TEST (31 May 2024)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£1544	£1448	£96
Space heating	£960	£982	-£22
Water heating	£480	£363	£118
Lighting	£104	£104	£0
Generated (PV)	-£206	-£204	-£3
Total cost of fuels	£1338	£1244	£93
Total cost of uses	£1338	£1245	£93
Delivered energy	23 kWh/m²	21 kWh/m²	2 kWh/m²
Carbon dioxide emissions	0.8 tonnes	0.7 tonnes	0.0 tonnes
CO2 emissions per m²	4 kg/m²	3 kg/m²	0 kg/m²
Primary energy	38 kWh/m²	36 kWh/m²	2 kWh/m²

SAP 10 WORKSHEET FOR Existing dwelling (SAP) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Basement floor	62.9400 (1a)	x	2.9100 (2a)	=	183.1554	(1a) - (3a)
Ground floor	76.6800 (1b)	x	2.8300 (2b)	=	217.0044	(1b) - (3b)
First floor	46.9400 (1c)	x	2.7800 (2c)	=	130.4932	(1c) - (3c)
Second floor	22.7400 (1d)	x	2.3200 (2d)	=	52.7568	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	209.3000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	583.4098	(5)

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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	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Number of storeys in the dwelling (ns)		4	(9)
Additional infiltration	[(9) - 1] x 0.1 =	0.3000	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0.3500	(11)

If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0	0.0000	(12)
If no draught lobby, enter 0.05, else enter 0	0.0500	(13)
Percentage of windows and doors draught stripped	100.0000	(14)
Window infiltration 0.25 - [0.2 * (14) / 100] =	0.0500	(15)
Pressure test	No	
Pressure Test Method	Blower Door	
Measured/design AP50	15.0000	(17)
Infiltration rate	0.7500	(18)
Number of sides sheltered	2	(19)
Shelter factor (20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) =	0.6375	(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	0.8128	0.7969	0.7809	0.7013	0.6853	0.6056	0.6056	0.5897	0.6375	0.6853	0.7172	0.7491	(22b)
Effective ac	0.8303	0.8175	0.8049	0.7459	0.7348	0.6834	0.6834	0.6739	0.7032	0.7348	0.7572	0.7805	(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	
Exist (Uw = 1.40)			34.2600	1.3258	45.4205			(27)
NW			1.3200	1.3258	1.7500			(27a)
Opening			2.3600	1.3258	3.1288			(27a)
Heatloss Floor 1			24.4900	0.1800	4.4082			(28a)
Heatloss Floor 2			12.4000	1.2000	14.8800			(28b)
Existing walls	161.7000	34.2600	127.4400	0.3000	38.2320			(29a)
Basement	71.9300		71.9300	0.1800	12.9474			(29a)
External Roof 1	28.2500	1.3200	26.9300	0.4000	10.7720			(30)
External Roof 2	29.2800	2.3600	26.9200	0.4000	10.7680			(30)
External Roof unins	24.4900		24.4900	0.1600	3.9184			(30)
Total net area of external elements Aum(A, m2)			352.5400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		146.2252			(33)
Party Wall 1			85.8500	0.0000	0.0000			(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)
Thermal bridges (Default value 0.200 * total exposed area)							70.5080	(36)
Point Thermal bridges						(36a) =	0.0000	
Total fabric heat loss					(33) + (36) + (36a) =		216.7332	(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	159.8599	157.3903	154.9697	143.5999	141.4727	131.5700	131.5700	129.7361	135.3843	141.4727	145.7761	150.2751	(38)
Heat transfer coeff	376.5931	374.1236	371.7029	360.3332	358.2059	348.3032	348.3032	346.4694	352.1176	358.2059	362.5093	367.0083	(39)
Average = Sum(39)m / 12 =												360.3230	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.7993	1.7875	1.7759	1.7216	1.7114	1.6641	1.6641	1.6554	1.6824	1.7114	1.7320	1.7535	(40)
HLP (average)												1.7216	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	3.0140	(42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	74.7550	73.6316	71.9946	68.8624	66.5509	63.9731	62.5079	64.1326	65.9135	68.6812	71.8807	74.4686	(42a)
Hot water usage for baths	33.9688	33.4643	32.7539	31.4440	30.4632	29.3756	28.7881	29.4936	30.2617	31.4254	32.7623	33.8539	(42b)
Hot water usage for other uses	47.8911	46.1496	44.4081	42.6666	40.9251	39.1836	39.1836	40.9251	42.6666	44.4081	46.1496	47.8911	(42c)
Average daily hot water use (litres/day)												143.9534	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	156.6149	153.2455	149.1565	142.9730	137.9392	132.5323	130.4797	134.5513	138.8418	144.5148	150.7926	156.2136	(44)
Energy conte	248.0397	218.2195	229.2480	195.7228	185.6926	162.9640	157.8039	166.6026	171.2059	196.1052	214.8317	244.5928	(45)
Energy content (annual)										Total = Sum(45)m =		2391.0288	
Distribution loss (46)m = 0.15 x (45)m	37.2060	32.7329	34.3872	29.3584	27.8539	24.4446	23.6706	24.9904	25.6809	29.4158	32.2248	36.6889	(46)
Water storage loss:													
Store volume												210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												2.0900	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												1.1286	(55)
Total storage loss	34.9866	31.6008	34.9866	33.8580	34.9866	33.8580	34.9866	34.9866	33.8580	34.9866	33.8580	34.9866	(56)
If cylinder contains dedicated solar storage	34.9866	31.6008	34.9866	33.8580	34.9866	33.8580	34.9866	34.9866	33.8580	34.9866	33.8580	34.9866	(57)
Primary loss	41.3081	37.3106	38.8296	27.9829	18.5887	17.5893	18.1756	19.8279	30.3815	38.8296	39.9756	41.3081	(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	324.3344	287.1309	303.0643	257.5638	239.2679	214.4112	210.9661	221.4171	235.4453	269.9214	288.6653	320.8875	(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)
Aperture area of solar collector												3.0000	(H1)
Zero-loss collector efficiency												0.8000	(H2)
Collector linear heat loss coefficient												1.8000	(H3)
Collector 2nd order heat loss coefficient												0.0000	(H4)
Collector loop efficiency												0.9000	(H5)
Incidence angle modifier												1.0000	(H6)
Overshading factor												0.8000	(H8)
Overall heat loss coefficient of system												6.5000	(H10)
Heat loss coefficient of collector loop												3.9667	(H11)
Dedicated solar storage volume												75.0000	(H12)
Effective solar volume												75.0000	(H14)
Reference volume												225.0000	(H15)
Storage tank correction coefficient												1.3161	(H16)
Heat delivered to hot water												644.2686	(H24)

Heat delivered to space heating												0.0000	(H29)
Solar input												644.2686	
Solar input	-0.0000	-16.1738	-59.5433	-82.7771	-109.1606	-100.9191	-100.3833	-87.0587	-59.3919	-28.8609	-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	324.3344	270.9571	243.5209	174.7867	130.1072	113.4921	110.5828	134.3584	176.0534	241.0606	288.6653	320.8875	(64)
Total per year (kWh/year) = Sum(64)m =												2528.8065	(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	143.5090	127.6871	135.2780	114.5506	104.6030	95.3433	94.9995	99.2470	108.3175	124.2580	130.4984	142.3629	(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	180.8410	180.8410	180.8410	180.8410	180.8410	180.8410	180.8410	180.8410	180.8410	180.8410	180.8410	180.8410	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	56.3087	50.0129	40.6732	30.7923	23.0176	19.4324	20.9974	27.2932	36.6329	46.5139	54.2886	57.8737	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	566.8662	572.7485	557.9253	526.3685	486.5336	449.0945	424.0829	418.2006	433.0238	464.5806	504.4154	541.8546	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	56.0981	56.0981	56.0981	56.0981	56.0981	56.0981	56.0981	56.0981	56.0981	56.0981	56.0981	56.0981	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-120.5607	-120.5607	-120.5607	-120.5607	-120.5607	-120.5607	-120.5607	-120.5607	-120.5607	-120.5607	-120.5607	-120.5607	(71)
Water heating gains (Table 5)	192.8884	190.0105	181.8252	159.0980	140.5954	132.4213	127.6875	133.3965	150.4410	167.0134	181.2478	191.3480	(72)
Total internal gains	932.4418	929.1504	896.8022	832.6372	766.5251	717.3267	689.1463	695.2687	736.4761	794.4863	856.3303	907.4547	(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	
Southeast	12.2800	36.7938	0.7600	0.7000	0.7700	166.5782	(77)
Southwest	14.8200	36.7938	0.7600	0.7000	0.7700	201.0333	(79)
Northwest	7.1600	11.2829	0.7600	0.7000	0.7700	29.7838	(81)
Southwest	2.3600	26.0000	0.7600	0.7000	1.0000	29.3792	(82)
Northwest	1.3200	18.0708	0.7600	0.7000	1.0000	11.4211	(82)

