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Our Reference : CA-58

Sent By : E-Mail

13 February 2024

Dear Anthony

PLANNING CONDITIONS 7 & 9

Statement By :	Joe Solti Accredited SAP Assessor
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Thank you for sending the drawings. We are pleased to present our report as follows.

Development Details

Site Location :	London Camera Exchange, 8 Tunsgate, Guildford GU1 3QT
Development :	Rear Extension to Retail Unit + 1 Bedroom First Floor Flat
Local Authority :	Guildford Borough Council
Policy D2 :	C02 > 20% reduction in CO2 Water > 110 litres/person/day

PLANNING CONDITION 7

Water Use

Water Use :	110 litres/person/day (or less)
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Note 1 : See water efficiency calculation CA5801G

Note 2 : Calculations based on Building Regulations Part G 2015 (inc 2016 amendments)

PLANNING CONDITION 9

Baseline Energy Demand (CO2)

Base CO2 Emissions :	Total = 1,818.82 kg/year
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Note 1 : See thermal (SBEM/SAP) calculations CA5801A and CA5802A

Note 2 : Calculations are based on Building Regulations Part L 2021

Actual Energy Demand (CO2)

Renewable (LZC) :	Air Source Heat Pump / Hot Water Heat Pump
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Actual CO2 Emissions :	Total = 1410.71 kg/year
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Saving (LZC) :	Total = 408.11 kg/year = 22.44%
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Note 1 : See thermal (SBEM/SAP) calculations CA5801B and CA5802B

Note 2 : Calculations are based on Building Regulations Part L 2021

Design

Energy & CO₂ Emissions

- > Fabric insulation standards (including glazing), will meet or exceed current (2021) Building Regulations Part L standards.
- > Attention to be paid to minimise thermal bridging and air leakage at junctions.
- > 100% of new internal fixed lighting and external lighting will be low-energy (eg LEDs).
- > Advanced heating controls.
- > Where supplied, white goods will be energy efficient (A++, A+ or A rated).

Materials

- > Consideration will be given to using materials and construction that have a low environmental impact, such as those achieving an A+ or A rated under BRE's Green Guide.
- > Where possible, materials will be chosen that are responsibly sourced (such as FSC timber), recycled or reclaimed.
- > All insulation materials will have a GWP (Global Warming Potential) of 5 or less.

Water Use

- > Indoor water use will be restricted by use of sanitary fittings (taps and shower) with lower flow rates, dual-flush toilets, and (where applicable) washing machines and dishwashers with low water usage.

Surface Water & Flood Risk

- > Where possible, Sustainable Drainage Systems will be used to avoid, reduce, and delay the discharge of rain-fall run-off to public watercourses and sewers.
- > Measures are to be undertaken to reduce the risk of flooding where developments are in medium or high risk flood zones.

Waste

- > Construction site waste is to be minimised (diverted from landfill) by re-using materials on site (or to/from other sites), returning to the supplier where possible/practical, recovery/recycling, and composting.
- > Hazardous waste will be avoided (or minimised where unavoidable).
- > If available, the kitchen design will incorporate fixed bin(s) in the kitchen cupboards to encourage recycling.

Health & Wellbeing

- > Key rooms have reasonably good levels of daylighting, and décor will enhance this (the need for artificial lighting will also be reduced).

- > Sound insulation (between retail unit and flat, and within the flat), will meet or exceed current Building Regulation standards.
- > To ensure the dwelling is usable/adaptable for all potential existing and future owners or occupiers, as many as possible/practical of the 16 no Lifetime Homes criteria will be incorporated into the design and construction of the dwelling.

Management

- > Guidance will be provided to the end owner/occupier of the retail unit and flat, providing information on the correct and efficient use of their premises/home.
- > Security measures will be incorporated into the design and construction of the units.

Renewable Energy (and LZCs)

Various options were considered, but were found to be not feasible for the following reasons :

- > Solar Thermal = Not possible (conservation area).
- > Solar PV = Not possible (conservation area).
- > Ground Source Heat Pump = Not possible due to lack of suitable external space.
- > **Air Source Heat Pump / Hot Water Heat Pump = Best solution = Incorporated**
- > Biomass = Unfavourable solution for small urban developments. No saving in energy use.
- > Wind Power = Siting extremely difficult, location not suitable.
- > Combined Heat & Power (CHP) = Limited savings in CO2 emissions.

Summary/Conclusion

The retail extension and flat are to be designed to high levels of fabric insulation, in line with current thinking, with air source heat pump / hot water heat pump incorporated to reduce energy use and CO2 emissions (and avoid fossil fuels).

Therefore the proposal meets the requirements of Guildford Borough Council's Strategy for Sustainable Design and Renewable Energy.

I trust this is satisfactory. Should you have any queries, or would like to discuss anything, please do not hesitate to contact me.

Yours sincerely

Joe Solti (Project Director) joe@thermenergy.co.uk

Project name

London Camera Exchange

As designed

Date: Fri Feb 09 09:16:27 2024

Administrative information

Building Details

Address: London Camera Exchange, 8, Tunsgate,
Guildford, Surrey, GU1 3QT

Certifier details

Name:

Telephone number:

Address: , ,

Certification tool

Calculation engine: TAS

Calculation engine version: "v9.5.6"

Interface to calculation engine: TAS

Interface to calculation engine version: v9.5.6

BRUKL compliance module version: v6.1.e.0

Foundation area [m²]: 20.78The CO₂ emission and primary energy rates of the building must not exceed the targets

The building does not comply with England Building Regulations Part L 2021

Target CO ₂ emission rate (TER), kgCO ₂ /m ² annum	4.12
Building CO ₂ emission rate (BER), kgCO ₂ /m ² annum	11.83
Target primary energy rate (TPER), kWh _{PE} /m ² annum	43.41
Building primary energy rate (BPER), kWh _{PE} /m ² annum	124.53
Do the building's emission and primary energy rates exceed the targets?	BER > TER BPER > TPER

The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Fabric element	U _a -Limit	U _a -Calc	U _i -Calc	First surface with maximum value
Walls*	0.26	0.48	0.89	Existing Ext Wall
Floors	0.18	0.75	1.07	Ground Floor Existing
Pitched roofs	0.16	-	-	No pitched roofs in project
Flat roofs	0.18	0.24	0.9	Existing Roof
Windows** and roof windows	1.6	3.46	3.46	W01 Existing
Rooflights***	2.2	-	-	No rooflights in project
Personnel doors [^]	1.6	2.29	2.29	D01 New
Vehicle access & similar large doors	1.3	-	-	No vehicle access or similar large doors in project
High usage entrance doors	3	-	-	No high usage entrance doors in project

U_a-Limit = Limiting area-weighted average U-values [W/(m²K)]U_i-Calc = Calculated maximum individual element U-values [W/(m²K)]U_a-Calc = Calculated area-weighted average U-values [W/(m²K)]

* Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows.

** Display windows and similar glazing are excluded from the U-value check. *** Values for rooflights refer to the horizontal position.

[^] For fire doors, limiting U-value is 1.8 W/m²K

NB: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

Air permeability	Limiting standard	This building
m ³ /(h.m ²) at 50 Pa	8	15

Building services

For details on the standard values listed below, system-specific guidance, and additional regulatory requirements, refer to the Approved Documents.

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	NO
Whole building electric power factor achieved by power factor correction	<0.9

1- AC (Retail Sales)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	2.5	3	-	-	-
Standard value	2.5*	3	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.

2- Elec. Rads

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	1	-	-	-	-
Standard value	0.86	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

3- Extract (WC)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	1	-	-	-	-
Standard value	0.86	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

1- New HWS Circuit

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	1	0
Standard value	1	N/A

Zone-level mechanical ventilation, exhaust, and terminal units

ID	System type in the Approved Documents
A	Local supply or extract ventilation units
B	Zonal supply system where the fan is remote from the zone
C	Zonal extract system where the fan is remote from the zone
D	Zonal balanced supply and extract ventilation system
E	Local balanced supply and extract ventilation units
F	Other local ventilation units
G	Fan assisted terminal variable air volume units
H	Fan coil units
I	Kitchen extract with the fan remote from the zone and a grease filter

NB: Limiting SFP may be increased by the amounts specified in the Approved Documents if the installation includes particular components.

Zone name	ID of system type	SFP [W/(l/s)]									HR efficiency	
		A	B	C	D	E	F	G	H	I	Zone	Standard
	Standard value	0.3	1.1	0.5	2.3	2	0.5	0.5	0.4	1	-	-
WC		0.4	-	-	-	-	-	-	-	-	-	N/A

General lighting and display lighting		General luminaire	Display light source	
Zone name		Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m ²]
	Standard value	95	80	0.3
Retail Sales		60	60	-
Studio		60	-	-
WC		60	-	-
Staffroom		60	-	-
Circ		60	-	-
Stockroom		60	-	-
Cupboard		60	-	-

The spaces in the building should have appropriate passive control measures to limit solar gains in summer

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
Retail Sales	YES (+12%)	NO
Studio	N/A	N/A
Staffroom	N/A	N/A

Regulation 25A: Consideration of high efficiency alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	NO
Is evidence of such assessment available as a separate submission?	NO
Are any such measures included in the proposed design?	NO

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m ²]	74	74
External area [m ²]	211	211
Weather	LON	LON
Infiltration [m ³ /hm ² @ 50Pa]	15	3
Average conductance [W/K]	168	73
Average U-value [W/m ² K]	0.8	0.34
Alpha value* [%]	37.55	22.55

* Percentage of the building's average heat transfer coefficient which is due to thermal bridging

Building Use

% Area	Building Type
100	Retail/Financial and Professional Services
	Restaurants and Cafes/Drinking Establishments/Takeaways
	Offices and Workshop Businesses
	General Industrial and Special Industrial Groups
	Storage or Distribution
	Hotels
	Residential Institutions: Hospitals and Care Homes
	Residential Institutions: Residential Schools
	Residential Institutions: Universities and Colleges
	Secure Residential Institutions
	Residential Spaces
	Non-residential Institutions: Community/Day Centre
	Non-residential Institutions: Libraries, Museums, and Galleries
	Non-residential Institutions: Education
	Non-residential Institutions: Primary Health Care Building
	Non-residential Institutions: Crown and County Courts
	General Assembly and Leisure, Night Clubs, and Theatres
	Others: Passenger Terminals
	Others: Emergency Services
	Others: Miscellaneous 24hr Activities
	Others: Car Parks 24 hrs
	Others: Stand Alone Utility Block

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	43.87	14.26
Cooling	3.55	3.43
Auxiliary	0.34	0.34
Lighting	31.17	11.66
Hot water	1.83	1.83
Equipment*	22.78	22.78
TOTAL**	80.76	31.53

* Energy used by equipment does not count towards the total for consumption or calculating emissions.

** Total is net of any electrical energy displaced by CHP generators, if applicable.

Energy Production by Technology [kWh/m²]

	Actual	Notional
Photovoltaic systems	0	2.58
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
<i>Displaced electricity</i>	<i>0</i>	<i>2.58</i>

Energy & CO₂ Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m ²]	334.08	155.05
Primary energy [kWh _{PE} /m ²]	124.53	43.41
Total emissions [kg/m ²]	11.83	4.12

HVAC Systems Performance

System Type	Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEFF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Split or multi-split system, [HS] ASHP, [HFT] Electricity, [CFT] Electricity									
Actual	365	69.4	40.6	6.4	0	2.5	3	2.5	3
Notional	30.3	98.3	3.2	6.2	0	2.64	4.4	----	----
[ST] Other local room heater - unfanned, [HS] Room heater, [HFT] Electricity, [CFT] Electricity									
Actual	357.9	0	99.4	0	0	1	0	1	0
Notional	192.8	0	40	0	0	1.34	0	----	----
[ST] Other local room heater - unfanned, [HS] Room heater, [HFT] Electricity, [CFT] Electricity									
Actual	179.4	0	49.9	0	6.1	1	0	1	0
Notional	139.4	0	28.9	0	6.1	1.34	0	----	----

Key to terms

Heat dem [MJ/m2]	= Heating energy demand
Cool dem [MJ/m2]	= Cooling energy demand
Heat con [kWh/m2]	= Heating energy consumption
Cool con [kWh/m2]	= Cooling energy consumption
Aux con [kWh/m2]	= Auxiliary energy consumption
Heat SSEFF	= Heating system seasonal efficiency (for notional building, value depends on activity glazing class)
Cool SSEER	= Cooling system seasonal energy efficiency ratio
Heat gen SSEFF	= Heating generator seasonal efficiency
Cool gen SSEER	= Cooling generator seasonal energy efficiency ratio
ST	= System type
HS	= Heat source
HFT	= Heating fuel type
CFT	= Cooling fuel type

Project name

London Camera Exchange

As designed

Date: Fri Feb 09 08:46:42 2024

Administrative information

Building Details

Address: London Camera Exchange, 8, Tunsgate,
Guildford, Surrey, GU1 3QT

Certifier details

Name:

Telephone number:

Address: , ,

Certification tool

Calculation engine: TAS

Calculation engine version: "v9.5.6"

Interface to calculation engine: TAS

Interface to calculation engine version: v9.5.6

BRUKL compliance module version: v6.1.e.0

Foundation area [m²]: 20.78The CO₂ emission and primary energy rates of the building must not exceed the targets

The building does not comply with England Building Regulations Part L 2021

Target CO ₂ emission rate (TER), kgCO ₂ /m ² annum	4.12
Building CO ₂ emission rate (BER), kgCO ₂ /m ² annum	8.7
Target primary energy rate (TPER), kWh _{PE} /m ² annum	43.4
Building primary energy rate (BPER), kWh _{PE} /m ² annum	90.97
Do the building's emission and primary energy rates exceed the targets?	BER > TER BPER > TPER

The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Fabric element	U _a -Limit	U _a -Calc	U _i -Calc	First surface with maximum value
Walls*	0.26	0.48	0.89	Existing Ext Wall
Floors	0.18	0.75	1.07	Ground Floor Existing
Pitched roofs	0.16	-	-	No pitched roofs in project
Flat roofs	0.18	0.24	0.9	Existing Roof
Windows** and roof windows	1.6	3.46	3.46	W01 Existing
Rooflights***	2.2	-	-	No rooflights in project
Personnel doors [^]	1.6	2.29	2.29	D01 New
Vehicle access & similar large doors	1.3	-	-	No vehicle access or similar large doors in project
High usage entrance doors	3	-	-	No high usage entrance doors in project

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* Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows.