Solar gains	438.1956	771.8158	1119.3563	1486.2821	1750.5190	1774.2692	1695.5299	1493.6999	1246.1435	870.4965	529.5850	371.8904	(83)
Total gains	1370.6374	1700.9662	2016.1585	2318.9193	2517.0441	2491.5959	2384.6761	2188.9686	1982.6196	1664.9829	1385.9152	1279.3452	(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, ni1,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	38.5953	38.8501	39.1031	40.3369	40.5764	41.7301	41.7301	41.9510	41.2780	40.5764	40.0948	39.6033	
alpha	3.5730	3.5900	3.6069	3.6891	3.7051	3.7820	3.7820	3.7967	3.7519	3.7051	3.6730	3.6402	
util living area	0.9966	0.9923	0.9818	0.9519	0.8819	0.7448	0.5936	0.6522	0.8615	0.9714	0.9937	0.9974	(86)
Living	19.2227	19.4220	19.7386	20.1675	20.5294	20.7873	20.8774	20.8603	20.6651	20.1822	19.6443	19.2231	
Non living	17.4430	17.7031	18.1108	18.6732	19.1032	19.3893	19.4506	19.4500	19.2772	18.7063	18.0160	17.4661	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	11	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	20	28	7	0	0	0	0	0	0	0	0	31	
MIT	20.3506	20.1063	19.8621	20.1675	20.5294	20.7873	20.8774	20.8603	20.6651	20.1822	19.6443	19.9936	(87)
Th 2	19.4705	19.4788	19.4869	19.5254	19.5326	19.5666	19.5666	19.5730	19.5535	19.5326	19.5180	19.5027	(88)
util rest of house	0.9954	0.9895	0.9746	0.9315	0.8280	0.6296	0.4227	0.4832	0.7768	0.9553	0.9908	0.9965	(89)
MIT 2	18.8931	18.6950	18.2843	18.6732	19.1032	19.3893	19.4506	19.4500	19.2772	18.7063	18.0160	18.6038	(90)
Living area fraction										fLA = Living area / (4) =		0.2824	(91)
MIT	19.3047	19.0936	18.7299	19.0952	19.5059	19.7841	19.8536	19.8483	19.6691	19.1231	18.4759	18.9963	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3047	19.0936	18.7299	19.0952	19.5059	19.7841	19.8536	19.8483	19.6691	19.1231	18.4759	18.9963	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9952	0.9885	0.9696	0.9236	0.8268	0.6496	0.4598	0.5195	0.7852	0.9490	0.9878	0.9960	(94)
Useful gains	1364.0473	1681.4498	1954.9526	2141.8002	2081.0302	1618.4250	1096.5084	1137.1032	1556.7629	1580.0141	1369.0451	1274.2710	(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	5650.6792	5310.1600	4545.9037	3673.6736	2796.1372	1805.6503	1133.2230	1194.7198	1960.9935	3053.0189	4123.8673	5430.3651	(97)
Space heating kWh	3189.2541	2438.4932	1927.6677	1102.9488	532.0396	0.0000	0.0000	0.0000	0.0000	1095.9156	1983.4720	3092.1340	(98a)
Space heating requirement - total per year (kWh/year)												15361.9250	
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	3189.2541	2438.4932	1927.6677	1102.9488	532.0396	0.0000	0.0000	0.0000	0.0000	1095.9156	1983.4720	3092.1340	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												15361.9250	
Space heating per m2											(98c) / (4) =	73.3967	(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 %)												349.9356	(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													
	3189.2541	2438.4932	1927.6677	1102.9488	532.0396	0.0000	0.0000	0.0000	0.0000	1095.9156	1983.4720	3092.1340	(98)
Space heating efficiency (main heating system 1)													
	349.9356	349.9356	349.9356	349.9356	349.9356	0.0000	0.0000	0.0000	0.0000	349.9356	349.9356	349.9356	(210)
Space heating fuel (main heating system)													
	911.3830	696.8405	550.8635	315.1862	152.0393	0.0000	0.0000	0.0000	0.0000	313.1763	566.8105	883.6293	(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													
	324.3344	270.9571	243.5209	174.7867	130.1072	113.4921	110.5828	134.3584	176.0534	241.0606	288.6653	320.8875	(64)
Efficiency of water heater												178.4829	(216)
(217)m	178.4829	178.4829	178.4829	178.4829	178.4829	178.4829	178.4829	178.4829	178.4829	178.4829	178.4829	178.4829	(217)
Fuel for water heating, kWh/month													
	181.7174	151.8113	136.4394	97.9291	72.8962	63.5871	61.9571	75.2781	98.6389	135.0609	161.7328	179.7862	(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	6.7945	6.1370	6.7945	6.5753	6.7945	6.5753	6.7945	6.7945	6.5753	6.7945	6.5753	6.7945	(231)
Lighting	49.2867	39.5396	35.6010	26.0829	20.1471	16.4604	18.3789	23.8896	31.0302	40.7133	45.9856	50.6565	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-26.2518	-41.2662	-65.1726	-79.0423	-87.7073	-77.9924	-76.9049	-70.4830	-59.6897	-48.8158	-29.9801	-22.1859	(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	-3.8001	-8.8818	-20.2351	-35.4209	-53.7023	-61.0358	-60.2860	-49.3814	-34.1882	-15.2917	-5.6658	-2.9624	(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	4389.9286	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	178.4829	
Water heating fuel used	1416.8345	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
pump for solar water heating	80.0000	(230g)
Total electricity for the above, kWh/year	80.0000	(231)
Electricity for lighting (calculated in Appendix L)	397.7719	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1036.3436	(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	5248.1913	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	4389.9286	16.4900	723.8992	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1416.8345	16.4900	233.6360	(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)
Pump for solar water heating	80.0000	16.4900	13.1920	(249)
Energy for lighting	397.7719	16.4900	65.5926	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-685.4921	16.4900	-113.0377	
PV Unit electricity exported	-350.8515	5.5900	-19.6126	
Total			-132.6503	(252)
Total energy cost			903.6696	(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] =	1.2793	(257)
SAP value		79.2629	
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	4389.9286	0.1553	681.6848	(261)
Total CO2 associated with community systems			0.0000	(373)

Water heating (other fuel)	1416.8345	0.1450	205.4790	(264)
Space and water heating			887.1638	(265)
Pumps, fans and electric keep-hot	80.0000	0.1387	11.0970	(267)
Energy for lighting	397.7719	0.1443	57.4108	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-685.4921	0.1336	-91.5875	
PV Unit electricity exported	-350.8515	0.1207	-42.3412	
Total			-133.9286	(269)
Total CO2, kg/year			821.7429	(272)
CO2 emissions per m2			3.9300	(273)
EI value			95.6699	
EI rating			96	(274)
EI band			A	

SAP 10 WORKSHEET FOR Existing dwelling (SAP) (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)	
Basement floor	62.9400	(1a) x	2.9100	(2a) =	183.1554	(1a) - (3a)
Ground floor	76.6800	(1b) x	2.8300	(2b) =	217.0044	(1b) - (3b)
First floor	46.9400	(1c) x	2.7800	(2c) =	130.4932	(1c) - (3c)
Second floor	22.7400	(1d) x	2.3200	(2d) =	52.7568	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	209.3000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		583.4098	(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	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Number of storeys in the dwelling (ns)		4	(9)
Additional infiltration	[(9) - 1] x 0.1 =	0.3000	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0.3500	(11)
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0.0000	(12)
If no draught lobby, enter 0.05, else enter 0		0.0500	(13)
Percentage of windows and doors draught stripped		100.0000	(14)
Window infiltration	0.25 - [0.2 * (14) / 100] =	0.0500	(15)
Pressure test		No	
Pressure Test Method		Blower Door	
Measured/design AP50		15.0000	(17)
Infiltration rate		0.7500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.6375	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.5000	4.4000	4.1000	4.1000	3.7000	3.8000	3.7000	3.7000	4.0000	3.9000	4.3000	(22)
Wind factor	1.1500	1.1250	1.1000	1.0250	1.0250	0.9250	0.9500	0.9250	0.9250	1.0000	0.9750	1.0750	(22a)
Adj infilt rate	0.7331	0.7172	0.7013	0.6534	0.6534	0.5897	0.6056	0.5897	0.5897	0.6375	0.6216	0.6853	(22b)
Effective ac	0.7687	0.7572	0.7459	0.7135	0.7135	0.6739	0.6834	0.6739	0.6739	0.7032	0.6932	0.7348	(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	
Exist (Uw = 1.40)			34.2600	1.3258	45.4205			(27)
NW			1.3200	1.3258	1.7500			(27a)
Opening			2.3600	1.3258	3.1288			(27a)
Heatloss Floor 1			24.4900	0.1800	4.4082			(28a)
Heatloss Floor 2			12.4000	1.2000	14.8800			(28b)
Existing walls	161.7000	34.2600	127.4400	0.3000	38.2320			(29a)
Basement	71.9300		71.9300	0.1800	12.9474			(29a)
External Roof 1	28.2500	1.3200	26.9300	0.4000	10.7720			(30)
External Roof 2	29.2800	2.3600	26.9200	0.4000	10.7680			(30)
External Roof unins	24.4900		24.4900	0.1600	3.9184			(30)
Total net area of external elements Aum(A, m2)			352.5400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		146.2252			(33)
Party Wall 1			85.8500	0.0000	0.0000			(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)
Thermal bridges (Default value 0.200 * total exposed area)							70.5080	(36)
Point Thermal bridges						(36a) =	0.0000	

Total fabric heat loss (33) + (36) + (36a) = 216.7332 (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	148.0011	145.7761	143.5999	137.3649	137.3649	129.7361	131.5700	129.7361	129.7361	135.3843	133.4527	141.4727	(38)
Heat transfer coeff	364.7343	362.5093	360.3332	354.0981	354.0981	346.4694	348.3032	346.4694	346.4694	352.1176	350.1860	358.2059	(39)
Average = Sum(39)m / 12 =												353.6662	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.7426	1.7320	1.7216	1.6918	1.6918	1.6554	1.6641	1.6554	1.6554	1.6824	1.6731	1.7114	(40)
HLP (average)												1.6898	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 3.0140 (42)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	74.7550	73.6316	71.9946	68.8624	66.5509	63.9731	62.5079	64.1326	65.9135	68.6812	71.8807	74.4686	(42a)
Hot water usage for baths	33.9688	33.4643	32.7539	31.4440	30.4632	29.3756	28.7881	29.4936	30.2617	31.4254	32.7623	33.8539	(42b)
Hot water usage for other uses	47.8911	46.1496	44.4081	42.6666	40.9251	39.1836	39.1836	40.9251	42.6666	44.4081	46.1496	47.8911	(42c)
Average daily hot water use (litres/day)												143.9534	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	156.6149	153.2455	149.1565	142.9730	137.9392	132.5323	130.4797	134.5513	138.8418	144.5148	150.7926	156.2136	(44)
Energy conte	248.0397	218.2195	229.2480	195.7228	185.6926	162.9640	157.8039	166.6026	171.2059	196.1052	214.8317	244.5928	(45)
Energy content (annual)										Total = Sum(45)m =		2391.0288	
Distribution loss (46)m = 0.15 x (45)m	37.2060	32.7329	34.3872	29.3584	27.8539	24.4446	23.6706	24.9904	25.6809	29.4158	32.2248	36.6889	(46)

Water storage loss:		
Store volume	210.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):	2.0900	(48)
Temperature factor from Table 2b	0.5400	(49)
Enter (49) or (54) in (55)	1.1286	(55)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Total storage loss	34.9866	31.6008	34.9866	33.8580	34.9866	33.8580	34.9866	34.9866	33.8580	34.9866	33.8580	34.9866	(56)
If cylinder contains dedicated solar storage	34.9866	31.6008	34.9866	33.8580	34.9866	33.8580	34.9866	34.9866	33.8580	34.9866	33.8580	34.9866	(57)
Primary loss	41.3081	37.3106	38.8296	27.9829	18.5887	17.5893	18.1756	19.8279	30.3815	38.8296	39.9756	41.3081	(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	324.3344	287.1309	303.0643	257.5638	239.2679	214.4112	210.9661	221.4171	235.4453	269.9214	288.6653	320.8875	(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)

Aperture area of solar collector	3.0000	(H1)
Zero-loss collector efficiency	0.8000	(H2)
Collector linear heat loss coefficient	1.8000	(H3)
Collector 2nd order heat loss coefficient	0.0000	(H4)
Collector loop efficiency	0.9000	(H5)
Incidence angle modifier	1.0000	(H6)
Overshading factor	0.8000	(H8)
Overall heat loss coefficient of system	6.5000	(H10)
Heat loss coefficient of collector loop	3.9667	(H11)
Dedicated solar storage volume	75.0000	(H12)
Effective solar volume	75.0000	(H14)
Reference volume	225.0000	(H15)
Storage tank correction coefficient	1.3161	(H16)
Heat delivered to hot water	690.0270	(H24)
Heat delivered to space heating	0.0000	(H29)
Solar input	690.0270	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar input	-0.0000	-15.6733	-59.0226	-85.5613	-109.0197	-108.8352	-108.0153	-97.4208	-68.1770	-35.3322	-2.9695	-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	324.3344	271.4576	244.0417	172.0025	130.2481	105.5760	102.9507	123.9963	167.2683	234.5892	285.6958	320.8875	(64)
									Total per year (kWh/year) = Sum(64)m =			2483.0482	(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	143.5090	127.6871	135.2780	114.5506	104.6030	95.3433	94.9995	99.2470	108.3175	124.2580	130.4984	142.3629	(65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (Table 5), Watts													
(66)m	180.8410	180.8410	180.8410	180.8410	180.8410	180.8410	180.8410	180.8410	180.8410	180.8410	180.8410	180.8410	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	56.3087	50.0129	40.6732	30.7923	23.0176	19.4324	20.9974	27.2932	36.6329	46.5139	54.2886	57.8737	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	566.8662	572.7485	557.9253	526.3685	486.5336	449.0945	424.0829	418.2006	433.0238	464.5806	504.4154	541.8546	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	56.0981	56.0981	56.0981	56.0981	56.0981	56.0981	56.0981	56.0981	56.0981	56.0981	56.0981	56.0981	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-120.5607	-120.5607	-120.5607	-120.5607	-120.5607	-120.5607	-120.5607	-120.5607	-120.5607	-120.5607	-120.5607	-120.5607	(71)
Water heating gains (Table 5)	192.8884	190.0105	181.8252	159.0980	140.5954	132.4213	127.6875	133.3965	150.4410	167.0134	181.2478	191.3480	(72)
Total internal gains	932.4418	929.1504	896.8022	832.6372	766.5251	717.3267	689.1463	695.2687	736.4761	794.4863	856.3303	907.4547	(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	
Southeast	12.2800	39.1209	0.7600	0.7000	0.7700	177.1137	(77)
Southwest	14.8200	39.1209	0.7600	0.7000	0.7700	213.7480	(79)

Northwest				7.1600		12.4928		0.7600		0.7000		0.7700	32.9774 (81)
Southwest				2.3600		29.0000		0.7600		0.7000		1.0000	32.7691 (82)
Northwest				1.3200		20.1646		0.7600		0.7000		1.0000	12.7444 (82)
Solar gains	469.3526	743.1905	1085.4467	1494.6687	1718.9212	1862.3162	1774.2692	1599.1073	1329.1602	916.4314	585.9563	390.9740 (83)	
Total gains	1401.7944	1672.3409	1982.2489	2327.3060	2485.4463	2579.6429	2463.4155	2294.3760	2065.6364	1710.9177	1442.2866	1298.4287 (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	39.8502	40.0948	40.3369	41.0472	41.0472	41.9510	41.7301	41.9510	41.9510	41.2780	41.5057	40.5764	
alpha	3.6567	3.6730	3.6891	3.7365	3.7365	3.7967	3.7820	3.7967	3.7967	3.7519	3.7670	3.7051	
util living area	0.9957	0.9914	0.9771	0.9324	0.8238	0.5856	0.3755	0.4270	0.7585	0.9534	0.9905	0.9967	(86)
Living	19.4016	19.5656	19.9229	20.3391	20.6800	20.8774	20.9130	20.9099	20.7996	20.3669	19.8471	19.3954	
Non living	17.7001	17.9143	18.3719	18.8976	19.2743	19.4558	19.4617	19.4681	19.4121	18.9482	18.3047	17.7080	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	10	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	21	28	3	0	0	0	0	0	0	0	0	31	
MIT	20.3868	20.1876	19.9681	20.3391	20.6800	20.8774	20.9130	20.9099	20.7996	20.3669	19.8471	20.0912	(87)
Th 2	19.5104	19.5180	19.5254	19.5467	19.5467	19.5730	19.5666	19.5730	19.5730	19.5535	19.5602	19.5326	(88)
util rest of house	0.9940	0.9881	0.9673	0.9019	0.7407	0.4285	0.1789	0.2219	0.6225	0.9249	0.9859	0.9954	(89)
MIT 2	18.9691	18.8101	18.4343	18.8976	19.2743	19.4558	19.4617	19.4681	19.4121	18.9482	18.3047	18.7273	(90)
Living area fraction										fLA = Living area / (4) =		0.2824	(91)
MIT	19.3695	19.1992	18.8674	19.3047	19.6713	19.8573	19.8716	19.8753	19.8040	19.3488	18.7403	19.1125	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.3695	19.1992	18.8674	19.3047	19.6713	19.8573	19.8716	19.8753	19.8040	19.3488	18.7403	19.1125	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9938	0.9872	0.9614	0.8953	0.7491	0.4622	0.2216	0.2668	0.6482	0.9194	0.9821	0.9949	(94)
Useful gains	1393.1203	1650.8681	1905.6738	2083.7474	1861.8806	1192.3602	545.9572	612.0514	1338.9602	1573.0668	1416.4961	1291.8386	(95)
Ext temp.	5.2000	5.7000	7.7000	10.2000	13.3000	16.3000	18.3000	18.1000	15.5000	11.9000	8.2000	5.2000	(96)
Heat loss rate W	5168.1012	4893.5720	4024.0000	3223.9585	2256.0691	1232.4923	547.3992	615.0958	1491.1925	2622.8705	3691.0797	4983.5327	(97)
Space heating kWh	2808.5857	2179.0970	1576.0347	820.9520	293.2762	0.0000	0.0000	0.0000	0.0000	781.0539	1637.7003	2746.6204	(98a)
Space heating requirement - total per year (kWh/year)												12843.3202	
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	2808.5857	2179.0970	1576.0347	820.9520	293.2762	0.0000	0.0000	0.0000	0.0000	781.0539	1637.7003	2746.6204	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												12843.3202	
Space heating per m2											(98c) / (4) =	61.3632	(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 %)	348.2253 (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	2808.5857	2179.0970	1576.0347	820.9520	293.2762	0.0000	0.0000	0.0000	0.0000	781.0539	1637.7003	2746.6204	(98)
Space heating efficiency (main heating system 1)	348.2253	348.2253	348.2253	348.2253	348.2253	0.0000	0.0000	0.0000	0.0000	348.2253	348.2253	348.2253	(210)
Space heating fuel (main heating system)	806.5427	625.7722	452.5905	235.7531	84.2202	0.0000	0.0000	0.0000	0.0000	224.2956	470.2990	788.7481	(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	324.3344	271.4576	244.0417	172.0025	130.2481	105.5760	102.9507	123.9963	167.2683	234.5892	285.6958	320.8875	(64)
Efficiency of water heater												178.4138	(216)
(217)m	178.4138	178.4138	178.4138	178.4138	178.4138	178.4138	178.4138	178.4138	178.4138	178.4138	178.4138	178.4138	(217)
Fuel for water heating, kWh/month	181.7877	152.1506	136.7841	96.4065	73.0034	59.1748	57.7033	69.4992	93.7530	131.4860	160.1310	179.8558	(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	6.7945	6.1370	6.7945	6.5753	6.7945	6.5753	6.7945	6.7945	6.5753	6.7945	6.5753	6.7945	(231)
Lighting	49.2867	39.5396	35.6010	26.0829	20.1471	16.4604	18.3789	23.8896	31.0302	40.7133	45.9856	50.6565	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-28.1456	-40.0590	-63.1557	-78.1343	-84.1879	-80.4456	-79.1852	-73.9310	-62.8818	-50.6159	-32.9349	-23.4026	(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	-4.4195	-8.7657	-20.3765	-37.4860	-54.8584	-65.5168	-64.4773	-54.7794	-37.9519	-17.5767	-6.9639	-3.3452	(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	3688.2215	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	178.4138	
Water heating fuel used	1391.7354	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
pump for solar water heating	80.0000	(230g)
Total electricity for the above, kWh/year	80.0000	(231)
Electricity for lighting (calculated in Appendix L)	397.7719	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-1073.5968	(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	4484.1320	(238)

10a. Fuel costs - using BEDF prices (547)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3688.2215	26.0600	961.1505	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1391.7354	26.0600	362.6863	(247)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000	(247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(249)
Pump for solar water heating	80.0000	26.0600	20.8480	(249)
Energy for lighting	397.7719	26.0600	103.6594	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-697.0795	26.0600	-181.6589	
PV Unit electricity exported	-376.5174	5.8100	-21.8757	
Total			-203.5346	(252)
Total energy cost			1244.8096	(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	3688.2215	0.1561	575.7514	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1391.7354	0.1455	202.4322	(264)
Space and water heating			778.1836	(265)
Pumps, fans and electric keep-hot	80.0000	0.1387	11.0970	(267)
Energy for lighting	397.7719	0.1443	57.4108	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-697.0795	0.1334	-93.0124	
PV Unit electricity exported	-376.5174	0.1204	-45.3171	
Total			-138.3295	(269)
Total CO2, kg/year			708.3619	(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	3688.2215	1.5779	5819.7546	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1391.7354	1.5380	2140.5461	(278)
Space and water heating			7960.3006	(279)
Pumps, fans and electric keep-hot	80.0000	1.5128	121.0240	(281)
Energy for lighting	397.7719	1.5338	610.1159	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-697.0795	1.4931	-1040.7943	
PV Unit electricity exported	-376.5174	0.4414	-166.1865	
Total			-1206.9809	(283)
Total Primary energy kWh/year			7484.4596	(286)

Full SAP Calculation Printout

Property Reference	30 Grove Place	**Issued on Date**	28/06/2024
Assessment Reference	Lean	**Prop Type Ref**	Energy assessment
Property	30 Grove Place, LONDON, NW3 1JR		

SAP Rating	79 C	**DER**		**TER**	
Environmental	77 C	**% DER < TER**			N/A
CO_2 Emissions (t/year)	3.88	**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 Existing dwelling (SAP) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Basement floor	62.9400	(1a)	x 2.9100	(2a) =	183.1554	(1a) - (3a)
Ground floor	76.6800	(1b)	x 2.8300	(2b) =	217.0044	(1b) - (3b)
First floor	46.9400	(1c)	x 2.7800	(2c) =	130.4932	(1c) - (3c)
Second floor	22.7400	(1d)	x 2.3200	(2d) =	52.7568	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	209.3000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		583.4098	(5)