** Display windows and similar glazing are excluded from the U-value check. *** Values for rooflights refer to the horizontal position.

[^] For fire doors, limiting U-value is 1.8 W/m²K

NB: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

Air permeability	Limiting standard	This building
m ³ /(h.m ²) at 50 Pa	8	15

Building services

For details on the standard values listed below, system-specific guidance, and additional regulatory requirements, refer to the Approved Documents.

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	NO
Whole building electric power factor achieved by power factor correction	<0.9

1- AC (Retail Sales)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4	4.5	-	-	-
Standard value	2.5*	3	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.

2- Elec. Rads

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	1	-	-	-	-
Standard value	0.86	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

3- Extract (WC)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	1	-	-	-	-
Standard value	0.86	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

1- New HWS Circuit

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	1	0
Standard value	1	N/A

Zone-level mechanical ventilation, exhaust, and terminal units

ID	System type in the Approved Documents
A	Local supply or extract ventilation units
B	Zonal supply system where the fan is remote from the zone
C	Zonal extract system where the fan is remote from the zone
D	Zonal balanced supply and extract ventilation system
E	Local balanced supply and extract ventilation units
F	Other local ventilation units
G	Fan assisted terminal variable air volume units
H	Fan coil units
I	Kitchen extract with the fan remote from the zone and a grease filter

NB: Limiting SFP may be increased by the amounts specified in the Approved Documents if the installation includes particular components.

Zone name	ID of system type	SFP [W/(l/s)]									HR efficiency	
		A	B	C	D	E	F	G	H	I	Zone	Standard
	Standard value	0.3	1.1	0.5	2.3	2	0.5	0.5	0.4	1	-	-
WC		0.3	-	-	-	-	-	-	-	-	-	N/A

General lighting and display lighting		General luminaire	Display light source	
Zone name		Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m ²]
	Standard value	95	80	0.3
Retail Sales		100	100	-
Studio		100	-	-
WC		100	-	-
Staffroom		100	-	-
Circ		100	-	-
Stockroom		100	-	-
Cupboard		100	-	-

The spaces in the building should have appropriate passive control measures to limit solar gains in summer

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
Retail Sales	YES (+12%)	NO
Studio	N/A	N/A
Staffroom	N/A	N/A

Regulation 25A: Consideration of high efficiency alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	NO
Is evidence of such assessment available as a separate submission?	NO
Are any such measures included in the proposed design?	NO

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m ²]	74	74
External area [m ²]	211	211
Weather	LON	LON
Infiltration [m ³ /hm ² @ 50Pa]	15	3
Average conductance [W/K]	168	73
Average U-value [W/m ² K]	0.8	0.34
Alpha value* [%]	37.55	22.55

* Percentage of the building's average heat transfer coefficient which is due to thermal bridging

Building Use

% Area	Building Type
100	Retail/Financial and Professional Services
	Restaurants and Cafes/Drinking Establishments/Takeaways
	Offices and Workshop Businesses
	General Industrial and Special Industrial Groups
	Storage or Distribution
	Hotels
	Residential Institutions: Hospitals and Care Homes
	Residential Institutions: Residential Schools
	Residential Institutions: Universities and Colleges
	Secure Residential Institutions
	Residential Spaces
	Non-residential Institutions: Community/Day Centre
	Non-residential Institutions: Libraries, Museums, and Galleries
	Non-residential Institutions: Education
	Non-residential Institutions: Primary Health Care Building
	Non-residential Institutions: Crown and County Courts
	General Assembly and Leisure, Night Clubs, and Theatres
	Others: Passenger Terminals
	Others: Emergency Services
	Others: Miscellaneous 24hr Activities
	Others: Car Parks 24 hrs
	Others: Stand Alone Utility Block

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	38.61	14.26
Cooling	1.89	3.43
Auxiliary	0.25	0.34
Lighting	16.2	11.66
Hot water	1.83	1.83
Equipment*	22.78	22.78
TOTAL**	58.78	31.53

* Energy used by equipment does not count towards the total for consumption or calculating emissions.

** Total is net of any electrical energy displaced by CHP generators, if applicable.

Energy Production by Technology [kWh/m²]

	Actual	Notional
Photovoltaic systems	0	2.59
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
<i>Displaced electricity</i>	<i>0</i>	<i>2.59</i>

Energy & CO₂ Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m ²]	351.29	155.05
Primary energy [kWh _{PE} /m ²]	90.97	43.4
Total emissions [kg/m ²]	8.7	4.12

HVAC Systems Performance

System Type	Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEFF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Split or multi-split system, [HS] ASHP, [HFT] Electricity, [CFT] Electricity									
Actual	396	55.2	27.5	3.4	0	4	4.5	4	4.5
Notional	30.3	98.3	3.2	6.2	0	2.64	4.4	----	----
[ST] Other local room heater - unfanned, [HS] Room heater, [HFT] Electricity, [CFT] Electricity									
Actual	390.7	0	108.5	0	0	1	0	1	0
Notional	192.8	0	40	0	0	1.34	0	----	----
[ST] Other local room heater - unfanned, [HS] Room heater, [HFT] Electricity, [CFT] Electricity									
Actual	195.2	0	54.2	0	4.6	1	0	1	0
Notional	139.4	0	28.9	0	6.1	1.34	0	----	----

Key to terms

Heat dem [MJ/m2]	= Heating energy demand
Cool dem [MJ/m2]	= Cooling energy demand
Heat con [kWh/m2]	= Heating energy consumption
Cool con [kWh/m2]	= Cooling energy consumption
Aux con [kWh/m2]	= Auxiliary energy consumption
Heat SSEFF	= Heating system seasonal efficiency (for notional building, value depends on activity glazing class)
Cool SSEER	= Cooling system seasonal energy efficiency ratio
Heat gen SSEFF	= Heating generator seasonal efficiency
Cool gen SSEER	= Cooling generator seasonal energy efficiency ratio
ST	= System type
HS	= Heat source
HFT	= Heating fuel type
CFT	= Cooling fuel type

Full SAP Calculation Printout



Property Reference	CA-58		Issued on Date	13/02/2024	
Assessment Reference	CA5802A (Notional)	Prop Type Ref	CA-58		
Property	1 Bed Flat, 8 Tunsgate, Guildford, GU1 3QT				
SAP Rating	39 E	DER	17.80	TER	13.83
Environmental	87 B	% DER < TER			-28.71
CO ₂ Emissions (t/year)	0.86	DFEE	87.81	TFEE	40.78
Compliance Check	See BREL	% DFEE < TFEE			-115.35
% DPER < TPER	-154.22	DPER	185.18	TPER	72.84
Assessor Details	Mr. Joe Solti			Assessor ID	5122-0001
Client	Accord Surveyors Ltd, .				

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	53.0000 (1b)	x 2.1500 (2b)	= 113.9500 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 113.9500 (5)

2. Ventilation rate

		m ³ per hour
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	2 * 10 =	20.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c)	20.0000 / (5) =	0.1755 (8)
Pressure test	No	
Pressure Test Method	Blower Door	
Measured/design AP50	15.0000	(17)
Infiltration rate	0.9255	(18)
Number of sides sheltered	3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.7173 (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	0.9145	0.8966	0.8787	0.7890	0.7711	0.6814	0.6814	0.6635	0.7173	0.7711	0.8069	0.8428 (22b)
Effective ac	0.9182	0.9019	0.8860	0.8113	0.7973	0.7322	0.7322	0.7201	0.7572	0.7973	0.8256	0.8552 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K					
Windows (new) (Uw = 1.40)			6.0000	1.3258	7.9545		(27)					
Door (new)			2.0000	1.4000	2.8000		(26a)					
Floor			53.0000	0.2500	13.2500		(28b)					
Wall (existing)	38.0000	3.5000	34.5000	0.3000	10.3500		(29a)					
Wall (existing-party)	14.0000		14.0000	0.7000	9.8000		(29a)					
Wall (new)	17.0000	4.5000	12.5000	0.1800	2.2500		(29a)					
Roof	53.0000		53.0000	0.1500	7.9500		(30)					
Total net area of external elements Aum(A, m ²)			175.0000				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	54.3545		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							100.0000 (35)					
Thermal bridges (Default value 0.200 * total exposed area)							35.0000 (36)					
Point Thermal bridges						(36a) =	0.0000					
Total fabric heat loss						(33) + (36) + (36a) =	89.3545 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	34.5267	33.9161	33.3176	30.5063	29.9803	27.5318	27.5318	27.0784	28.4749	29.9803	31.0444	32.1568 (38)
	123.8813	123.2706	122.6721	119.8608	119.3349	116.8863	116.8863	116.4329	117.8295	119.3349	120.3989	121.5113 (39)

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Average = Sum(39)m / 12 =

119.8583

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	2.3374	2.3259	2.3146	2.2615	2.2516	2.2054	2.2054	2.1968	2.2232	2.2516	2.2717	2.2927 (40)
HLP (average)												2.2615
Days in month	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												1.7786 (42)
Hot water usage for mixer showers												69.0962 (42a)
Hot water usage for baths												0.0000 (42b)
Hot water usage for other uses												32.8442 (42c)
Average daily hot water use (litres/day)												93.8078 (43)
Daily hot water use	102.2062	99.9695	97.2562	93.1556	89.8166	86.2305	84.8710	87.5728	90.4195	94.1819	98.3449	101.9404 (44)
Energy content (annual)	161.8696	142.3552	149.4791	127.5254	120.9104	106.0304	102.6441	108.4334	111.4963	127.8040	140.1103	159.6141 (45)
Distribution loss (46)m = 0.15 x (45)m												1558.2722
Water storage loss:												23.9421 (46)
Store volume												170.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												2.0000 (48)
Temperature factor from Table 2b												0.6000 (49)
Enter (49) or (54) in (55)												1.2000 (55)
Total storage loss												37.2000 (56)
If cylinder contains dedicated solar storage												37.2000 (57)
Primary loss												0.0000 (59)
Combi loss												0.0000 (61)
Total heat required for water heating calculated for each month	199.0696	175.9552	186.6791	163.5254	158.1104	142.0304	139.8441	145.6334	147.4963	165.0040	176.1103	196.8141 (62)
WWHRS												0.0000 (63a)
PV diverter												0.0000 (63b)
Solar input												0.0000 (63c)
FGHRS												0.0000 (63d)
Output from w/h	199.0696	175.9552	186.6791	163.5254	158.1104	142.0304	139.8441	145.6334	147.4963	165.0040	176.1103	196.8141 (64)
12Total per year (kWh/year)												1996.2722 (64)
Electric shower(s)												1996 (64)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)
Heat gains from water heating, kWh/month	83.5816	74.2131	79.4618	71.2022	69.9627	64.0551	63.8892	65.8141	65.8725	72.2548	75.3867	82.8317 (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	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	87.9085	97.3272	87.9085	90.8388	87.9085	90.8388	87.9085	87.9085	90.8388	87.9085	90.8388	87.9085 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	155.0178	156.6264	152.5728	143.9431	133.0497	122.8114	115.9716	114.3630	118.4166	127.0463	137.9397	148.1780 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928 (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)	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424 (71)
Water heating gains (Table 5)	112.3409	110.4362	106.8035	98.8919	94.0359	88.9654	85.8725	88.4598	91.4896	97.1167	104.7037	111.3329 (72)
Total internal gains	404.9456	414.0682	396.9632	383.3522	364.6725	352.2940	339.4310	340.4097	350.4234	361.7499	383.1606	397.0978 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W						
Northeast	2.5000	11.2829	0.6300	0.7000	0.7700	8.6205 (75)						
Southwest	3.5000	36.7938	0.6300	0.7000	0.7700	39.3564 (79)						
Solar gains	47.9769	84.5858	123.3396	165.5721	197.0906	200.7836	191.4469	167.1501	137.8417	95.5360	57.9867	40.7208 (83)
Total gains	452.9225	498.6540	520.3028	548.9243	561.7631	553.0777	530.8779	507.5599	488.2652	457.2859	441.1473	437.8186 (84)

7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
tau	11.8841	11.9430	12.0013	12.2828	12.3369	12.5953	12.5953	12.6444	12.4945	12.3369	12.2279	12.1159
alpha	1.7923	1.7962	1.8001	1.8189	1.8225	1.8397	1.8397	1.8430	1.8330	1.8225	1.8152	1.8077
util living area	0.9479	0.9360	0.9200	0.8865	0.8327	0.7403	0.6375	0.6655	0.7947	0.8911	0.9330	0.9508 (86)
MIT	16.5726	16.8882	17.4676	18.3435	19.2255	20.0521	20.5077	20.4450	19.8161	18.6960	17.5309	16.5580 (87)
Th 2	19.1179	19.1249	19.1319	19.1647	19.1709	19.1999	19.1999	19.2053	19.1887	19.1709	19.1584	19.1454 (88)
util rest of house	0.9374	0.9229	0.9023	0.8578	0.7812	0.6387	0.4621	0.5010	0.7112	0.8578	0.9170	0.9409 (89)

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MIT 2	14.3581	14.7473	15.4632	16.5432	17.6035	18.5522	18.9942	18.9506	18.3073	16.9879	15.5547	14.3447 (90)
Living area fraction									FLA = Living area / (4) =			0.4623 (91)
MIT	15.3818	15.7369	16.3898	17.3754	18.3533	19.2455	19.6939	19.6414	19.0048	17.7775	16.4682	15.3678 (92)
Temperature adjustment												0.0000
adjusted MIT	15.3818	15.7369	16.3898	17.3754	18.3533	19.2455	19.6939	19.6414	19.0048	17.7775	16.4682	15.3678 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9038	0.8860	0.8628	0.8178	0.7503	0.6419	0.5198	0.5496	0.7000	0.8210	0.8807	0.9085	(94)
Useful gains	409.3612	441.8093	448.8955	448.9272	421.4632	355.0081	275.9278	278.9420	341.8099	375.4494	388.5293	397.7767	(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	1372.8227	1335.8736	1213.1974	1015.8717	793.9693	543.0006	361.6307	377.4104	577.9284	856.5224	1127.9225	1357.0182	(97)
Space heating kWh	716.8153	600.8112	568.6406	408.2000	277.1445	0.0000	0.0000	0.0000	0.0000	357.9183	532.3631	713.6757	(98a)
Space heating requirement - total per year (kWh/year)												4175.5688	
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	716.8153	600.8112	568.6406	408.2000	277.1445	0.0000	0.0000	0.0000	0.0000	357.9183	532.3631	713.6757	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4175.5688	
Space heating per m2										(98c) / (4) =		78.7843	(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 %)													100.0000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement	716.8153	600.8112	568.6406	408.2000	277.1445	0.0000	0.0000	0.0000	0.0000	357.9183	532.3631	713.6757	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	716.8153	600.8112	568.6406	408.2000	277.1445	0.0000	0.0000	0.0000	0.0000	357.9183	532.3631	713.6757	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	199.0696	175.9552	186.6791	163.5254	158.1104	142.0304	139.8441	145.6334	147.4963	165.0040	176.1103	196.8141	(64)
Efficiency of water heater (217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(216)
Fuel for water heating, kWh/month	199.0696	175.9552	186.6791	163.5254	158.1104	142.0304	139.8441	145.6334	147.4963	165.0040	176.1103	196.8141	(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	18.6888	14.9928	13.4994	9.8902	7.6395	6.2415	6.9690	9.0586	11.7662	15.4379	17.4370	19.2082	(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													4175.5688 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)
Efficiency of water heater													100.0000
Water heating fuel used													1996.2722 (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)													150.8290 (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													6322.6700 (238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	4175.5688	0.1533	640.3212	(261)
Total CO2 associated with community systems			0.0000	(373)

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Water heating (other fuel)	1996.2722	0.1410	281.4035 (264)
Space and water heating			921.7247 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	150.8290	0.1443	21.7693 (268)
Total CO2, kg/year			943.4940 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			17.8000 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	4175.5688	1.5677	6546.1855 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1996.2722	1.5212	3036.8066 (278)
Space and water heating			9582.9921 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	150.8290	1.5338	231.3466 (282)
Total Primary energy kWh/year			9814.3387 (286)
Dwelling Primary energy Rate (DPER)			185.1800 (287)

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

 1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	53.0000 (1b)	x 2.1500 (2b)	= 113.9500 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	113.9500 (5)

 2. Ventilation rate

Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	2 * 10 =	20.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1755 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.4255 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3298 (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	0.4205	0.4122	0.4040	0.3628	0.3545	0.3133	0.3133	0.3050	0.3298	0.3545	0.3710	0.3875 (22b)
Effective ac	0.5884	0.5850	0.5816	0.5658	0.5628	0.5491	0.5491	0.5465	0.5544	0.5628	0.5688	0.5751 (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
TER Semi-glazed door			2.0000	1.0000	2.0000		(26a)
TER Opening Type (Uw = 1.20)			6.0000	1.1450	6.8702		(27)
Floor			53.0000	0.1300	6.8900		(28b)
Wall (existing)	38.0000	3.5000	34.5000	0.1800	6.2100		(29a)
Wall (existing-party)	14.0000		14.0000	0.1800	2.5200		(29a)
Wall (new)	17.0000	4.5000	12.5000	0.1800	2.2500		(29a)
Roof	53.0000		53.0000	0.1100	5.8300		(30)
Total net area of external elements Aum(A, m2)			175.0000				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	32.5702	(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							100.0000 (35)
Thermal bridges (User defined value 0.050 * total exposed area)							8.7500 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	41.3202 (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	22.1257	21.9966	21.8701	21.2759	21.1647	20.6471	20.6471	20.5513	20.8465	21.1647	21.3896	21.6247 (38)
Heat transfer coeff	63.4459	63.3168	63.1903	62.5961	62.4849	61.9673	61.9673	61.8715	62.1667	62.4849	62.7098	62.9450 (39)
Average = Sum(39)m / 12 =												62.5956

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1971	1.1947	1.1923	1.1811	1.1790	1.1692	1.1692	1.1674	1.1730	1.1790	1.1832	1.1876 (40)
HLP (average)												1.1810
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7786 (42)
Hot water usage for mixer showers	69.3619	68.3196	66.8006	63.8944	61.7497	59.3579	57.9984	59.5058	61.1583	63.7263	66.6950	69.0962 (42a)
Hot water usage for baths	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42b)
Hot water usage for other uses	32.8442	31.6499	30.4556	29.2612	28.0669	26.8726	26.8726	28.0669	29.2612	30.4556	31.6499	32.8442 (42c)
Average daily hot water use (litres/day)												93.8078 (43)
Daily hot water use	102.2062	99.9695	97.2562	93.1556	89.8166	86.2305	84.8710	87.5728	90.4195	94.1819	98.3449	101.9404 (44)
Energy content	161.8696	142.3552	149.4791	127.5254	120.9104	106.0304	102.6441	108.4334	111.4963	127.8040	140.1103	159.6141 (45)
Energy content (annual)												Total = Sum(45)m = 1558.2722
Distribution loss (46)m = 0.15 x (45)m	24.2804	21.3533	22.4219	19.1288	18.1366	15.9046	15.3966	16.2650	16.7244	19.1706	21.0165	23.9421 (46)
Water storage loss:												170.0000 (47)
Store volume												1.5003 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.8102 (55)
Enter (49) or (54) in (55)												
Total storage loss	25.1153	22.6848	25.1153	24.3051	25.1153	24.3051	25.1153	25.1153	24.3051	25.1153	24.3051	25.1153 (56)
If cylinder contains dedicated solar storage	25.1153	22.6848	25.1153	24.3051	25.1153	24.3051	25.1153	25.1153	24.3051	25.1153	24.3051	25.1153 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	210.2473	186.0512	197.8568	174.3425	169.2881	152.8475	151.0218	156.8111	158.3135	176.1817	186.9275	207.9918 (62)
WWHRS	-31.7094	-28.0440	-29.3661	-24.3163	-22.6619	-19.3920	-18.1769	-19.3293	-20.0637	-23.6528	-26.7958	-31.1222 (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	178.5379	158.0071	168.4907	150.0262	146.6261	133.4556	132.8449	137.4818	138.2498	152.5288	160.1317	176.8696 (64)
Total per year (kWh/year)												1833.2503 (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	92.5238	82.2899	88.4040	79.8559	78.9049	72.7088	72.8313	74.7563	74.5262	81.1970	84.0404	91.7738 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	87.9085	97.3272	87.9085	90.8388	87.9085	90.8388	87.9085	87.9085	90.8388	87.9085	90.8388	87.9085 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	155.0178	156.6264	152.5728	143.9431	133.0497	122.8114	115.9716	114.3630	118.4166	127.0463	137.9397	148.1780 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928 (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)	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424 (71)
Water heating gains (Table 5)	124.3599	122.4552	118.8225	110.9110	106.0549	100.9845	97.8916	100.4788	103.5087	109.1357	116.7228	123.3519 (72)
Total internal gains	419.9646	429.0873	411.9822	398.3712	379.6915	364.3131	351.4501	352.4287	362.4425	376.7689	398.1797	412.1168 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
Northeast	2.5000	11.2829	0.6300	0.7000	0.7700	8.6205 (75)
Southwest	3.5000	36.7938	0.6300	0.7000	0.7700	39.3564 (79)
Solar gains	47.9769	84.5858	123.3396	165.5721	197.0906	200.7836
Total gains	467.9415	513.6730	535.3219	563.9433	576.7821	565.0967
						191.4469
						542.8969
						519.5789
						500.2842
						472.3049
						456.1664
						40.7208 (83)
						452.8376 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
tau	23.2044	23.2517	23.2982	23.5194	23.5612	23.7580	23.7580	23.7948	23.6818	23.5612	23.4767	23.3890
alpha	2.5470	2.5501	2.5532	2.5680	2.5707	2.5839	2.5839	2.5863	2.5788	2.5707	2.5651	2.5593
util living area	0.9263	0.9053	0.8763	0.8160	0.7226	0.5852	0.4561	0.4887	0.6632	0.8231	0.8995	0.9314 (86)
MIT	18.6297	18.8995	19.3043	19.8685	20.3741	20.7482	20.9044	20.8827	20.6291	20.0054	19.2451	18.5856 (87)
Th 2	19.9223	19.9243	19.9262	19.9352	19.9369	19.9447	19.9447	19.9462	19.9417	19.9369	19.9335	19.9299 (88)
util rest of house	0.9161	0.8924	0.8586	0.7883	0.6778	0.5145	0.3615	0.3948	0.5982	0.7911	0.8836	0.9219 (89)
MIT 2	17.1898	17.5278	18.0344	18.7325	19.3321	19.7464	19.8908	19.8761	19.6288	18.9116	17.9728	17.1390 (90)