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2. Ventilation rate

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		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	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Number of storeys in the dwelling (ns)		4	(9)
Additional infiltration	[(9) - 1] x 0.1 =	0.3000	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0.3500	(11)
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0.0000	(12)
If no draught lobby, enter 0.05, else enter 0		0.0500	(13)
Percentage of windows and doors draught stripped		100.0000	(14)
Window infiltration	0.25 - [0.2 * (14) / 100] =	0.0500	(15)

Pressure test	No	
Pressure Test Method	Blower Door	
Measured/design AP50	15.0000	(17)
Infiltration rate	0.7500	(18)
Number of sides sheltered	2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.6375 (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	0.8128	0.7969	0.7809	0.7013	0.6853	0.6056	0.6056	0.5897	0.6375	0.6853	0.7172	0.7491	(22b)
Effective ac	0.8303	0.8175	0.8049	0.7459	0.7348	0.6834	0.6834	0.6739	0.7032	0.7348	0.7572	0.7805	(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	
Exist (Uw = 1.40)			34.2600	1.3258	45.4205			(27)
NW			1.3200	1.3258	1.7500			(27a)
Opening			2.3600	1.3258	3.1288			(27a)
Heatloss Floor 1			24.4900	0.1800	4.4082			(28a)
Heatloss Floor 2			12.4000	1.2000	14.8800			(28b)
Existing walls	161.7000	34.2600	127.4400	0.3000	38.2320			(29a)
Basement	71.9300		71.9300	0.1800	12.9474			(29a)
External Roof 1	28.2500	1.3200	26.9300	0.4000	10.7720			(30)

External Roof 2	29.2800	2.3600	26.9200	0.4000	10.7680		(30)
External Roof unins	24.4900		24.4900	0.1600	3.9184		(30)
Total net area of external elements Aum(A, m2)			352.5400				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		146.2252		(33)
Party Wall 1			85.8500	0.0000	0.0000		(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Default value 0.200 * total exposed area)	70.5080	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	216.7332	(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	159.8599	157.3903	154.9697	143.5999	141.4727	131.5700	131.5700	129.7361	135.3843	141.4727	145.7761	150.2751	(38)
Heat transfer coeff	376.5931	374.1236	371.7029	360.3332	358.2059	348.3032	348.3032	346.4694	352.1176	358.2059	362.5093	367.0083	(39)
Average = Sum(39)m / 12 =												360.3230	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.7993	1.7875	1.7759	1.7216	1.7114	1.6641	1.6641	1.6554	1.6824	1.7114	1.7320	1.7535	(40)
HLP (average)												1.7216	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy	3.0140	(42)

Hot water usage for mixer showers

74.7550	73.6316	71.9946	68.8624	66.5509	63.9731	62.5079	64.1326	65.9135	68.6812	71.8807	74.4686	(42a)

Hot water usage for baths

33.9688	33.4643	32.7539	31.4440	30.4632	29.3756	28.7881	29.4936	30.2617	31.4254	32.7623	33.8539	(42b)

Hot water usage for other uses

47.8911	46.1496	44.4081	42.6666	40.9251	39.1836	39.1836	40.9251	42.6666	44.4081	46.1496	47.8911	(42c)

Average daily hot water use (litres/day)	143.9534	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	156.6149	153.2455	149.1565	142.9730	137.9392	132.5323	130.4797	134.5513	138.8418	144.5148	150.7926	156.2136	(44)
Energy conte	248.0397	218.2195	229.2480	195.7228	185.6926	162.9640	157.8039	166.6026	171.2059	196.1052	214.8317	244.5928	(45)
Energy content (annual)										Total = Sum(45)m =		2391.0288	
Distribution loss (46)m = 0.15 x (45)m	37.2060	32.7329	34.3872	29.3584	27.8539	24.4446	23.6706	24.9904	25.6809	29.4158	32.2248	36.6889	(46)

Water storage loss:		
Store volume	210.0000	(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	0.8298	(52)
Temperature factor from Table 2b	0.5400	(53)
Enter (49) or (54) in (55)	1.4290	(55)

Total storage loss

44.2978	40.0109	44.2978	42.8688	44.2978	42.8688	44.2978	44.2978	42.8688	44.2978	42.8688	44.2978	(56)

If cylinder contains dedicated solar storage

44.2978	40.0109	44.2978	42.8688	44.2978	42.8688	44.2978	44.2978	42.8688	44.2978	42.8688	44.2978	(57)
Primary loss 41.3081	37.3106	41.3081	39.9756	41.3081	39.9756	41.3081	41.3081	39.9756	41.3081	39.9756	41.3081	(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

333.6456	295.5410	314.8540	278.5673	271.2985	245.8084	243.4098	252.2085	254.0503	281.7111	297.6761	330.1987	(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

333.6456	295.5410	314.8540	278.5673	271.2985	245.8084	243.4098	252.2085	254.0503	281.7111	297.6761	330.1987	(64)

Total per year (kWh/year) = Sum(64)m =	3398.9694	(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

150.9579	134.4152	144.7097	131.3534	130.2275	120.4611	120.9545	123.8801	123.2015	133.6897	137.7071	149.8118	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	180.8410	180.8410	180.8410	180.8410	180.8410	180.8410	180.8410	180.8410	180.8410	180.8410	180.8410	180.8410	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	56.3087	50.0129	40.6732	30.7923	23.0176	19.4324	20.9974	27.2932	36.6329	46.5139	54.2886	57.8737	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	566.8662	572.7485	557.9253	526.3685	486.5336	449.0945	424.0829	418.2006	433.0238	464.5806	504.4154	541.8546	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	56.0981	56.0981	56.0981	56.0981	56.0981	56.0981	56.0981	56.0981	56.0981	56.0981	56.0981	56.0981	(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)	-120.5607	-120.5607	-120.5607	-120.5607	-120.5607	-120.5607	-120.5607	-120.5607	-120.5607	-120.5607	-120.5607	-120.5607	(71)
Water heating gains (Table 5)	202.9005	200.0226	194.5023	182.4353	175.0370	167.3070	162.5733	166.5055	171.1132	179.6905	191.2599	201.3600	(72)
Total internal gains	945.4539	942.1625	912.4793	858.9745	803.9667	752.2124	724.0320	728.3778	757.1483	810.1634	869.3423	920.4668	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
Southeast	12.2800	36.7938	0.7600	0.7000	0.7700	166.5782	(77)
Southwest	14.8200	36.7938	0.7600	0.7000	0.7700	201.0333	(79)
Northwest	7.1600	11.2829	0.7600	0.7000	0.7700	29.7838	(81)
Southwest	2.3600	26.0000	0.7600	0.7000	1.0000	29.3792	(82)
Northwest	1.3200	18.0708	0.7600	0.7000	1.0000	11.4211	(82)

Solar gains	438.1956	771.8158	1119.3563	1486.2821	1750.5190	1774.2692	1695.5299	1493.6999	1246.1435	870.4965	529.5850	371.8904	(83)
Total gains	1383.6495	1713.9782	2031.8356	2345.2566	2554.4856	2526.4816	2419.5619	2222.0776	2003.2918	1680.6600	1398.9273	1292.3572	(84)

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7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

Utilisation factor for gains for living area, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	38.5953	38.8501	39.1031	40.3369	40.5764	41.7301	41.7301	41.9510	41.2780	40.5764	40.0948	39.6033	
alpha	3.5730	3.5900	3.6069	3.6891	3.7051	3.7820	3.7820	3.7967	3.7519	3.7051	3.6730	3.6402	
util living area	0.9965	0.9921	0.9813	0.9504	0.8778	0.7388	0.5869	0.6452	0.8583	0.9706	0.9935	0.9973	(86)
MIT	18.7511	19.0163	19.4388	20.0114	20.4940	20.8302	20.9473	20.9249	20.6684	20.0269	19.3102	18.7496	(87)
Th 2	19.4705	19.4788	19.4869	19.5254	19.5326	19.5666	19.5666	19.5730	19.5535	19.5326	19.5180	19.5027	(88)
util rest of house	0.9952	0.9892	0.9740	0.9294	0.8227	0.6231	0.4171	0.4768	0.7725	0.9541	0.9905	0.9963	(89)
MIT 2	17.4846	17.7539	18.1774	18.7604	19.2055	19.4938	19.5554	19.5543	19.3795	18.7909	18.0751	17.5053	(90)
Living area fraction										fLA = Living area / (4) =		0.2824	(91)
MIT	17.8422	18.1104	18.5336	19.1137	19.5694	19.8712	19.9485	19.9414	19.7435	19.1400	18.4239	17.8567	(92)
Temperature adjustment												-0.1500	
adjusted MIT	17.6922	17.9604	18.3836	18.9637	19.4194	19.7212	19.7985	19.7914	19.5935	18.9900	18.2739	17.7067	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9928	0.9848	0.9662	0.9187	0.8175	0.6374	0.4469	0.5055	0.7755	0.9453	0.9867	0.9944	(94)
Useful gains	1373.7419	1687.8793	1963.2608	2154.5792	2088.2717	1610.3545	1081.2384	1123.3090	1553.5861	1588.6943	1380.3531	1285.1837	(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	5043.4245	4886.2108	4417.1737	3626.2978	2765.1331	1783.7232	1114.0326	1175.0202	1934.3596	3005.3526	4050.6323	4957.0772	(97)
Space heating kWh	2730.2438	2149.2788	1825.7113	1059.6374	503.5849	0.0000	0.0000	0.0000	0.0000	1053.9937	1922.6010	2731.8888	(98a)
Space heating requirement - total per year (kWh/year)												13976.9398	
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	2730.2438	2149.2788	1825.7113	1059.6374	503.5849	0.0000	0.0000	0.0000	0.0000	1053.9937	1922.6010	2731.8888	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												13976.9398	
Space heating per m2											(98c) / (4) =	66.7795	(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	2730.2438	2149.2788	1825.7113	1059.6374	503.5849	0.0000	0.0000	0.0000	0.0000	1053.9937	1922.6010	2731.8888	(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)	3250.2903	2558.6652	2173.4658	1261.4731	599.5059	0.0000	0.0000	0.0000	0.0000	1254.7544	2288.8108	3252.2486	(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	333.6456	295.5410	314.8540	278.5673	271.2985	245.8084	243.4098	252.2085	254.0503	281.7111	297.6761	330.1987	(64)
Efficiency of water heater												74.0000	(216)
(217)m	82.7818	82.6499	82.3629	81.7017	80.2053	74.0000	74.0000	74.0000	74.0000	81.6723	82.5052	82.7935	(217)
Fuel for water heating, kWh/month	403.0422	357.5820	382.2765	340.9565	338.2553	332.1735	328.9322	340.8223	343.3112	344.9288	360.7969	398.8220	(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	49.2867	39.5396	35.6010	26.0829	20.1471	16.4604	18.3789	23.8896	31.0302	40.7133	45.9856	50.6565	(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	16639.2140	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	74.0000	
Water heating fuel used	4271.8995	(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)	397.7719	(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	21349.8854	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	16639.2140	3.6400	605.6674	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	4271.8995	3.6400	155.4971	(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	397.7719	16.4900	65.5926	(250)
Additional standing charges			92.0000	(251)
Total energy cost			925.5180	(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] =	1.3102	(257)
SAP value		78.7615	
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	16639.2140	0.2100	3494.2349	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	4271.8995	0.2100	897.0989	(264)
Space and water heating			4391.3338	(265)
Pumps, fans and electric keep-hot	41.0000	0.1387	5.6872	(267)
Energy for lighting	397.7719	0.1443	57.4108	(268)
Total CO2, kg/year			4454.4318	(272)
CO2 emissions per m2			21.2800	(273)
EI value			76.5280	
EI rating			77	(274)
EI band			C	