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Living area fraction											FLA = Living area / (4) =	0.4623 (91)
MIT	17.8554	18.1619	18.6214	19.2577	19.8138	20.2095	20.3593	20.3414	20.0912	19.4172	18.5609	17.8077 (92)
Temperature adjustment												0.0000
adjusted MIT	17.8554	18.1619	18.6214	19.2577	19.8138	20.2095	20.3593	20.3414	20.0912	19.4172	18.5609	17.8077 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8906	0.8657	0.8325	0.7679	0.6721	0.5333	0.4002	0.4316	0.6082	0.7729	0.8581	0.8971 (94)
Useful gains	416.7585	444.6632	445.6304	433.0490	387.6698	301.3891	217.2576	224.2651	304.2697	365.0389	391.4473	406.2499 (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	860.0359	839.6998	765.9559	648.3483	506.9893	347.6056	232.9565	243.8597	372.4552	550.9432	718.7122	856.5367 (97)
Space heating kWh	329.7984	265.4646	238.3222	155.0155	88.7737	0.0000	0.0000	0.0000	0.0000	138.3128	235.6307	335.0133 (98a)
Space heating requirement - total per year (kWh/year)												1786.3313
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	329.7984	265.4646	238.3222	155.0155	88.7737	0.0000	0.0000	0.0000	0.0000	138.3128	235.6307	335.0133 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1786.3313
Space heating per m2												(98c) / (4) = 33.7044 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)	
Fraction of space heat from main system(s)												1.0000 (202)	
Efficiency of main space heating system 1 (in %)												92.3000 (206)	
Efficiency of main space heating system 2 (in %)												0.0000 (207)	
Efficiency of secondary/supplementary heating system, %												0.0000 (208)	
Space heating requirement	329.7984	265.4646	238.3222	155.0155	88.7737	0.0000	0.0000	0.0000	0.0000	138.3128	235.6307	335.0133 (98)	
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000 (210)	
Space heating fuel (main heating system)	357.3113	287.6107	258.2039	167.9475	96.1795	0.0000	0.0000	0.0000	0.0000	149.8513	255.2879	362.9614 (211)	
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)	
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)	
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)	
Water heating requirement	178.5379	158.0071	168.4907	150.0262	146.6261	133.4556	132.8449	137.4818	138.2498	152.5288	160.1317	176.8696 (64)	
Efficiency of water heater	(217)m	85.4165	85.2141	84.8372	84.1332	82.9713	79.8000	79.8000	79.8000	83.8410	84.9246	85.4693 (217)	
Fuel for water heating, kWh/month	209.0203	185.4238	198.6049	178.3198	176.7191	167.2376	166.4723	172.2829	173.2454	181.9262	188.5574	206.9393 (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 (221)	
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)	
Lighting	18.2656	14.6534	13.1937	9.6663	7.4665	6.1002	6.8112	8.8535	11.4998	15.0884	17.0423	18.7733 (232)	
Electricity generated by PVs (Appendix M) (negative quantity)	(233a)m	-25.2507	-35.8284	-51.8373	-58.7010	-63.6886	-59.6364	-58.9608	-55.5132	-49.4228	-41.2301	-27.8661	-21.8088 (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 (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 (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 (235c)	
Electricity generated by PVs (Appendix M) (negative quantity)	(233b)m	-13.5505	-28.5943	-56.9820	-85.7778	-113.5791	-114.1329	-112.7298	-95.3189	-69.7366	-40.8849	-18.0944	-10.7035 (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 (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 (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												1935.3535 (211)	
Space heating fuel - main system 2												0.0000 (213)	
Space heating fuel - secondary												0.0000 (215)	
Efficiency of water heater												79.8000	
Water heating fuel used												2204.7490 (219)	
Space cooling fuel												0.0000 (221)	
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												86.0000 (231)	
Electricity for lighting (calculated in Appendix L)												147.4142 (232)	
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1309.8289 (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												3063.6879 (238)	

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1935.3535	0.2100	406.4242 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2204.7490	0.2100	462.9973 (264)

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Space and water heating			869.4215 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	147.4142	0.1443	21.2764 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-549.7443	0.1344	-73.8987
PV Unit electricity exported	-760.0846	0.1258	-95.6499
Total			-169.5486 (269)
Total CO2, kg/year			733.0786 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.8300 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	1935.3535	1.1300	2186.9495 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2204.7490	1.1300	2491.3664 (278)
Space and water heating			4678.3159 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	147.4142	1.5338	226.1089 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-549.7443	1.4968	-822.8561
PV Unit electricity exported	-760.0846	0.4619	-351.0999
Total			-1173.9560 (283)
Total Primary energy kWh/year			3860.5695 (286)
Target Primary Energy Rate (TPER)			72.8400 (287)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022) CALCULATION OF FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	53.0000 (1b)	x 2.1500 (2b)	= 113.9500 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 113.9500 (5)

2. Ventilation rate

		m3 per hour
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	2 * 10 =	20.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
		Air changes per hour
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1755 (8)
Pressure test		No
Pressure Test Method		Blower Door
Measured/design AP50		15.0000 (17)
Infiltration rate		0.9255 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.7173 (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	0.9145	0.8966	0.8787	0.7890	0.7711	0.6814	0.6814	0.6635	0.7173	0.7711	0.8069	0.8428 (22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000 (23c)
Effective ac	0.9182	0.9019	0.8860	0.8113	0.7973	0.7322	0.7322	0.7201	0.7572	0.7973	0.8256	0.8552 (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
Windows (new) (Uw = 1.40)			6.0000	1.3258	7.9545		(27)
Door (new)			2.0000	1.4000	2.8000		(26a)
Floor			53.0000	0.2500	13.2500		(28b)
Wall (existing)	38.0000	3.5000	34.5000	0.3000	10.3500		(29a)
Wall (existing-party)	14.0000		14.0000	0.7000	9.8000		(29a)
Wall (new)	17.0000	4.5000	12.5000	0.1800	2.2500		(29a)
Roof	53.0000		53.0000	0.1500	7.9500		(30)
Total net area of external elements Aum(A, m2)			175.0000				(31)
Fabric heat loss, W/K = Sum (A x U)					(26) ... (30) + (32) =	54.3545	(33)

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Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 100.0000 (35)
 Thermal bridges (Default value 0.200 * total exposed area) 35.0000 (36)
 Point Thermal bridges (36a) = 0.0000
 Total fabric heat loss (33) + (36) + (36a) = 89.3545 (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	34.5267	33.9161	33.3176	30.5063	29.9803	27.5318	27.5318	27.0784	28.4749	29.9803	31.0444	32.1568 (38)
Heat transfer coeff	123.8813	123.2706	122.6721	119.8608	119.3349	116.8863	116.8863	116.4329	117.8295	119.3349	120.3989	121.5113 (39)
Average = Sum(39)m / 12 =												119.8583

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	2.3374	2.3259	2.3146	2.2615	2.2516	2.2054	2.2054	2.1968	2.2232	2.2516	2.2717	2.2927 (40)
HLP (average)												2.2615
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7786 (42)

Hot water usage for mixer showers 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (42a)

Hot water usage for baths 23.3623 23.0153 22.5267 21.6258 20.9512 20.2033 19.7992 20.2844 20.8127 21.6131 22.5325 23.2833 (42b)

Hot water usage for other uses 32.8442 31.6499 30.4556 29.2612 28.0669 26.8726 26.8726 28.0669 29.2612 30.4556 31.6499 32.8442 (42c)

Average daily hot water use (litres/day) 51.5189 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	56.2065	54.6652	52.9823	50.8871	49.0181	47.0758	46.6718	48.3513	50.0739	52.0686	54.1824	56.1275 (44)
Energy conte	89.0174	77.8425	81.4318	69.6618	65.9878	57.8852	56.4455	59.8690	61.7461	70.6566	77.1928	87.8821 (45)
Energy content (annual)												855.6187
Distribution loss (46)m = 0.15 x (45)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 (46)												
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (57)												
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	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	75.6648	66.1661	69.2170	59.2126	56.0897	49.2024	47.9787	50.8887	52.4842	60.0581	65.6138	74.6998 (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	75.6648	66.1661	69.2170	59.2126	56.0897	49.2024	47.9787	50.8887	52.4842	60.0581	65.6138	74.6998 (64)
12Total per year (kWh/year)												727.2759 (64)
Electric shower(s)	43.2771	38.5603	42.1064	40.1816	40.9356	39.0486	40.3502	40.9356	40.1816	42.1064	41.3146	43.2771 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												492.2750 (64a)
Heat gains from water heating, kWh/month	29.7355	26.1816	27.8308	24.8485	24.2563	22.0627	22.0822	22.9561	23.1665	25.5411	26.7321	29.4942 (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	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	87.9085	97.3272	87.9085	90.8388	87.9085	90.8388	87.9085	87.9085	90.8388	87.9085	90.8388	87.9085 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	155.0178	156.6264	152.5728	143.9431	133.0497	122.8114	115.9716	114.3630	118.4166	127.0463	137.9397	148.1780 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928 (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)	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424 (71)
Water heating gains (Table 5)	39.9670	38.9607	37.4070	34.5119	32.6026	30.6427	29.6804	30.8549	32.1756	34.3295	37.1279	39.6428 (72)
Total internal gains	332.5717	342.5928	327.5667	318.9721	303.2392	293.9713	283.2389	282.8048	291.1094	298.9627	315.5848	325.4077 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W						
Northeast	2.5000	11.2829	0.6300	0.7000	0.7700	8.6205 (75)						
Southwest	3.5000	36.7938	0.6300	0.7000	0.7700	39.3564 (79)						
Solar gains	47.9769	84.5858	123.3396	165.5721	197.0906	200.7836	191.4469	167.1501	137.8417	95.5360	57.9867	40.7208 (83)
Total gains	380.5486	427.1786	450.9064	484.5442	500.3297	494.7549	474.6858	449.9550	428.9512	394.4987	373.5715	366.1285 (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	11.8841	11.9430	12.0013	12.2828	12.3369	12.5953	12.5953	12.6444	12.4945	12.3369	12.2279	12.1159
alpha	1.7923	1.7962	1.8001	1.8189	1.8225	1.8397	1.8397	1.8430	1.8330	1.8225	1.8152	1.8077
util living area												

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	0.9604	0.9496	0.9355	0.9050	0.8563	0.7709	0.6735	0.7031	0.8251	0.9121	0.9482	0.9630 (86)
MIT	16.4002	16.7226	17.3130	18.2109	19.1166	19.9736	20.4553	20.3849	19.7211	18.5641	17.3732	16.3839 (87)
Th 2	19.1179	19.1249	19.1319	19.1647	19.1709	19.1999	19.1999	19.2053	19.1887	19.1709	19.1584	19.1454 (88)
util rest of house												
	0.9522	0.9390	0.9207	0.8800	0.8096	0.6745	0.4990	0.5415	0.7486	0.8839	0.9354	0.9553 (89)
MIT 2	15.1392	15.4614	16.0494	16.9486	17.8262	18.6289	19.0123	18.9725	18.4130	17.3076	16.1280	15.1376 (90)
Living area fraction									fLA = Living area / (4) =			0.4623 (91)
MIT	15.7221	16.0444	16.6335	17.5321	18.4227	19.2505	19.6793	19.6254	19.0177	17.8885	16.7036	15.7138 (92)
Temperature adjustment												0.0000
adjusted MIT	15.7221	16.0444	16.6335	17.5321	18.4227	19.2505	19.6793	19.6254	19.0177	17.8885	16.7036	15.7138 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9287	0.9121	0.8909	0.8483	0.7838	0.6779	0.5558	0.5885	0.7390	0.8551	0.9092	0.9330 (94)
Useful gains	353.4221	389.6359	401.7279	411.0594	392.1545	335.3917	263.8445	264.7852	316.9956	337.3303	339.6359	341.6041 (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												
Space heating kWh	1414.9852	1373.7797	1243.1007	1034.6560	802.2547	543.5833	359.9308	375.5380	579.4489	869.7664	1156.2656	1399.0518 (97)
Space heating requirement - total per year (kWh/year)	789.8029	661.3446	625.9814	448.9896	305.1145	0.0000	0.0000	0.0000	0.0000	396.1325	587.9734	786.7411 (98a)
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)	789.8029	661.3446	625.9814	448.9896	305.1145	0.0000	0.0000	0.0000	0.0000	396.1325	587.9734	786.7411 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4602.0800
Space heating per m2												(98c) / (4) = 86.8317 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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
Heat loss rate W												
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	1098.7316	864.9589	884.8901	0.0000	0.0000	0.0000	0.0000 (100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.4131	0.4768	0.4521	0.0000	0.0000	0.0000	0.0000 (101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	453.8447	412.4225	400.0159	0.0000	0.0000	0.0000	0.0000 (102)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	539.3383	517.8736	490.7405	0.0000	0.0000	0.0000	0.0000 (103)
Cooled fraction												
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	61.5554	78.4557	67.4991	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling requirement												1.0000 (105)
Energy for space heating												51.8775 (107)
Energy for space cooling												86.8317 (99)
Total												0.9788 (108)
Fabric Energy Efficiency (DFEE)												87.8105 (109)
												87.8 (109)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	53.0000 (1b)	x 2.1500 (2b)	= 113.9500 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	113.9500 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 20.0000 / (5) = 0.1755 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4255 (18)
Number of sides sheltered	3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3298 (21)

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	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													
	0.4205	0.4122	0.4040	0.3628	0.3545	0.3133	0.3133	0.3050	0.3298	0.3545	0.3710	0.3875	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)													(23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =													(23c)
Effective ac	0.5884	0.5850	0.5816	0.5658	0.5628	0.5491	0.5491	0.5465	0.5544	0.5628	0.5688	0.5751	(25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K						
TER Semi-glazed door			2.0000	1.0000	2.0000			(26a)					
TER Opening Type (Uw = 1.20)			6.0000	1.1450	6.8702			(27)					
Floor			53.0000	0.1300	6.8900			(28b)					
Wall (existing)	38.0000	3.5000	34.5000	0.1800	6.2100			(29a)					
Wall (existing-party)	14.0000		14.0000	0.1800	2.5200			(29a)					
Wall (new)	17.0000	4.5000	12.5000	0.1800	2.2500			(29a)					
Roof	53.0000		53.0000	0.1100	5.8300			(30)					
Total net area of external elements Aum(A, m ²)			175.0000					(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	32.5702		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K								100.0000 (35)					
Thermal bridges (User defined value 0.050 * total exposed area)								8.7500 (36)					
Point Thermal bridges								0.0000 (36a) =					
Total fabric heat loss								(33) + (36) + (36a) = 41.3202 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	22.1257	21.9966	21.8701	21.2759	21.1647	20.6471	20.6471	20.5513	20.8465	21.1647	21.3896	21.6247	(38)
Heat transfer coeff	63.4459	63.3168	63.1903	62.5961	62.4849	61.9673	61.9673	61.8715	62.1667	62.4849	62.7098	62.9450	(39)
Average = Sum(39)m / 12 =												62.5956	
HLP	1.1971	1.1947	1.1923	1.1811	1.1790	1.1692	1.1692	1.1674	1.1730	1.1790	1.1832	1.1876	(40)
HLP (average)												1.1810	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.7786 (42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	23.3623	23.0153	22.5267	21.6258	20.9512	20.2033	19.7992	20.2844	20.8127	21.6131	22.5325	23.2833	(42b)
Hot water usage for other uses	32.8442	31.6499	30.4556	29.2612	28.0669	26.8726	26.8726	28.0669	29.2612	30.4556	31.6499	32.8442	(42c)
Average daily hot water use (litres/day)													51.5189 (43)
Daily hot water use	56.2065	54.6652	52.9823	50.8871	49.0181	47.0758	46.6718	48.3513	50.0739	52.0686	54.1824	56.1275	(44)
Energy conte	89.0174	77.8425	81.4318	69.6618	65.9878	57.8852	56.4455	59.8690	61.7461	70.6566	77.1928	87.8821	(45)
Energy content (annual)													Total = Sum(45)m = 855.6187
Distribution loss (46)m = 0.15 x (45)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	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
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	(59)
Total heat required for water heating calculated for each month													(61)
75.6648	66.1661	69.2170	59.2126	56.0897	49.2024	47.9787	50.8887	52.4842	60.0581	65.6138	74.6998	74.6998	(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	75.6648	66.1661	69.2170	59.2126	56.0897	49.2024	47.9787	50.8887	52.4842	60.0581	65.6138	74.6998	(64)
Total per year (kWh/year)													Total per year (kWh/year) = Sum(64)m = 727.2759 (64)
Electric shower(s)	43.2771	38.5603	42.1064	40.1816	40.9356	39.0486	40.3502	40.9356	40.1816	42.1064	41.3146	43.2771	(64a)
Heat gains from water heating, kWh/month	29.7355	26.1816	27.8308	24.8485	24.2563	22.0627	22.0822	22.9561	23.1665	25.5411	26.7321	29.4942	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	87.9085	97.3272	87.9085	90.8388	87.9085	90.8388	87.9085	87.9085	90.8388	87.9085	90.8388	87.9085	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	155.0178	156.6264	152.5728	143.9431	133.0497	122.8114	115.9716	114.3630	118.4166	127.0463	137.9397	148.1780	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	(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)	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	(71)
Water heating gains (Table 5)	39.9670	38.9607	37.4070	34.5119	32.6026	30.6427	29.6804	30.8549	32.1756	34.3295	37.1279	39.6428	(72)
Total internal gains	332.5717	342.5928	327.5667	318.9721	303.2392	293.9713	283.2389	282.8048	291.1094	298.9627	315.5848	325.4077	(73)

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6. Solar gains

[Jan]			Area m ²	Solar flux Table 6a W/m ²	Specific data or Table 6b	g	Specific data or Table 6c	FF	Access factor Table 6d	Gains W		
Northeast			2.5000	11.2829		0.6300		0.7000	0.7700	8.6205 (75)		
Southwest			3.5000	36.7938		0.6300		0.7000	0.7700	39.3564 (79)		
Solar gains	47.9769	84.5858	123.3396	165.5721	197.0906	200.7836	191.4469	167.1501	137.8417	95.5360	57.9867	40.7208 (83)
Total gains	380.5486	427.1786	450.9064	484.5442	500.3297	494.7549	474.6858	449.9550	428.9512	394.4987	373.5715	366.1285 (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	23.2044	23.2517	23.2982	23.5194	23.5612	23.7580	23.7580	23.7948	23.6818	23.5612	23.4767	23.3890
alpha	2.5470	2.5501	2.5532	2.5680	2.5707	2.5839	2.5839	2.5863	2.5788	2.5707	2.5651	2.5593
util living area	0.9515	0.9338	0.9096	0.8564	0.7715	0.6375	0.5068	0.5444	0.7206	0.8691	0.9316	0.9557 (86)
MIT	18.3596	18.6489	19.0808	19.6965	20.2567	20.6897	20.8773	20.8483	20.5425	19.8305	19.0082	18.3126 (87)
Th 2	19.9223	19.9243	19.9262	19.9352	19.9369	19.9447	19.9447	19.9462	19.9417	19.9369	19.9335	19.9299 (88)
util rest of house	0.9443	0.9241	0.8957	0.8327	0.7300	0.5666	0.4062	0.4454	0.6583	0.8427	0.9200	0.9491 (89)
MIT 2	17.5304	17.8155	18.2405	18.8416	19.3677	19.7502	19.8894	19.8736	19.6334	18.9808	18.1795	17.4892 (90)
Living area fraction	fLA = Living area / (4) = 0.4623 (91)											
MIT	17.9137	18.2007	18.6289	19.2368	19.7787	20.1845	20.3461	20.3241	20.0536	19.3736	18.5626	17.8698 (92)
Temperature adjustment	0.0000											
adjusted MIT	17.9137	18.2007	18.6289	19.2368	19.7787	20.1845	20.3461	20.3241	20.0536	19.3736	18.5626	17.8698 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9266	0.9041	0.8747	0.8143	0.7231	0.5839	0.4464	0.4830	0.6656	0.8259	0.9008	0.9323 (94)
Useful gains	352.6296	386.2157	394.4203	394.5819	361.8070	288.8773	211.8947	217.3397	285.5204	325.8149	336.4982	341.3283 (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	863.7342	842.1614	766.4319	647.0416	504.7943	346.0565	232.1356	242.7930	370.1176	548.2168	718.8166	860.4470 (97)
Space heating kWh	380.2618	306.3955	276.7766	181.7710	106.3825	0.0000	0.0000	0.0000	0.0000	165.4670	275.2692	386.2243 (98a)
Space heating requirement - total per year (kWh/year)	2078.5479											
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	380.2618	306.3955	276.7766	181.7710	106.3825	0.0000	0.0000	0.0000	0.0000	165.4670	275.2692	386.2243 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	2078.5479											
Space heating per m ²	(98c) / (4) = 39.2179 (99)											

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	582.4929	458.5583	470.2233	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.6927	0.7633	0.7364	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	403.4908	350.0096	346.2643	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	539.3383	517.8736	490.7405	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	97.8102	124.8908	107.4903	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction	fc = cooled area / (4) = 1.0000 (105)											
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	24.4525	31.2227	26.8726	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement	82.5478 (107)											
Energy for space heating	39.2179 (99)											
Energy for space cooling	1.5575 (108)											
Total	40.7754 (109)											
Fabric Energy Efficiency (TFEE)	40.8 (109)											

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	53.0000 (1b)	x 2.1500 (2b)	= 113.9500 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	113.9500 (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												2 * 10 =	20.0000 (7a)
Number of passive vents												0 * 10 =	0.0000 (7b)
Number of flueless gas fires												0 * 40 =	0.0000 (7c)
												Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =												20.0000 / (5) =	0.1755 (8)
Pressure test												No	
Pressure Test Method												Blower Door	
Measured/design AP50												15.0000 (17)	
Infiltration rate												0.9255 (18)	
Number of sides sheltered												3 (19)	
Shelter factor												(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor												(21) = (18) x (20) =	0.7173 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.9145	0.8966	0.8787	0.7890	0.7711	0.6814	0.6814	0.6635	0.7173	0.7711	0.8069	0.8428 (22b)
	0.9182	0.9019	0.8860	0.8113	0.7973	0.7322	0.7322	0.7201	0.7572	0.7973	0.8256	0.8552 (25)

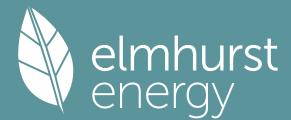
3. Heat losses and heat loss parameter

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					
Windows (new) (Uw = 1.40)			6.0000	1.3258	7.9545			(27)				
Door (new)			2.0000	1.4000	2.8000			(26a)				
Floor			53.0000	0.2500	13.2500			(28b)				
Wall (existing)	38.0000	3.5000	34.5000	0.3000	10.3500			(29a)				
Wall (existing-party)	14.0000		14.0000	0.7000	9.8000			(29a)				
Wall (new)	17.0000	4.5000	12.5000	0.1800	2.2500			(29a)				
Roof	53.0000		53.0000	0.1500	7.9500			(30)				
Total net area of external elements Aum(A, m2)				175.0000				(31)				
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	54.3545		(33)				
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								100.0000	(35)			
Thermal bridges (Default value 0.200 * total exposed area)								35.0000	(36)			
Point Thermal bridges								(36a) =	0.0000			
Total fabric heat loss								(33) + (36) + (36a) =	89.3545 (37)			
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	34.5267	33.9161	33.3176	30.5063	29.9803	27.5318	27.5318	27.0784	28.4749	29.9803	31.0444	32.1568 (38)
Heat transfer coeff	123.8813	123.2706	122.6721	119.8608	119.3349	116.8863	116.8863	116.4329	117.8295	119.3349	120.3989	121.5113 (39)
Average = Sum(39)m / 12 =												119.8583
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	2.3374	2.3259	2.3146	2.2615	2.2516	2.2054	2.2054	2.1968	2.2232	2.2516	2.2717	2.2927 (40)
HLP (average)												2.2615
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.7786 (42)
Hot water usage for mixer showers												69.3619	
Hot water usage for baths												68.3196	
Hot water usage for other uses												0.0000	
Average daily hot water use (litres/day)												30.4556	
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	102.2062	99.9695	97.2562	93.1556	89.8166	86.2305	84.8710	87.5728	90.4195	94.1819	98.3449	101.9404 (44)	
Energy content (annual)	161.8696	142.3552	149.4791	127.5254	120.9104	106.0304	102.6441	108.4334	111.4963	127.8040	140.1103	159.6141 (45)	
Distribution loss (46)m = 0.15 x (45)m												24.2804	
Water storage loss:												21.3533	
Store volume												37.2000	
a) If manufacturer declared loss factor is known (kWh/day):												2.0000 (47)	
Temperature factor from Table 2b												0.6000 (48)	
Enter (49) or (54) in (55)												1.2000 (55)	
Total storage loss												37.2000	
If cylinder contains dedicated solar storage												37.2000	
Primary loss												0.0000	
Combi loss												0.0000	
Total heat required for water heating calculated for each month												199.0696	
WWHRS												0.0000	
PV diverter												0.0000	
Solar input												0.0000	
FGHRS												0.0000	

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Output from w/h	199.0696	175.9552	186.6791	163.5254	158.1104	142.0304	139.8441	145.6334	147.4963	165.0040	176.1103	196.8141 (64)
	Total per year (kWh/year) = Sum(64)m = 1996.2722 (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	83.5816	74.2131	79.4618	71.2022	69.9627	64.0551	63.8892	65.8141	65.8725	72.2548	75.3867	82.8317 (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	106.7137	106.7137	106.7137	106.7137	106.7137	106.7137	106.7137	106.7137	106.7137	106.7137	106.7137	106.7137 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	21.3514	18.9641	15.4227	11.6760	8.7279	7.3685	7.9619	10.3492	13.8906	17.6374	20.5854	21.9448 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	231.3698	233.7707	227.7206	214.8404	198.5816	183.3006	173.0920	170.6911	176.7412	189.6214	205.8802	221.1612 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	47.4499	47.4499	47.4499	47.4499	47.4499	47.4499	47.4499	47.4499	47.4499	47.4499	47.4499	47.4499 (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)	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424 (71)
Water heating gains (Table 5)	112.3409	110.4362	106.8035	98.8919	94.0359	88.9654	85.8725	88.4598	91.4896	97.1167	104.7037	111.3329 (72)
Total internal gains	448.0833	446.1922	432.9679	408.4295	384.3666	362.6557	349.9475	352.5212	365.1427	387.3965	414.1905	437.4601 (73)