SAP 10 WORKSHEET FOR Existing dwelling (SAP) (Version 10.2, February 2022)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY

1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Basement floor	62.9400 (1a)	x	2.9100 (2a)	=	183.1554	(1a) - (3a)
Ground floor	76.6800 (1b)	x	2.8300 (2b)	=	217.0044	(1b) - (3b)
First floor	46.9400 (1c)	x	2.7800 (2c)	=	130.4932	(1c) - (3c)
Second floor	22.7400 (1d)	x	2.3200 (2d)	=	52.7568	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 209.3000						(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		583.4098	(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	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Number of storeys in the dwelling (ns)		4	(9)
Additional infiltration	[(9) - 1] x 0.1 =	0.3000	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0.3500	(11)
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0.0000	(12)
If no draught lobby, enter 0.05, else enter 0		0.0500	(13)
Percentage of windows and doors draught stripped		100.0000	(14)

Window infiltration	0.25 - [0.2 * (14) / 100] =	0.0500 (15)
Pressure test		No
Pressure Test Method		Blower Door
Measured/design AP50		15.0000 (17)
Infiltration rate		0.7500 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.6375 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.5000	4.4000	4.1000	4.1000	3.7000	3.8000	3.7000	3.7000	4.0000	3.9000	4.3000	(22)
Wind factor	1.1500	1.1250	1.1000	1.0250	1.0250	0.9250	0.9500	0.9250	0.9250	1.0000	0.9750	1.0750	(22a)
Adj infilt rate	0.7331	0.7172	0.7013	0.6534	0.6534	0.5897	0.6056	0.5897	0.5897	0.6375	0.6216	0.6853	(22b)
Effective ac	0.7687	0.7572	0.7459	0.7135	0.7135	0.6739	0.6834	0.6739	0.6739	0.7032	0.6932	0.7348	(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	
Exist (Uw = 1.40)			34.2600	1.3258	45.4205			(27)
NW			1.3200	1.3258	1.7500			(27a)
Opening			2.3600	1.3258	3.1288			(27a)
Heatloss Floor 1			24.4900	0.1800	4.4082			(28a)
Heatloss Floor 2			12.4000	1.2000	14.8800			(28b)
Existing walls	161.7000	34.2600	127.4400	0.3000	38.2320			(29a)
Basement	71.9300		71.9300	0.1800	12.9474			(29a)
External Roof 1	28.2500	1.3200	26.9300	0.4000	10.7720			(30)
External Roof 2	29.2800	2.3600	26.9200	0.4000	10.7680			(30)
External Roof unins	24.4900		24.4900	0.1600	3.9184			(30)
Total net area of external elements Aum(A, m2)			352.5400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	146.2252			(33)
Party Wall 1			85.8500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		250.0000 (35)
Thermal bridges (Default value 0.200 * total exposed area)		70.5080 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	216.7332 (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	148.0011	145.7761	143.5999	137.3649	137.3649	129.7361	131.5700	129.7361	129.7361	135.3843	133.4527	141.4727	(38)
Heat transfer coeff	364.7343	362.5093	360.3332	354.0981	354.0981	346.4694	348.3032	346.4694	346.4694	352.1176	350.1860	358.2059	(39)
Average = Sum(39)m / 12 =												353.6662	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.7426	1.7320	1.7216	1.6918	1.6918	1.6554	1.6641	1.6554	1.6554	1.6824	1.6731	1.7114	(40)
HLP (average)												1.6898	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		3.0140 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
74.7550	73.6316	71.9946	68.8624	66.5509	63.9731	62.5079	64.1326	65.9135	68.6812	71.8807	74.4686	(42a)

Hot water usage for baths

33.9688	33.4643	32.7539	31.4440	30.4632	29.3756	28.7881	29.4936	30.2617	31.4254	32.7623	33.8539	(42b)

Hot water usage for other uses

47.8911	46.1496	44.4081	42.6666	40.9251	39.1836	39.1836	40.9251	42.6666	44.4081	46.1496	47.8911	(42c)

Average daily hot water use (litres/day)	143.9534 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	156.6149	153.2455	149.1565	142.9730	137.9392	132.5323	130.4797	134.5513	138.8418	144.5148	150.7926	156.2136	(44)
Energy conte	248.0397	218.2195	229.2480	195.7228	185.6926	162.9640	157.8039	166.6026	171.2059	196.1052	214.8317	244.5928	(45)
Energy content (annual)										Total = Sum(45)m =		2391.0288	
Distribution loss (46)m = 0.15 x (45)m	37.2060	32.7329	34.3872	29.3584	27.8539	24.4446	23.6706	24.9904	25.6809	29.4158	32.2248	36.6889	(46)

Water storage loss:	
Store volume	210.0000 (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	0.8298 (52)
Temperature factor from Table 2b	0.5400 (53)
Enter (49) or (54) in (55)	1.4290 (55)

Total storage loss

44.2978	40.0109	44.2978	42.8688	44.2978	42.8688	44.2978	44.2978	42.8688	44.2978	42.8688	44.2978	(56)

If cylinder contains dedicated solar storage

44.2978	40.0109	44.2978	42.8688	44.2978	42.8688	44.2978	44.2978	42.8688	44.2978	42.8688	44.2978	(57)
Primary loss 41.3081	37.3106	41.3081	39.9756	41.3081	39.9756	41.3081	41.3081	39.9756	41.3081	39.9756	41.3081	(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

333.6456	295.5410	314.8540	278.5673	271.2985	245.8084	243.4098	252.2085	254.0503	281.7111	297.6761	330.1987	(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

333.6456	295.5410	314.8540	278.5673	271.2985	245.8084	243.4098	252.2085	254.0503	281.7111	297.6761	330.1987	(64)

Total per year (kWh/year) = Sum(64)m =	3398.9694 (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

150.9579	134.4152	144.7097	131.3534	130.2275	120.4611	120.9545	123.8801	123.2015	133.6897	137.7071	149.8118	(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	180.8410	180.8410	180.8410	180.8410	180.8410	180.8410	180.8410	180.8410	180.8410	180.8410	180.8410	180.8410	(66)

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

	56.3087	50.0129	40.6732	30.7923	23.0176	19.4324	20.9974	27.2932	36.6329	46.5139	54.2886	57.8737	(67)

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

	566.8662	572.7485	557.9253	526.3685	486.5336	449.0945	424.0829	418.2006	433.0238	464.5806	504.4154	541.8546	(68)

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

	56.0981	56.0981	56.0981	56.0981	56.0981	56.0981	56.0981	56.0981	56.0981	56.0981	56.0981	56.0981	(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)

	-120.5607	-120.5607	-120.5607	-120.5607	-120.5607	-120.5607	-120.5607	-120.5607	-120.5607	-120.5607	-120.5607	-120.5607	(71)

Water heating gains (Table 5)

	202.9005	200.0226	194.5023	182.4353	175.0370	167.3070	162.5733	166.5055	171.1132	179.6905	191.2599	201.3600	(72)

Total internal gains

	945.4539	942.1625	912.4793	858.9745	803.9667	752.2124	724.0320	728.3778	757.1483	810.1634	869.3423	920.4668	(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	
Southeast	12.2800	39.1209	0.7600	0.7000	0.7700	177.1137	(77)
Southwest	14.8200	39.1209	0.7600	0.7000	0.7700	213.7480	(79)
Northwest	7.1600	12.4928	0.7600	0.7000	0.7700	32.9774	(81)
Southwest	2.3600	29.0000	0.7600	0.7000	1.0000	32.7691	(82)
Northwest	1.3200	20.1646	0.7600	0.7000	1.0000	12.7444	(82)

Solar gains	469.3526	743.1905	1085.4467	1494.6687	1718.9212	1862.3162	1774.2692	1599.1073	1329.1602	916.4314	585.9563	390.9740	(83)
Total gains	1414.8065	1685.3530	1997.9260	2353.6432	2522.8879	2614.5286	2498.3012	2327.4851	2086.3086	1726.5948	1455.2986	1311.4407	(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, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	39.8502	40.0948	40.3369	41.0472	41.0472	41.9510	41.7301	41.9510	41.9510	41.2780	41.5057	40.5764	
alpha	3.6567	3.6730	3.6891	3.7365	3.7365	3.7967	3.7820	3.7967	3.7967	3.7519	3.7670	3.7051	
util living area	0.9956	0.9912	0.9765	0.9303	0.8184	0.5794	0.3705	0.4214	0.7543	0.9521	0.9902	0.9966	(86)
MIT	18.9871	19.2052	19.6819	20.2380	20.6914	20.9468	20.9931	20.9888	20.8443	20.2715	19.5778	18.9775	(87)
Th 2	19.5104	19.5180	19.5254	19.5467	19.5467	19.5730	19.5666	19.5730	19.5730	19.5535	19.5602	19.5326	(88)
util rest of house	0.9938	0.9878	0.9666	0.8991	0.7342	0.4232	0.1764	0.2187	0.6178	0.9231	0.9855	0.9953	(89)
MIT 2	17.7476	17.9693	18.4446	18.9903	19.3790	19.5601	19.5664	19.5724	19.5157	19.0394	18.3706	17.7536	(90)
Living area fraction									fLA = Living area / (4) =			0.2824	(91)
MIT	18.0977	18.3183	18.7940	19.3427	19.7497	19.9517	19.9693	19.9724	19.8909	19.3874	18.7115	18.0992	(92)
Temperature adjustment												-0.1500	
adjusted MIT	17.9477	18.1683	18.6440	19.1927	19.5997	19.8017	19.8193	19.8224	19.7409	19.2374	18.5615	17.9492	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9910	0.9831	0.9581	0.8892	0.7378	0.4502	0.2113	0.2553	0.6367	0.9142	0.9806	0.9930	(94)
Useful gains	1402.0600	1656.8591	1914.2447	2092.9012	1861.5062	1177.0918	528.0095	594.2272	1328.2991	1578.5320	1427.0315	1302.2301	(95)
Ext temp.	5.2000	5.7000	7.7000	10.2000	13.3000	16.3000	18.3000	18.1000	15.5000	11.9000	8.2000	5.2000	(96)
Heat loss rate W	4649.5098	4519.8762	3943.4927	3184.2969	2230.7037	1213.2447	529.1879	596.7599	1469.3385	2583.6183	3628.4596	4566.8493	(97)
Space heating kWh	2416.1026	1923.9475	1509.7606	785.8049	274.6829	0.0000	0.0000	0.0000	0.0000	747.7842	1585.0282	2428.8767	(98a)
Space heating requirement - total per year (kWh/year)												11671.9877	
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	2416.1026	1923.9475	1509.7606	785.8049	274.6829	0.0000	0.0000	0.0000	0.0000	747.7842	1585.0282	2428.8767	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												11671.9877	
Space heating per m2											(98c) / (4) =	55.7668	(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	2416.1026	1923.9475	1509.7606	785.8049	274.6829	0.0000	0.0000	0.0000	0.0000	747.7842	1585.0282	2428.8767	(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)	2876.3127	2290.4137	1797.3340	935.4821	327.0035	0.0000	0.0000	0.0000	0.0000	890.2193	1886.9384	2891.5199	(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