6. Solar gains

[Jan]	Area m ²	Solar flux Table 6a W/m ²	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W						
Northeast	2.5000	11.2829	0.6300	0.7000	0.7700	8.6205 (75)						
Southwest	3.5000	36.7938	0.6300	0.7000	0.7700	39.3564 (79)						
Solar gains	47.9769	84.5858	123.3396	165.5721	197.0906	200.7836	191.4469	167.1501	137.8417	95.5360	57.9867	40.7208 (83)
Total gains	496.0602	530.7780	556.3075	574.0016	581.4572	563.4393	541.3944	519.6713	502.9844	482.9325	472.1772	478.1809 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation factor for gains for living area, nil,m (see Table 9a)	11.8841	11.9430	12.0013	12.2828	12.3369	12.5953	12.5953	12.6444	12.4945	12.3369	12.2279	12.1159
tau	1.7923	1.7962	1.8001	1.8189	1.8225	1.8397	1.8397	1.8430	1.8330	1.8225	1.8152	1.8077
util living area	0.9401	0.9297	0.9118	0.8792	0.8252	0.7350	0.6311	0.6580	0.7873	0.8824	0.9257	0.9435 (86)
MIT	16.6725	16.9605	17.5451	18.3932	19.2587	20.0652	20.5168	20.4566	19.8383	18.7475	17.6011	16.6534 (87)
Th 2	19.1179	19.1249	19.1319	19.1647	19.1709	19.1999	19.1999	19.2053	19.1887	19.1709	19.1584	19.1454 (88)
util rest of house	0.9282	0.9155	0.8925	0.8491	0.7722	0.6326	0.4557	0.4932	0.7022	0.8472	0.9083	0.9324 (89)
MIT 2	14.4791	14.8343	15.5551	16.6003	17.6388	18.5635	18.9992	18.9576	18.3282	17.0462	15.6384	14.4606 (90)
Living area fraction	15.4930	15.8171	16.4750	17.4291	18.3876	19.2576	19.7007	19.6506	19.0262	17.8327	16.5457	15.4742 (91)
MIT	15.4930	15.8171	16.4750	17.4291	18.3876	19.2576	19.7007	19.6506	19.0262	17.8327	16.5457	15.4742 (92)
Temperature adjustment												0.0000
adjusted MIT	15.4930	15.8171	16.4750	17.4291	18.3876	19.2576	19.7007	19.6506	19.0262	17.8327	16.5457	15.4742 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8921	0.8770	0.8517	0.8090	0.7421	0.6367	0.5139	0.5426	0.6923	0.8103	0.8705	0.8976 (94)
Useful gains	442.5451	465.4960	473.8234	464.3529	431.4787	358.7252	278.2334	281.9578	348.2138	391.3131	411.0314	429.2000 (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	1386.6049	1345.7635	1223.6572	1022.3039	798.0679	544.4140	362.4292	378.4732	580.4568	863.1104	1137.2484	1369.9489 (97)
Space heating kWh	702.3805	591.5398	557.8763	401.7247	272.7424	0.0000	0.0000	0.0000	0.0000	351.0172	522.8762	699.9172 (98a)
Space heating requirement - total per year (kWh/year)	4100.0743											
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	702.3805	591.5398	557.8763	401.7247	272.7424	0.0000	0.0000	0.0000	0.0000	351.0172	522.8762	699.9172 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	4100.0743											
Space heating per m ²	77.3599 (99)											

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

Fraction of space heat from secondary/supplementary system (Table 11)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Fraction of space heat from main system(s)												0.0000 (201)
Efficiency of main space heating system 1 (in %)												1.0000 (202)
Efficiency of main space heating system 2 (in %)												100.0000 (206)
Efficiency of secondary/supplementary heating system, %												0.0000 (207)
												0.0000 (208)
Space heating requirement	702.3805	591.5398	557.8763	401.7247	272.7424	0.0000	0.0000	0.0000	0.0000	351.0172	522.8762	699.9172 (98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000 (210)
Space heating fuel (main heating system)	702.3805	591.5398	557.8763	401.7247	272.7424	0.0000	0.0000	0.0000	0.0000	351.0172	522.8762	699.9172 (211)

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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	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	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	0.0000	(215)
Water heating														
Water heating requirement	199.0696	175.9552	186.6791	163.5254	158.1104	142.0304	139.8441	145.6334	147.4963	165.0040	176.1103	196.8141		(64)
Efficiency of water heater (217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000		(216)
Fuel for water heating, kWh/month	199.0696	175.9552	186.6791	163.5254	158.1104	142.0304	139.8441	145.6334	147.4963	165.0040	176.1103	196.8141		(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	18.6888	14.9928	13.4994	9.8902	7.6395	6.2415	6.9690	9.0586	11.7662	15.4379	17.4370	19.2082		(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													4100.0743	(211)
Space heating fuel - main system 2													0.0000	(213)
Space heating fuel - secondary													0.0000	(215)
Efficiency of water heater													100.0000	
Water heating fuel used													1996.2722	(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)													150.8290	(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													6247.1755	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	4100.0743	16.4900	676.1023	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1996.2722	16.4900	329.1853	(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	150.8290	16.4900	24.8717	(250)
Additional standing charges			0.0000	(251)
Total energy cost			1030.1592	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)		3.7843	(257)
SAP value	$[(255) \times (256)] / [(4) + 45.0] =$	39.1533	
SAP rating (Section 12)		39	(258)
SAP band		E	

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	4100.0743	0.1533	628.7172	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1996.2722	0.1410	281.4035	(264)
Space and water heating			910.1207	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	150.8290	0.1443	21.7693	(268)
Total CO2, kg/year			931.8900	(272)
CO2 emissions per m2			17.5800	(273)
EI value			87.2578	
EI rating			87	(274)
EI band			B	

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1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	53.0000 (1b)	x 2.1500 (2b)	= 113.9500 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 113.9500 (5)

2. Ventilation rate

		m3 per hour
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	2 * 10 =	20.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1755 (8)
Pressure test		No
Pressure Test Method		Blower Door
Measured/design AP50		15.0000 (17)
Infiltration rate		0.9255 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.7173 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	3.7000	3.4000	3.4000	3.2000	3.3000	3.0000	3.0000	2.8000	2.7000	2.8000	2.8000	3.1000 (22)
Wind factor	0.9250	0.8500	0.8500	0.8000	0.8250	0.7500	0.7500	0.7000	0.6750	0.7000	0.7000	0.7750 (22a)
Adj infilt rate	0.6635	0.6097	0.6097	0.5738	0.5918	0.5380	0.5380	0.5021	0.4842	0.5021	0.5021	0.5559 (22b)
Effective ac	0.7201	0.6859	0.6859	0.6646	0.6751	0.6447	0.6447	0.6260	0.6172	0.6260	0.6260	0.6545 (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					
Windows (new) (Uw = 1.40)			6.0000	1.3258	7.9545		(27)					
Door (new)			2.0000	1.4000	2.8000		(26a)					
Floor			53.0000	0.2500	13.2500		(28b)					
Wall (existing)	38.0000	3.5000	34.5000	0.3000	10.3500		(29a)					
Wall (existing-party)	14.0000		14.0000	0.7000	9.8000		(29a)					
Wall (new)	17.0000	4.5000	12.5000	0.1800	2.2500		(29a)					
Roof	53.0000		53.0000	0.1500	7.9500		(30)					
Total net area of external elements Aum(A, m2)			175.0000				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	54.3545	(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							100.0000 (35)					
Thermal bridges (Default value 0.200 * total exposed area)							35.0000 (36)					
Point Thermal bridges						(36a) =	0.0000					
Total fabric heat loss						(33) + (36) + (36a) =	89.3545 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	27.0784	25.7906	25.7906	24.9926	25.3856	24.2429	24.2429	23.5416	23.2091	23.5416	23.5416	24.6117 (38)
Heat transfer coeff	116.4329	115.1452	115.1452	114.3471	114.7401	113.5975	113.5975	112.8962	112.5636	112.8962	112.8962	113.9662 (39)
Average = Sum(39)m / 12 =												114.0186
HLP	2.1968	2.1726	2.1726	2.1575	2.1649	2.1433	2.1433	2.1301	2.1238	2.1301	2.1301	2.1503 (40)
HLP (average)												2.1513
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												1.7786 (42)
Hot water usage for mixer showers	69.3619	68.3196	66.8006	63.8944	61.7497	59.3579	57.9984	59.5058	61.1583	63.7263	66.6950	69.0962 (42a)
Hot water usage for baths	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42b)
Hot water usage for other uses	32.8442	31.6499	30.4556	29.2612	28.0669	26.8726	26.8726	28.0669	29.2612	30.4556	31.6499	32.8442 (42c)
Average daily hot water use (litres/day)												93.8078 (43)
Daily hot water use	102.2062	99.9695	97.2562	93.1556	89.8166	86.2305	84.8710	87.5728	90.4195	94.1819	98.3449	101.9404 (44)
Energy conte	161.8696	142.3552	149.4791	127.5254	120.9104	106.0304	102.6441	108.4334	111.4963	127.8040	140.1103	159.6141 (45)
Energy content (annual)												Total = Sum(45)m = 1558.2722
Distribution loss (46)m = 0.15 x (45)m	24.2804	21.3533	22.4219	19.1288	18.1366	15.9046	15.3966	16.2650	16.7244	19.1706	21.0165	23.9421 (46)
Water storage loss:												
Store volume												170.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												2.0000 (48)
Temperature factor from Table 2b												0.6000 (49)

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Enter (49) or (54) in (55)												1.2000 (55)
Total storage loss	37.2000	33.6000	37.2000	36.0000	37.2000	36.0000	37.2000	37.2000	36.0000	37.2000	36.0000	37.2000 (56)
If cylinder contains dedicated solar storage	37.2000	33.6000	37.2000	36.0000	37.2000	36.0000	37.2000	37.2000	36.0000	37.2000	36.0000	37.2000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	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	199.0696	175.9552	186.6791	163.5254	158.1104	142.0304	139.8441	145.6334	147.4963	165.0040	176.1103	196.8141 (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	199.0696	175.9552	186.6791	163.5254	158.1104	142.0304	139.8441	145.6334	147.4963	165.0040	176.1103	196.8141 (64)
	Total per year (kWh/year) = Sum(64)m =											1996.2722 (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) = Sum(64a)m =											0.0000 (64a)
Heat gains from water heating, kWh/month	83.5816	74.2131	79.4618	71.2022	69.9627	64.0551	63.8892	65.8141	65.8725	72.2548	75.3867	82.8317 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	21.3514	18.9641	15.4227	11.6760	8.7279	7.3685	7.9619	10.3492	13.8906	17.6374	20.5854	21.9448 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	231.3698	233.7707	227.7206	214.8404	198.5816	183.3006	173.0920	170.6911	176.7412	189.6214	205.8802	221.1612 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	47.4499	47.4499	47.4499	47.4499	47.4499	47.4499	47.4499	47.4499	47.4499	47.4499	47.4499	47.4499 (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)	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424 (71)
Water heating gains (Table 5)	112.3409	110.4362	106.8035	98.8919	94.0359	88.9654	85.8725	88.4598	91.4896	97.1167	104.7037	111.3329 (72)
Total internal gains	448.0833	446.1922	432.9679	408.4295	384.3666	362.6557	349.9475	352.5212	365.1427	387.3965	414.1905	437.4601 (73)

6. Solar gains

[Jan]	Area m ²	Solar flux Table 6a W/m ²	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W						
Northeast	2.5000	13.7667	0.6300	0.7000	0.7700	10.5182 (75)						
Southwest	3.5000	42.7351	0.6300	0.7000	0.7700	45.7114 (79)						
Solar gains	56.2295	83.8654	124.0270	171.6531	198.6385	217.8596	205.4500	180.9170	148.8741	105.5046	65.3165	44.2864 (83)
Total gains	504.3129	530.0576	556.9949	580.0825	583.0051	580.5153	555.3976	533.4382	514.0168	492.9011	479.5069	481.7464 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												
Utilisation factor for gains for living area, nil,m (see Table 9a)												
tau	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
alpha	1.8430	1.8524	1.8524	1.8583	1.8554	1.8640	1.8640	1.8694	1.8719	1.8694	1.8694	1.8612
util living area	0.9334	0.9249	0.9029	0.8664	0.7989	0.6802	0.5484	0.5788	0.7546	0.8662	0.9163	0.9380 (86)
MIT	17.0610	17.2783	17.8996	18.6632	19.5576	20.3129	20.7027	20.6563	20.0479	19.0258	17.9640	17.0369 (87)
Th 2	19.2053	19.2208	19.2208	19.2304	19.2257	19.2395	19.2395	19.2480	19.2520	19.2480	19.2480	19.2350 (88)
util rest of house	0.9202	0.9100	0.8818	0.8333	0.7362	0.5552	0.3358	0.3768	0.6578	0.8264	0.8967	0.9259 (89)
MIT 2	14.9748	15.2455	16.0120	16.9469	18.0078	18.8319	19.1592	19.1395	18.5839	17.4056	16.1071	14.9518 (90)
Living area fraction	15.9392	16.1852	16.8846	17.7402	18.7242	19.5165	19.8727	19.8407	19.2607	18.1546	16.9655	15.9156 (91)
MIT	15.9392	16.1852	16.8846	17.7402	18.7242	19.5165	19.8727	19.8407	19.2607	18.1546	16.9655	15.9156 (92)
Temperature adjustment												0.0000
adjusted MIT	15.9392	16.1852	16.8846	17.7402	18.7242	19.5165	19.8727	19.8407	19.2607	18.1546	16.9655	15.9156 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8835	0.8718	0.8416	0.7950	0.7134	0.5788	0.4240	0.4565	0.6584	0.7921	0.8589	0.8906 (94)	
Useful gains	445.5601	462.1024	468.7925	461.1575	415.9208	336.0043	235.4865	243.5178	338.4479	390.4358	411.8674	429.0578 (95)	
Ext temp.	4.9000	5.3000	7.1000	9.4000	12.5000	15.4000	17.4000	17.2000	14.6000	11.1000	7.7000	4.8000 (96)	
Heat loss rate W	1285.3211	1253.3784	1126.6468	953.6832	714.1692	467.6235	280.8904	298.1200	524.6210	796.4341	1046.0381	1266.8084 (97)	
Space heating kWh	624.7822	531.7375	489.4436	354.6185	221.8968	0.0000	0.0000	0.0000	0.0000	302.0627	456.6029	623.2865 (98a)	
Space heating requirement - total per year (kWh/year)	3604.4307												
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	624.7822	531.7375	489.4436	354.6185	221.8968	0.0000	0.0000	0.0000	0.0000	302.0627	456.6029	623.2865 (98c)	
Space heating requirement after solar contribution - total per year (kWh/year)	3604.4307												
Space heating per m ²												(98c) / (4) =	68.0081 (99)

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

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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 %)													100.0000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement	624.7822	531.7375	489.4436	354.6185	221.8968	0.0000	0.0000	0.0000	0.0000	302.0627	456.6029	623.2865	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	624.7822	531.7375	489.4436	354.6185	221.8968	0.0000	0.0000	0.0000	0.0000	302.0627	456.6029	623.2865	(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	199.0696	175.9552	186.6791	163.5254	158.1104	142.0304	139.8441	145.6334	147.4963	165.0040	176.1103	196.8141	(64)
Efficiency of water heater (217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(216)
Fuel for water heating, kWh/month	199.0696	175.9552	186.6791	163.5254	158.1104	142.0304	139.8441	145.6334	147.4963	165.0040	176.1103	196.8141	(217)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(231)
Lighting	18.6888	14.9928	13.4994	9.8902	7.6395	6.2415	6.9690	9.0586	11.7662	15.4379	17.4370	19.2082	(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													3604.4307 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)
Efficiency of water heater													100.0000
Water heating fuel used													1996.2722 (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)													150.8290 (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													5751.5320 (238)

10a. Fuel costs - using BEDF prices (536)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3604.4307	25.1600	906.8748	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1996.2722	25.1600	502.2621	(247)
Energy for instantaneous electric shower(s)	0.0000	25.1600	0.0000	(247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(249)
Energy for lighting	150.8290	25.1600	37.9486	(250)
Additional standing charges			0.0000	(251)
Total energy cost			1447.0854	(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	3604.4307	0.1535	553.4265	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1996.2722	0.1410	281.4035	(264)
Space and water heating			834.8300	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	150.8290	0.1443	21.7693	(268)
Total CO2, kg/year			856.5993	(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	3604.4307	1.5685	5653.3746	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1996.2722	1.5212	3036.8066	(278)
Space and water heating			8690.1812	(279)

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Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	150.8290	1.5338	231.3466 (282)
Total Primary energy kWh/year			8921.5278 (286)

SAP 10 EPC IMPROVEMENTS

CA5802A (Notional)

Current energy efficiency rating: E 39
Current environmental impact rating: B 87

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

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

Recommended measures (none)	Typical annual savings	Energy efficiency	Environmental impact
	Total Savings	£0	0.00 kg/m ²

Potential energy efficiency rating: E 39
Potential environmental impact rating: B 87

Fuel prices for cost data on this page from database revision number 536 TEST (31 Jan 2024)
Recommendation texts revision number 6.1 (11 Jun 2019)

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

	Current	Potential	Saving
Electricity	£1447	£1447	£0
Space heating	£907	£907	£0
Water heating	£502	£502	£0
Lighting	£38	£38	£0
Total cost of fuels	£1447	£1447	£0
Total cost of uses	£1447	£1447	£0
Delivered energy	109 kWh/m ²	109 kWh/m ²	0 kWh/m ²
Carbon dioxide emissions	0.9 tonnes	0.9 tonnes	0.0 tonnes
CO2 emissions per m ²	16 kg/m ²	16 kg/m ²	0 kg/m ²
Primary energy	168 kWh/m ²	168 kWh/m ²	0 kWh/m ²

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	53.0000 (1b)	x 2.1500 (2b)	= 113.9500 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	113.9500 (5)

2. Ventilation rate

		m ³ per hour
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	2 * 10 =	20.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
	Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1755 (8)
Pressure test	No	
Pressure Test Method	Blower Door	
Measured/design AP50	15.0000	(17)
Infiltration rate	0.9255	(18)
Number of sides sheltered	3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.7173 (21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	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	0.9145	0.8966	0.8787	0.7890	0.7711	0.6814	0.6814	0.6635	0.7173	0.7711	0.8069	0.8428 (22b)

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Effective ac 0.9182 0.9019 0.8860 0.8113 0.7973 0.7322 0.7322 0.7201 0.7572 0.7973 0.8256 0.8552 (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
Windows (new) (Uw = 1.40)			6.0000	1.3258	7.9545		(27)
Door (new)			2.0000	1.4000	2.8000		(26a)
Floor			53.0000	0.2500	13.2500		(28b)
Wall (existing)	38.0000	3.5000	34.5000	0.3000	10.3500		(29a)
Wall (existing-party)	14.0000		14.0000	0.7000	9.8000		(29a)
Wall (new)	17.0000	4.5000	12.5000	0.1800	2.2500		(29a)
Roof	53.0000		53.0000	0.1500	7.9500		(30)
Total net area of external elements Aum(A, m2)			175.0000				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	54.3545	(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 100.0000 (35)
 Thermal bridges (Default value 0.200 * total exposed area) 35.0000 (36)
 Point Thermal bridges (36a) = 0.0000
 Total fabric heat loss (33) + (36) + (36a) = 89.3545 (37)

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

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	34.5267	33.9161	33.3176	30.5063	29.9803	27.5318	27.5318	27.0784	28.4749	29.9803	31.0444	32.1568
Heat transfer coeff	123.8813	123.2706	122.6721	119.8608	119.3349	116.8863	116.8863	116.4329	117.8295	119.3349	120.3989	121.5113
Average = Sum(39)m / 12 =												119.8583

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	2.3374	2.3259	2.3146	2.2615	2.2516	2.2054	2.2054	2.1968	2.2232	2.2516	2.2717	2.2927
HLP (average)												2.2615
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7786 (42)

Hot water usage for mixer showers	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Hot water usage for mixer showers	69.3619	68.3196	66.8006	63.8944	61.7497	59.3579	57.9984	59.5058	61.1583	63.7263	66.6950	69.0962
Hot water usage for baths	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Hot water usage for other uses	32.8442	31.6499	30.4556	29.2612	28.0669	26.8726	26.8726	28.0669	29.2612	30.4556	31.6499	32.8442
Average daily hot water use (litres/day)												93.8078

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	102.2062	99.9695	97.2562	93.1556	89.8166	86.2305	84.8710	87.5728	90.4195	94.1819	98.3449	101.9404
Energy content (annual)	161.8696	142.3552	149.4791	127.5254	120.9104	106.0304	102.6441	108.4334	111.4963	127.8040	140.1103	159.6141
Distribution loss (46)m = 0.15 x (45)m	24.2804	21.3533	22.4219	19.1288	18.1366	15.9046	15.3966	16.2650	16.7244	19.1706	21.0165	23.9421
Water storage loss: Store volume												170.0000
a) If manufacturer declared loss factor is known (kWh/day): Temperature factor from Table 2b												2.0000
Enter (49) or (54) in (55)												0.6000
Total storage loss												1.2000

Primary loss	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Primary loss	37.2000	33.6000	37.2000	36.0000	37.2000	36.0000	37.2000	37.2000	36.0000	37.2000	36.0000	37.2000
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total heat required for water heating calculated for each month	199.0696	175.9552	186.6791	163.5254	158.1104	142.0304	139.8441	145.6334	147.4963	165.0040	176.1103	196.8141
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Output from w/h	199.0696	175.9552	186.6791	163.5254	158.1104	142.0304	139.8441	145.6334	147.4963	165.0040	176.1103	196.8141
Total per year (kWh/year) = Sum(64)m =												1996.2722

Electric shower(s)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000

Heat gains from water heating, kWh/month

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat gains from water heating, kWh/month	83.5816	74.2131	79.4618	71.2022	69.9627	64.0551	63.8892	65.8141	65.8725	72.2548	75.3867	82.8317

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	106.7137	106.7137	106.7137	106.7137	106.7137	106.7137	106.7137	106.7137	106.7137	106.7137	106.7137	106.7137
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	21.3514	18.9641	15.4227	11.6760	8.7279	7.3685	7.9619	10.3492	13.8906	17.6374	20.5854	21.9448
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	231.3698	233.7707	227.7206	214.8404	198.5816	183.3006	173.0920	170.6911	176.7412	189.6214	205.8802	221.1612
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	47.4499	47.4499	47.4499	47.4499	47.4499	47.4499	47.4499	47.4499	47.4499	47.4499	47.4499	47.4499
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Losses e.g. evaporation (negative values) (Table 5)	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424
Water heating gains (Table 5)	112.3409	110.4362	106.8035	98.8919	94.0359	88.9654	85.8725	88.4598	91.4896	97.1167	104.7037	111.3329
Total internal gains	448.0833	446.1922	432.9679	408.4295	384.3666	362.6557	349.9475	352.5212	365.1427	387.3965	414.1905	437.4601

6. Solar gains

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[Jan]	Area				Solar flux		g		FF		Access		Gains	
	m2				Table 6a		Specific data		Specific data		factor		W	
					W/m2		or Table 6b		or Table 6c		Table 6d			
Northeast	2.5000				11.2829		0.6300		0.7000		0.7700		8.6205 (75)	
Southwest	3.5000				36.7938		0.6300		0.7000		0.7700		39.3564 (79)	

Solar gains	47.9769	84.5858	123.3396	165.5721	197.0906	200.7836	191.4469	167.1501	137.8417	95.5360	57.9867	40.7208	(83)
Total gains	496.0602	530.7780	556.3075	574.0016	581.4572	563.4393	541.3944	519.6713	502.9844	482.9325	472.1772	478.1809	(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	11.8841	11.9430	12.0013	12.2828	12.3369	12.5953	12.5953	12.6444	12.4945	12.3369	12.2279	12.1159	
alpha	1.7923	1.7962	1.8001	1.8189	1.8225	1.8397	1.8397	1.8430	1.8330	1.8225	1.8152	1.8077	
util living area	0.9401	0.9297	0.9118	0.8792	0.8252	0.7350	0.6311	0.6580	0.7873	0.8824	0.9257	0.9435	(86)
MIT	16.6725	16.9605	17.5451	18.3932	19.2587	20.0652	20.5168	20.4566	19.8383	18.7475	17.6011	16.6534	(87)
Th 2	19.1179	19.1249	19.1319	19.1647	19.1709	19.1999	19.1999	19.2053	19.1887	19.1709	19.1584	19.1454	(88)
util rest of house	0.9282	0.9155	0.8925	0.8491	0.7722	0.6326	0.4557	0.4932	0.7022	0.8472	0.9083	0.9324	(89)
MIT 2	14.4791	14.8343	15.5551	16.6003	17.6388	18.5635	18.9992	18.9576	18.3282	17.0462	15.6384	14.4606	(90)
Living area fraction	FLA = Living area / (4) =												
MIT	15.4930	15.8171	16.4750	17.4291	18.3876	19.2576	19.7007	19.6506	19.0262	17.8327	16.5457	15.4742	(92)
Temperature adjustment	0.0000												
adjusted MIT	15.4930	15.8171	16.4750	17.4291	18.3876	19.2576	19.7007	19.6506	19.0262	17.8327	16.5457	15.4742	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8921	0.8770	0.8517	0.8090	0.7421	0.6367	0.5139	0.5426	0.6923	0.8103	0.8705	0.8976	(94)
Useful gains	442.5451	465.4960	473.8234	464.3529	431.4787	358.7252	278.2334	281.9578	348.2138	391.3131	411.0314	429.2000	(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	1386.6049	1345.7635	1223.6572	1022.3039	798.0679	544.4140	362.4292	378.4732	580.4568	863.1104	1137.2484	1369.9489	(97)
Space heating kWh	702.3805	591.5398	557.8763	401.7247	272.7424	0.0000	0.0000	0.0000	0.0000	351.0172	522.8762	699.9172	(98a)
Space heating requirement - total per year (kWh/year)	4100.0743												
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	702.3805	591.5398	557.8763	401.7247	272.7424	0.0000	0.0000	0.0000	0.0000	351.0172	522.8762	699.9172	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)	4100.0743												
Space heating per m2	(98c) / (4) = 77.3599 (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 %) 100.0000 (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	702.3805	591.5398	557.8763	401.7247	272.7424	0.0000	0.0000	0.0000	0.0000	351.0172	522.8762	699.9172	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	702.3805	591.5398	557.8763	401.7247	272.7424	0.0000	0.0000	0.0000	0.0000	351.0172	522.8762	699.9172	(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	199.0696	175.9552	186.6791	163.5254	158.1104	142.0304	139.8441	145.6334	147.4963	165.0040	176.1103	196.8141	(64)
Efficiency of water heater	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(216)
Fuel for water heating, kWh/month	199.0696	175.9552	186.6791	163.5254	158.1104	142.0304	139.8441	145.6334	147.4963	165.0040	176.1103	196.8141	(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	18.6888	14.9928	13.4994	9.8902	7.6395	6.2415	6.9690	9.0586	11.7662	15.4379	17.4370	19.2082	(232)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1	4100.0743 (211)												