	333.6456	295.5410	314.8540	278.5673	271.2985	245.8084	243.4098	252.2085	254.0503	281.7111	297.6761	330.1987	(64)

Efficiency of water heater												74.0000	(216)
(217)m	82.6449	82.5152	82.0859	81.1306	78.7144	74.0000	74.0000	74.0000	74.0000	81.0046	82.2428	82.6631	(217)
Fuel for water heating, kWh/month													
	403.7100	358.1655	383.5666	343.3566	344.6618	332.1735	328.9322	340.8223	343.3112	347.7718	361.9481	399.4511	(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	49.2867	39.5396	35.6010	26.0829	20.1471	16.4604	18.3789	23.8896	31.0302	40.7133	45.9856	50.6565	(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												13895.2235	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												74.0000	
Water heating fuel used												4287.8707	(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)												397.7719	(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												18621.8661	(238)

10a. Fuel costs - using BEDF prices (547)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	13895.2235	5.6000	778.1325	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	4287.8707	5.6000	240.1208	(247)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000	(247a)
Pumps, fans and electric keep-hot	41.0000	26.0600	10.6846	(249)
Energy for lighting	397.7719	26.0600	103.6594	(250)
Additional standing charges			99.0000	(251)
Total energy cost			1231.5972	(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	13895.2235	0.2100	2917.9969	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	4287.8707	0.2100	900.4528	(264)
Space and water heating			3818.4498	(265)
Pumps, fans and electric keep-hot	41.0000	0.1387	5.6872	(267)
Energy for lighting	397.7719	0.1443	57.4108	(268)
Total CO2, kg/year			3881.5478	(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	13895.2235	1.1300	15701.6025	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	4287.8707	1.1300	4845.2939	(278)
Space and water heating			20546.8964	(279)
Pumps, fans and electric keep-hot	41.0000	1.5128	62.0248	(281)
Energy for lighting	397.7719	1.5338	610.1159	(282)
Total Primary energy kWh/year			21219.0371	(286)

SAP 10 EPC IMPROVEMENTS

Lean

Current energy efficiency rating:	C 79
Current environmental impact rating:	C 77

N	Solar water heating	SAP increase too small
U	Solar photovoltaic panels	Recommended
V2	Wind turbine	Not applicable

Recommended measures:	SAP change	Cost change	CO2 change
U Solar photovoltaic panels	+ 3.4	-£ 237	-122 kg (3.1%)

Measures omitted - SAP change or cost saving too small:

N Solar water heating	+ 0.7	-£ 50	-253 kg (6.5%)

	Typical annual savings		Energy efficiency	Environmental impact
Recommended measures				
Solar photovoltaic panels	£237	0.58 kg/m²	B 82	C 77
Total Savings	£237	0.58 kg/m²		

Potential energy efficiency rating: B 82
Potential environmental impact rating: C 77

Fuel prices for cost data on this page from database revision number 547 TEST (31 May 2024)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£114	£114	£0
Mains gas	£1117	£1117	£0
Space heating	£888	£888	£0
Water heating	£240	£240	£0
Lighting	£104	£104	£0
Generated (PV)	-£0	-£237	£237
Total cost of fuels	£1231	£994	£237
Total cost of uses	£1232	£995	£237
Delivered energy	89 kWh/m²	85 kWh/m²	4 kWh/m²
Carbon dioxide emissions	3.9 tonnes	3.8 tonnes	0.1 tonnes
CO2 emissions per m²	19 kg/m²	18 kg/m²	1 kg/m²
Primary energy	101 kWh/m²	95 kWh/m²	6 kWh/m²

SAP 10 WORKSHEET FOR Existing dwelling (SAP) (Version 10.2, February 2022)
CALCULATION OF ENERGY RATING FOR IMPROVED DWELLING

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Basement floor	62.9400	(1a) x	2.9100	(2a) =	183.1554	(1a) - (3a)
Ground floor	76.6800	(1b) x	2.8300	(2b) =	217.0044	(1b) - (3b)
First floor	46.9400	(1c) x	2.7800	(2c) =	130.4932	(1c) - (3c)
Second floor	22.7400	(1d) x	2.3200	(2d) =	52.7568	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	209.3000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	583.4098	(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		0 * 10 =	0.0000	(7a)
Number of passive vents		0 * 10 =	0.0000	(7b)
Number of flueless gas fires		0 * 40 =	0.0000	(7c)
			Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		0.0000 / (5) =	0.0000	(8)
Number of storeys in the dwelling (ns)			4	(9)
Additional infiltration		[(9) - 1] x 0.1 =	0.3000	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction			0.3500	(11)
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0			0.0000	(12)
If no draught lobby, enter 0.05, else enter 0			0.0500	(13)
Percentage of windows and doors draught stripped			100.0000	(14)
Window infiltration		0.25 - [0.2 * (14) / 100] =	0.0500	(15)
Pressure test			No	
Pressure Test Method			Blower Door	
Measured/design AP50			15.0000	(17)
Infiltration rate			0.7500	(18)
Number of sides sheltered			2	(19)
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.6375	(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	0.8128	0.7969	0.7809	0.7013	0.6853	0.6056	0.6056	0.5897	0.6375	0.6853	0.7172	0.7491	(22b)
Effective ac	0.8303	0.8175	0.8049	0.7459	0.7348	0.6834	0.6834	0.6739	0.7032	0.7348	0.7572	0.7805	(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	
Exist (Uw = 1.40)			34.2600	1.3258	45.4205			(27)
NW			1.3200	1.3258	1.7500			(27a)
Opening			2.3600	1.3258	3.1288			(27a)
Heatloss Floor 1			24.4900	0.1800	4.4082			(28a)
Heatloss Floor 2			12.4000	1.2000	14.8800			(28b)
Existing walls	161.7000	34.2600	127.4400	0.3000	38.2320			(29a)
Basement	71.9300		71.9300	0.1800	12.9474			(29a)
External Roof 1	28.2500	1.3200	26.9300	0.4000	10.7720			(30)
External Roof 2	29.2800	2.3600	26.9200	0.4000	10.7680			(30)
External Roof unins	24.4900		24.4900	0.1600	3.9184			(30)
Total net area of external elements Aum(A, m2)			352.5400					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	146.2252			(33)
Party Wall 1			85.8500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		250.0000 (35)
Thermal bridges (Default value 0.200 * total exposed area)		70.5080 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	216.7332 (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	159.8599	157.3903	154.9697	143.5999	141.4727	131.5700	131.5700	129.7361	135.3843	141.4727	145.7761	150.2751	(38)
Heat transfer coeff	376.5931	374.1236	371.7029	360.3332	358.2059	348.3032	348.3032	346.4694	352.1176	358.2059	362.5093	367.0083	(39)
Average = Sum(39)m / 12 =												360.3230	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.7993	1.7875	1.7759	1.7216	1.7114	1.6641	1.6641	1.6554	1.6824	1.7114	1.7320	1.7535	(40)
HLP (average)												1.7216	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy		3.0140 (42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
74.7550	73.6316	71.9946	68.8624	66.5509	63.9731	62.5079	64.1326	65.9135	68.6812	71.8807	74.4686	(42a)

Hot water usage for baths

33.9688	33.4643	32.7539	31.4440	30.4632	29.3756	28.7881	29.4936	30.2617	31.4254	32.7623	33.8539	(42b)

Hot water usage for other uses

47.8911	46.1496	44.4081	42.6666	40.9251	39.1836	39.1836	40.9251	42.6666	44.4081	46.1496	47.8911	(42c)

Average daily hot water use (litres/day)	143.9534 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	156.6149	153.2455	149.1565	142.9730	137.9392	132.5323	130.4797	134.5513	138.8418	144.5148	150.7926	156.2136	(44)
Energy conte	248.0397	218.2195	229.2480	195.7228	185.6926	162.9640	157.8039	166.6026	171.2059	196.1052	214.8317	244.5928	(45)
Energy content (annual)										Total = Sum(45)m =		2391.0288	

Distribution loss (46)m = 0.15 x (45)m		
37.2060 32.7329 34.3872 29.3584 27.8539 24.4446 23.6706 24.9904 25.6809 29.4158 32.2248 36.6889		(46)
Water storage loss:		
Store volume	210.0000	(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	0.8298	(52)
Temperature factor from Table 2b	0.5400	(53)
Enter (49) or (54) in (55)	1.4290	(55)
Total storage loss		
44.2978 40.0109 44.2978 42.8688 44.2978 42.8688 44.2978 44.2978 42.8688 44.2978 42.8688 44.2978		(56)
If cylinder contains dedicated solar storage		
44.2978 40.0109 44.2978 42.8688 44.2978 42.8688 44.2978 44.2978 42.8688 44.2978 42.8688 44.2978		(57)
Primary loss 41.3081 37.3106 41.3081 39.9756 41.3081 39.9756 41.3081 41.3081 39.9756 41.3081 39.9756 41.3081		(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		
333.6456 295.5410 314.8540 278.5673 271.2985 245.8084 243.4098 252.2085 254.0503 281.7111 297.6761 330.1987		(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		
333.6456 295.5410 314.8540 278.5673 271.2985 245.8084 243.4098 252.2085 254.0503 281.7111 297.6761 330.1987		(64)
Total per year (kWh/year) = Sum(64)m =	3398.9694	(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		
150.9579 134.4152 144.7097 131.3534 130.2275 120.4611 120.9545 123.8801 123.2015 133.6897 137.7071 149.8118		(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 180.8410	180.8410	180.8410	180.8410	180.8410	180.8410	180.8410	180.8410	180.8410	180.8410	180.8410	180.8410	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
56.3087	50.0129	40.6732	30.7923	23.0176	19.4324	20.9974	27.2932	36.6329	46.5139	54.2886	57.8737	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
566.8662	572.7485	557.9253	526.3685	486.5336	449.0945	424.0829	418.2006	433.0238	464.5806	504.4154	541.8546	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
56.0981	56.0981	56.0981	56.0981	56.0981	56.0981	56.0981	56.0981	56.0981	56.0981	56.0981	56.0981	(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)												
-120.5607	-120.5607	-120.5607	-120.5607	-120.5607	-120.5607	-120.5607	-120.5607	-120.5607	-120.5607	-120.5607	-120.5607	(71)
Water heating gains (Table 5)												
202.9005	200.0226	194.5023	182.4353	175.0370	167.3070	162.5733	166.5055	171.1132	179.6905	191.2599	201.3600	(72)
Total internal gains												
945.4539	942.1625	912.4793	858.9745	803.9667	752.2124	724.0320	728.3778	757.1483	810.1634	869.3423	920.4668	(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	
Southeast	12.2800	36.7938	0.7600	0.7000	0.7700	166.5782	(77)
Southwest	14.8200	36.7938	0.7600	0.7000	0.7700	201.0333	(79)
Northwest	7.1600	11.2829	0.7600	0.7000	0.7700	29.7838	(81)
Southwest	2.3600	26.0000	0.7600	0.7000	1.0000	29.3792	(82)
Northwest	1.3200	18.0708	0.7600	0.7000	1.0000	11.4211	(82)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Solar gains	438.1956	771.8158	1119.3563	1486.2821	1750.5190	1774.2692	1695.5299	1493.6999	1246.1435	870.4965	529.5850	371.8904	(83)
Total gains	1383.6495	1713.9782	2031.8356	2345.2566	2554.4856	2526.4816	2419.5619	2222.0776	2003.2918	1680.6600	1398.9273	1292.3572	(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	38.5953	38.8501	39.1031	40.3369	40.5764	41.7301	41.7301	41.9510	41.2780	40.5764	40.0948	39.6033	
alpha	3.5730	3.5900	3.6069	3.6891	3.7051	3.7820	3.7820	3.7967	3.7519	3.7051	3.6730	3.6402	
util living area	0.9965	0.9921	0.9813	0.9504	0.8778	0.7388	0.5869	0.6452	0.8583	0.9706	0.9935	0.9973	(86)
MIT	18.7511	19.0163	19.4388	20.0114	20.4940	20.8302	20.9473	20.9249	20.6684	20.0269	19.3102	18.7496	(87)
Th 2	19.4705	19.4788	19.4869	19.5254	19.5326	19.5666	19.5666	19.5730	19.5535	19.5326	19.5180	19.5027	(88)
util rest of house	0.9952	0.9892	0.9740	0.9294	0.8227	0.6231	0.4171	0.4768	0.7725	0.9541	0.9905	0.9963	(89)
MIT 2	17.4846	17.7539	18.1774	18.7604	19.2055	19.4938	19.5554	19.5543	19.3795	18.7909	18.0751	17.5053	(90)
Living area fraction									fLA = Living area / (4) =			0.2824	(91)
MIT	17.8422	18.1104	18.5336	19.1137	19.5694	19.8712	19.9485	19.9414	19.7435	19.1400	18.4239	17.8567	(92)
Temperature adjustment												-0.1500	
adjusted MIT	17.6922	17.9604	18.3836	18.9637	19.4194	19.7212	19.7985	19.7914	19.5935	18.9900	18.2739	17.7067	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9928	0.9848	0.9662	0.9187	0.8175	0.6374	0.4469	0.5055	0.7755	0.9453	0.9867	0.9944	(94)
Useful gains	1373.7419	1687.8793	1963.2608	2154.5792	2088.2717	1610.3545	1081.2384	1123.3090	1553.5861	1588.6943	1380.3531	1285.1837	(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	5043.4245	4886.2108	4417.1737	3626.2978	2765.1331	1783.7232	1114.0326	1175.0202	1934.3596	3005.3526	4050.6323	4957.0772	(97)
Space heating kWh	2730.2438	2149.2788	1825.7113	1059.6374	503.5849	0.0000	0.0000	0.0000	0.0000	1053.9937	1922.6010	2731.8888	(98a)
Space heating requirement - total per year (kWh/year)												13976.9398	
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	2730.2438	2149.2788	1825.7113	1059.6374	503.5849	0.0000	0.0000	0.0000	0.0000	1053.9937	1922.6010	2731.8888	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												13976.9398	
Space heating per m2											(98c) / (4) =	66.7795	(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	2730.2438	2149.2788	1825.7113	1059.6374	503.5849	0.0000	0.0000	0.0000	0.0000	1053.9937	1922.6010	2731.8888	(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)	3250.2903	2558.6652	2173.4658	1261.4731	599.5059	0.0000	0.0000	0.0000	0.0000	1254.7544	2288.8108	3252.2486	(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	333.6456	295.5410	314.8540	278.5673	271.2985	245.8084	243.4098	252.2085	254.0503	281.7111	297.6761	330.1987	(64)
Efficiency of water heater												74.0000	(216)
(217)m	82.7818	82.6499	82.3629	81.7017	80.2053	74.0000	74.0000	74.0000	74.0000	81.6723	82.5052	82.7935	(217)
Fuel for water heating, kWh/month	403.0422	357.5820	382.2765	340.9565	338.2553	332.1735	328.9322	340.8223	343.3112	344.9288	360.7969	398.8220	(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	49.2867	39.5396	35.6010	26.0829	20.1471	16.4604	18.3789	23.8896	31.0302	40.7133	45.9856	50.6565	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-36.4016	-53.9776	-81.6304	-96.5755	-108.1007	-102.2163	-100.8165	-93.1417	-80.3205	-63.6820	-40.9044	-31.1527	(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	(235d)

Annual totals kWh/year		
Space heating fuel - main system 1	16639.2140	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	74.0000	
Water heating fuel used	4271.8995	(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)	397.7719	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-888.9200	(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	20460.9654	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	16639.2140	3.6400	605.6674	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	4271.8995	3.6400	155.4971	(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	397.7719	16.4900	65.5926	(250)
Additional standing charges			92.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-888.9200	16.4900	-146.5829	
PV Unit electricity exported	0.0000	5.5900	0.0000	
Total			-146.5829	(252)
Total energy cost			778.9351	(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] =	1.1027	(257)
SAP value		82.1252	
SAP rating (Section 12)		82	(258)
SAP band		B	

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	16639.2140	0.2100	3494.2349	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	4271.8995	0.2100	897.0989	(264)
Space and water heating			4391.3338	(265)
Pumps, fans and electric keep-hot	41.0000	0.1387	5.6872	(267)
Energy for lighting	397.7719	0.1443	57.4108	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-888.9200	0.1336	-118.7417	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-118.7417	(269)
Total CO2, kg/year			4335.6901	(272)
CO2 emissions per m2			20.7200	(273)
EI value			77.1537	
EI rating			77	(274)
EI band			C	

SAP 10 WORKSHEET FOR Existing dwelling (SAP) (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)	
Basement floor	62.9400 (1a)	x	2.9100 (2a)	=	183.1554	(1a) - (3a)
Ground floor	76.6800 (1b)	x	2.8300 (2b)	=	217.0044	(1b) - (3b)
First floor	46.9400 (1c)	x	2.7800 (2c)	=	130.4932	(1c) - (3c)
Second floor	22.7400 (1d)	x	2.3200 (2d)	=	52.7568	(1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	209.3000					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	583.4098	(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	0 * 10 =	0.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
	Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000	(8)
Number of storeys in the dwelling (ns)		4	(9)
Additional infiltration	[(9) - 1] x 0.1 =	0.3000	(10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction		0.3500	(11)
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0		0.0000	(12)
If no draught lobby, enter 0.05, else enter 0		0.0500	(13)
Percentage of windows and doors draught stripped		100.0000	(14)
Window infiltration	0.25 - [0.2 * (14) / 100] =	0.0500	(15)
Pressure test		No	
Pressure Test Method		Blower Door	
Measured/design AP50		15.0000	(17)
Infiltration rate		0.7500	(18)
Number of sides sheltered		2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.6375	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.5000	4.4000	4.1000	4.1000	3.7000	3.8000	3.7000	3.7000	4.0000	3.9000	4.3000	(22)
Wind factor	1.1500	1.1250	1.1000	1.0250	1.0250	0.9250	0.9500	0.9250	0.9250	1.0000	0.9750	1.0750	(22a)
Adj infilt rate	0.7331	0.7172	0.7013	0.6534	0.6534	0.5897	0.6056	0.5897	0.5897	0.6375	0.6216	0.6853	(22b)
Effective ac	0.7687	0.7572	0.7459	0.7135	0.7135	0.6739	0.6834	0.6739	0.6739	0.7032	0.6932	0.7348	(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	
Exist (Uw = 1.40)			34.2600	1.3258	45.4205			(27)
NW			1.3200	1.3258	1.7500			(27a)
Opening			2.3600	1.3258	3.1288			(27a)
Heatloss Floor 1			24.4900	0.1800	4.4082			(28a)
Heatloss Floor 2			12.4000	1.2000	14.8800			(28b)
Existing walls	161.7000	34.2600	127.4400	0.3000	38.2320			(29a)
Basement	71.9300		71.9300	0.1800	12.9474			(29a)
External Roof 1	28.2500	1.3200	26.9300	0.4000	10.7720			(30)
External Roof 2	29.2800	2.3600	26.9200	0.4000	10.7680			(30)
External Roof unins	24.4900		24.4900	0.1600	3.9184			(30)
Total net area of external elements Aum(A, m2)			352.5400					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		146.2252			(33)
Party Wall 1			85.8500	0.0000	0.0000			(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Default value 0.200 * total exposed area)	70.5080	(36)
Point Thermal bridges (36a) =	0.0000	
Total fabric heat loss (33) + (36) + (36a) =	216.7332	(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	148.0011	145.7761	143.5999	137.3649	137.3649	129.7361	131.5700	129.7361	129.7361	135.3843	133.4527	141.4727	(38)
Heat transfer coeff	364.7343	362.5093	360.3332	354.0981	354.0981	346.4694	348.3032	346.4694	346.4694	352.1176	350.1860	358.2059	(39)
Average = Sum(39)m / 12 =												353.6662	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.7426	1.7320	1.7216	1.6918	1.6918	1.6554	1.6641	1.6554	1.6554	1.6824	1.6731	1.7114	(40)
HLP (average)												1.6898	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy	3.0140	(42)

Hot water usage for mixer showers

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
74.7550	73.6316	71.9946	68.8624	66.5509	63.9731	62.5079	64.1326	65.9135	68.6812	71.8807	74.4686	(42a)

Hot water usage for baths

33.9688	33.4643	32.7539	31.4440	30.4632	29.3756	28.7881	29.4936	30.2617	31.4254	32.7623	33.8539	(42b)

Hot water usage for other uses

47.8911	46.1496	44.4081	42.6666	40.9251	39.1836	39.1836	40.9251	42.6666	44.4081	46.1496	47.8911	(42c)
Average daily hot water use (litres/day)											143.9534	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	156.6149	153.2455	149.1565	142.9730	137.9392	132.5323	130.4797	134.5513	138.8418	144.5148	150.7926	156.2136	(44)
Energy conte	248.0397	218.2195	229.2480	195.7228	185.6926	162.9640	157.8039	166.6026	171.2059	196.1052	214.8317	244.5928	(45)
Energy content (annual)										Total = Sum(45)m =		2391.0288	

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

37.2060	32.7329	34.3872	29.3584	27.8539	24.4446	23.6706	24.9904	25.6809	29.4158	32.2248	36.6889	(46)

Water storage loss:		
Store volume	210.0000	(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	0.8298	(52)
Temperature factor from Table 2b	0.5400	(53)
Enter (49) or (54) in (55)	1.4290	(55)
Total storage loss		

44.2978	40.0109	44.2978	42.8688	44.2978	42.8688	44.2978	44.2978	42.8688	44.2978	42.8688	44.2978	(56)

If cylinder contains dedicated solar storage

	44.2978	40.0109	44.2978	42.8688	44.2978	42.8688	44.2978	44.2978	42.8688	44.2978	42.8688	44.2978	(57)
Primary loss	41.3081	37.3106	41.3081	39.9756	41.3081	39.9756	41.3081	41.3081	39.9756	41.3081	39.9756	41.3081	(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

	333.6456	295.5410	314.8540	278.5673	271.2985	245.8084	243.4098	252.2085	254.0503	281.7111	297.6761	330.1987	(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

	333.6456	295.5410	314.8540	278.5673	271.2985	245.8084	243.4098	252.2085	254.0503	281.7111	297.6761	330.1987	(64)

Total per year (kWh/year) = Sum(64)m = 3398.9694 (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

	150.9579	134.4152	144.7097	131.3534	130.2275	120.4611	120.9545	123.8801	123.2015	133.6897	137.7071	149.8118	(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	180.8410	180.8410	180.8410	180.8410	180.8410	180.8410	180.8410	180.8410	180.8410	180.8410	180.8410	180.8410	(66)

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

	56.3087	50.0129	40.6732	30.7923	23.0176	19.4324	20.9974	27.2932	36.6329	46.5139	54.2886	57.8737	(67)

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

	566.8662	572.7485	557.9253	526.3685	486.5336	449.0945	424.0829	418.2006	433.0238	464.5806	504.4154	541.8546	(68)

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

	56.0981	56.0981	56.0981	56.0981	56.0981	56.0981	56.0981	56.0981	56.0981	56.0981	56.0981	56.0981	(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)

	-120.5607	-120.5607	-120.5607	-120.5607	-120.5607	-120.5607	-120.5607	-120.5607	-120.5607	-120.5607	-120.5607	-120.5607	(71)

Water heating gains (Table 5)

	202.9005	200.0226	194.5023	182.4353	175.0370	167.3070	162.5733	166.5055	171.1132	179.6905	191.2599	201.3600	(72)

Total internal gains

	945.4539	942.1625	912.4793	858.9745	803.9667	752.2124	724.0320	728.3778	757.1483	810.1634	869.3423	920.4668	(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	
Southeast	12.2800	39.1209	0.7600	0.7000	0.7700	177.1137	(77)
Southwest	14.8200	39.1209	0.7600	0.7000	0.7700	213.7480	(79)
Northwest	7.1600	12.4928	0.7600	0.7000	0.7700	32.9774	(81)
Southwest	2.3600	29.0000	0.7600	0.7000	1.0000	32.7691	(82)
Northwest	1.3200	20.1646	0.7600	0.7000	1.0000	12.7444	(82)

Solar gains	469.3526	743.1905	1085.4467	1494.6687	1718.9212	1862.3162	1774.2692	1599.1073	1329.1602	916.4314	585.9563	390.9740	(83)
Total gains	1414.8065	1685.3530	1997.9260	2353.6432	2522.8879	2614.5286	2498.3012	2327.4851	2086.3086	1726.5948	1455.2986	1311.4407	(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, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	39.8502	40.0948	40.3369	41.0472	41.0472	41.9510	41.7301	41.9510	41.9510	41.2780	41.5057	40.5764	
alpha	3.6567	3.6730	3.6891	3.7365	3.7365	3.7967	3.7820	3.7967	3.7967	3.7519	3.7670	3.7051	
util living area	0.9956	0.9912	0.9765	0.9303	0.8184	0.5794	0.3705	0.4214	0.7543	0.9521	0.9902	0.9966	(86)
MIT	18.9871	19.2052	19.6819	20.2380	20.6914	20.9468	20.9931	20.9888	20.8443	20.2715	19.5778	18.9775	(87)
Th 2	19.5104	19.5180	19.5254	19.5467	19.5467	19.5730	19.5666	19.5730	19.5730	19.5535	19.5602	19.5326	(88)
util rest of house	0.9938	0.9878	0.9666	0.8991	0.7342	0.4232	0.1764	0.2187	0.6178	0.9231	0.9855	0.9953	(89)
MIT 2	17.7476	17.9693	18.4446	18.9903	19.3790	19.5601	19.5664	19.5724	19.5157	19.0394	18.3706	17.7536	(90)

Living area fraction fLA = Living area / (4) = 0.2824 (91)

MIT	18.0977	18.3183	18.7940	19.3427	19.7497	19.9517	19.9693	19.9724	19.8909	19.3874	18.7115	18.0992	(92)
Temperature adjustment												-0.1500	
adjusted MIT	17.9477	18.1683	18.6440	19.1927	19.5997	19.8017	19.8193	19.8224	19.7409	19.2374	18.5615	17.9492	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9910	0.9831	0.9581	0.8892	0.7378	0.4502	0.2113	0.2553	0.6367	0.9142	0.9806	0.9930	(94)
Useful gains	1402.0600	1656.8591	1914.2447	2092.9012	1861.5062	1177.0918	528.0095	594.2272	1328.2991	1578.5320	1427.0315	1302.2301	(95)
Ext temp.	5.2000	5.7000	7.7000	10.2000	13.3000	16.3000	18.3000	18.1000	15.5000	11.9000	8.2000	5.2000	(96)
Heat loss rate W	4649.5098	4519.8762	3943.4927	3184.2969	2230.7037	1213.2447	529.1879	596.7599	1469.3385	2583.6183	3628.4596	4566.8493	(97)
Space heating kWh	2416.1026	1923.9475	1509.7606	785.8049	274.6829	0.0000	0.0000	0.0000	0.0000	747.7842	1585.0282	2428.8767	(98a)

Space heating requirement - total per year (kWh/year) 11671.9877

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

	2416.1026	1923.9475	1509.7606	785.8049	274.6829	0.0000	0.0000	0.0000	0.0000	747.7842	1585.0282	2428.8767	(98c)

Space heating requirement after solar contribution - total per year (kWh/year) 11671.9877

Space heating per m2 (98c) / (4) = 55.7668 (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													
	2416.1026	1923.9475	1509.7606	785.8049	274.6829	0.0000	0.0000	0.0000	0.0000	747.7842	1585.0282	2428.8767	(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)													
	2876.3127	2290.4137	1797.3340	935.4821	327.0035	0.0000	0.0000	0.0000	0.0000	890.2193	1886.9384	2891.5199	(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													
	333.6456	295.5410	314.8540	278.5673	271.2985	245.8084	243.4098	252.2085	254.0503	281.7111	297.6761	330.1987	(64)
Efficiency of water heater												74.0000	(216)
(217)m	82.6449	82.5152	82.0859	81.1306	78.7144	74.0000	74.0000	74.0000	74.0000	81.0046	82.2428	82.6631	(217)
Fuel for water heating, kWh/month													
	403.7100	358.1655	383.5666	343.3566	344.6618	332.1735	328.9322	340.8223	343.3112	347.7718	361.9481	399.4511	(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	49.2867	39.5396	35.6010	26.0829	20.1471	16.4604	18.3789	23.8896	31.0302	40.7133	45.9856	50.6565	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-38.9220	-52.8661	-80.3402	-97.2102	-107.0069	-105.1253	-103.5318	-97.2272	-84.1582	-66.6250	-44.7826	-32.8209	(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												13895.2235	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												74.0000	
Water heating fuel used												4287.8707	(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)												397.7719	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-910.6164	(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												17711.2497	(238)

10a. Fuel costs - using BEDF prices (547)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	13895.2235	5.6000	778.1325	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	4287.8707	5.6000	240.1208	(247)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000	(247a)
Pumps, fans and electric keep-hot	41.0000	26.0600	10.6846	(249)
Energy for lighting	397.7719	26.0600	103.6594	(250)
Additional standing charges			99.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-910.6164	26.0600	-237.3066	
PV Unit electricity exported	0.0000	5.8100	0.0000	
Total			-237.3066	(252)
Total energy cost			994.2906	(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	13895.2235	0.2100	2917.9969	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	4287.8707	0.2100	900.4528	(264)
Space and water heating			3818.4498	(265)
Pumps, fans and electric keep-hot	41.0000	0.1387	5.6872	(267)
Energy for lighting	397.7719	0.1443	57.4108	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-910.6164	0.1335	-121.5577	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-121.5577	(269)
Total CO2, kg/year			3759.9901	(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	13895.2235	1.1300	15701.6025	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	4287.8707	1.1300	4845.2939	(278)
Space and water heating			20546.8964	(279)
Pumps, fans and electric keep-hot	41.0000	1.5128	62.0248	(281)
Energy for lighting	397.7719	1.5338	610.1159	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-910.6164	1.4933	-1359.8057	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-1359.8057	(283)
Total Primary energy kWh/year			19859.2314	(286)