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Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	100.0000	
Water heating fuel used	1996.2722	(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)	150.8290	(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	6247.1755	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	4100.0743	16.4900	676.1023 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1996.2722	16.4900	329.1853 (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	150.8290	16.4900	24.8717 (250)
Additional standing charges			0.0000 (251)
Total energy cost			1030.1592 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	3.7843	(257)
SAP value		39.1533	
SAP rating (Section 12)		39	(258)
SAP band		E	

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	4100.0743	0.1533	628.7172 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1996.2722	0.1410	281.4035 (264)
Space and water heating			910.1207 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	150.8290	0.1443	21.7693 (268)
Total CO2, kg/year			931.8900 (272)
CO2 emissions per m2			17.5800 (273)
EI value			87.2578
EI rating			87
EI band			B

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	53.0000 (1b)	x 2.1500 (2b)	= 113.9500 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	113.9500 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1755 (8)
Pressure test	No
Pressure Test Method	Blower Door

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Measured/design AP50 15.0000 (17)
 Infiltration rate 0.9255 (18)
 Number of sides sheltered 3 (19)

Shelter factor (20) = 1 - [0.075 x (19)] = 0.7750 (20)
 Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.7173 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	3.7000	3.4000	3.4000	3.2000	3.3000	3.0000	3.0000	2.8000	2.7000	2.8000	2.8000	3.1000 (22)
Wind factor	0.9250	0.8500	0.8500	0.8000	0.8250	0.7500	0.7500	0.7000	0.6750	0.7000	0.7000	0.7750 (22a)
Adj infilt rate	0.6635	0.6097	0.6097	0.5738	0.5918	0.5380	0.5380	0.5021	0.4842	0.5021	0.5021	0.5559 (22b)
Effective ac	0.7201	0.6859	0.6859	0.6646	0.6751	0.6447	0.6447	0.6260	0.6172	0.6260	0.6260	0.6545 (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
Windows (new) (Uw = 1.40)			6.0000	1.3258	7.9545		(27)
Door (new)			2.0000	1.4000	2.8000		(26a)
Floor			53.0000	0.2500	13.2500		(28b)
Wall (existing)	38.0000	3.5000	34.5000	0.3000	10.3500		(29a)
Wall (existing-party)	14.0000		14.0000	0.7000	9.8000		(29a)
Wall (new)	17.0000	4.5000	12.5000	0.1800	2.2500		(29a)
Roof	53.0000		53.0000	0.1500	7.9500		(30)
Total net area of external elements Aum(A, m2)			175.0000				(31)
Fabric heat loss, W/K = Sum (A x U)					(26) ... (30) + (32) =	54.3545	(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 100.0000 (35)
 Thermal bridges (Default value 0.200 * total exposed area) 35.0000 (36)
 Point Thermal bridges (36a) = 0.0000
 Total fabric heat loss (33) + (36) + (36a) = 89.3545 (37)

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

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	27.0784	25.7906	25.7906	24.9926	25.3856	24.2429	24.2429	23.5416	23.2091	23.5416	23.5416	24.6117 (38)
Average = Sum(39)m / 12 =	116.4329	115.1452	115.1452	114.3471	114.7401	113.5975	113.5975	112.8962	112.5636	112.8962	112.8962	113.9662 (39)
												114.0186

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	2.1968	2.1726	2.1726	2.1575	2.1649	2.1433	2.1433	2.1301	2.1238	2.1301	2.1301	2.1503 (40)
HLP (average)												2.1513
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.7786 (42)

Hot water usage for mixer showers	69.3619	68.3196	66.8006	63.8944	61.7497	59.3579	57.9984	59.5058	61.1583	63.7263	66.6950	69.0962 (42a)
Hot water usage for baths	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42b)
Hot water usage for other uses	32.8442	31.6499	30.4556	29.2612	28.0669	26.8726	26.8726	28.0669	29.2612	30.4556	31.6499	32.8442 (42c)
Average daily hot water use (litres/day)												93.8078 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	102.2062	99.9695	97.2562	93.1556	89.8166	86.2305	84.8710	87.5728	90.4195	94.1819	98.3449	101.9404 (44)
Energy conte	161.8696	142.3552	149.4791	127.5254	120.9104	106.0304	102.6441	108.4334	111.4963	127.8040	140.1103	159.6141 (45)
Energy content (annual)												Total = Sum(45)m = 1558.2722
Distribution loss (46)m = 0.15 x (45)m	24.2804	21.3533	22.4219	19.1288	18.1366	15.9046	15.3966	16.2650	16.7244	19.1706	21.0165	23.9421 (46)

Water storage loss:

Store volume												170.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												2.0000 (48)
Temperature factor from Table 2b												0.6000 (49)
Enter (49) or (54) in (55)												1.2000 (55)
Total storage loss	37.2000	33.6000	37.2000	36.0000	37.2000	36.0000	37.2000	37.2000	36.0000	37.2000	36.0000	37.2000 (56)

If cylinder contains dedicated solar storage

Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	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	199.0696	175.9552	186.6791	163.5254	158.1104	142.0304	139.8441	145.6334	147.4963	165.0040	176.1103	196.8141 (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	199.0696	175.9552	186.6791	163.5254	158.1104	142.0304	139.8441	145.6334	147.4963	165.0040	176.1103	196.8141 (64)
												Total per year (kWh/year) = Sum(64)m = 1996.2722 (64)

Electric shower(s)

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
												0.0000 (64a)

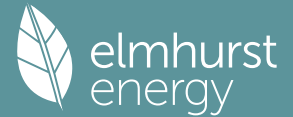
Heat gains from water heating, kWh/month

	83.5816	74.2131	79.4618	71.2022	69.9627	64.0551	63.8892	65.8141	65.8725	72.2548	75.3867	82.8317 (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	106.7137	106.7137	106.7137	106.7137	106.7137	106.7137	106.7137	106.7137	106.7137	106.7137	106.7137	106.7137 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	21.3514	18.9641	15.4227	11.6760	8.7279	7.3685	7.9619	10.3492	13.8906	17.6374	20.5854	21.9448 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	231.3698	233.7707	227.7206	214.8404	198.5816	183.3006	173.0920	170.6911	176.7412	189.6214	205.8802	221.1612 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	47.4499	47.4499	47.4499	47.4499	47.4499	47.4499	47.4499	47.4499	47.4499	47.4499	47.4499	47.4499 (69)

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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)	(negative values)	(negative values)	(negative values)	(negative values)	(negative values)	(negative values)	(negative values)	(negative values)	(negative values)	(negative values)	(negative values) (71)
Water heating gains	(Table 5)	(Table 5)	(Table 5)	(Table 5)	(Table 5)	(Table 5)	(Table 5)	(Table 5)	(Table 5)	(Table 5)	(Table 5)	(Table 5) (72)
Total internal gains												(73)

6. Solar gains

[Jan]	Area			Solar flux		g		FF		Access		Gains
	m2			Table 6a		Specific data		Specific data		factor		W
				W/m2		or Table 6b		or Table 6c		Table 6d		
Northeast	2.5000			13.7667		0.6300		0.7000		0.7700		10.5182 (75)
Southwest	3.5000			42.7351		0.6300		0.7000		0.7700		45.7114 (79)
Solar gains	56.2295	83.8654	124.0270	171.6531	198.6385	217.8596	205.4500	180.9170	148.8741	105.5046	65.3165	44.2864 (83)
Total gains	504.3129	530.0576	556.9949	580.0825	583.0051	580.5153	555.3976	533.4382	514.0168	492.9011	479.5069	481.7464 (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	12.6444	12.7858	12.7858	12.8750	12.8309	12.9600	12.9600	13.0405	13.0790	13.0405	13.0405	12.9181
alpha	1.8430	1.8524	1.8524	1.8583	1.8554	1.8640	1.8640	1.8694	1.8719	1.8694	1.8694	1.8612
util living area	0.9334	0.9249	0.9029	0.8664	0.7989	0.6802	0.5484	0.5788	0.7546	0.8662	0.9163	0.9380 (86)
MIT	17.0610	17.2783	17.8996	18.6632	19.5576	20.3129	20.7027	20.6563	20.0479	19.0258	17.9640	17.0369 (87)
Th 2	19.2053	19.2208	19.2208	19.2304	19.2257	19.2395	19.2395	19.2480	19.2520	19.2480	19.2480	19.2350 (88)
util rest of house	0.9202	0.9100	0.8818	0.8333	0.7362	0.5552	0.3358	0.3768	0.6578	0.8264	0.8967	0.9259 (89)
MIT 2	14.9748	15.2455	16.0120	16.9469	18.0078	18.8319	19.1592	19.1395	18.5839	17.4056	16.1071	14.9518 (90)
Living area fraction	15.9392	16.1852	16.8846	17.7402	18.7242	19.5165	19.8727	19.8407	19.2607	18.1546	16.9655	15.9156 (92)
MIT	15.9392	16.1852	16.8846	17.7402	18.7242	19.5165	19.8727	19.8407	19.2607	18.1546	16.9655	15.9156 (93)
Temperature adjustment												0.0000
adjusted MIT	15.9392	16.1852	16.8846	17.7402	18.7242	19.5165	19.8727	19.8407	19.2607	18.1546	16.9655	15.9156 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8835	0.8718	0.8416	0.7950	0.7134	0.5788	0.4240	0.4565	0.6584	0.7921	0.8589	0.8906 (94)
Useful gains	445.5601	462.1024	468.7925	461.1575	415.9208	336.0043	235.4865	243.5178	338.4479	390.4358	411.8674	429.0578 (95)
Ext temp.	4.9000	5.3000	7.1000	9.4000	12.5000	15.4000	17.4000	17.2000	14.6000	11.1000	7.7000	4.8000 (96)
Heat loss rate W	1285.3211	1253.3784	1126.6468	953.6832	714.1692	467.6235	280.8904	298.1200	524.6210	796.4341	1046.0381	1266.8084 (97)
Space heating kWh	624.7822	531.7375	489.4436	354.6185	221.8968	0.0000	0.0000	0.0000	0.0000	302.0627	456.6029	623.2865 (98a)
Space heating requirement - total per year (kWh/year)												3604.4307
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	624.7822	531.7375	489.4436	354.6185	221.8968	0.0000	0.0000	0.0000	0.0000	302.0627	456.6029	623.2865 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3604.4307
Space heating per m2										(98c) / (4) =		68.0081 (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 %)												100.0000 (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	624.7822	531.7375	489.4436	354.6185	221.8968	0.0000	0.0000	0.0000	0.0000	302.0627	456.6029	623.2865 (98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000 (210)
Space heating fuel (main heating system)	624.7822	531.7375	489.4436	354.6185	221.8968	0.0000	0.0000	0.0000	0.0000	302.0627	456.6029	623.2865 (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	199.0696	175.9552	186.6791	163.5254	158.1104	142.0304	139.8441	145.6334	147.4963	165.0040	176.1103	196.8141 (64)
Efficiency of water heater (217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000 (216)
Fuel for water heating, kWh/month	199.0696	175.9552	186.6791	163.5254	158.1104	142.0304	139.8441	145.6334	147.4963	165.0040	176.1103	196.8141 (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	18.6888	14.9928	13.4994	9.8902	7.6395	6.2415	6.9690	9.0586	11.7662	15.4379	17.4370	19.2082 (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)												

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(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												3604.4307	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												100.0000	
Water heating fuel used												1996.2722	(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)												150.8290	(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												5751.5320	(238)

10a. Fuel costs - using BEDF prices (536)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3604.4307	25.1600	906.8748	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1996.2722	25.1600	502.2621	(247)
Energy for instantaneous electric shower(s)	0.0000	25.1600	0.0000	(247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(249)
Energy for lighting	150.8290	25.1600	37.9486	(250)
Additional standing charges			0.0000	(251)
Total energy cost			1447.0854	(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	3604.4307	0.1535	553.4265	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1996.2722	0.1410	281.4035	(264)
Space and water heating			834.8300	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	150.8290	0.1443	21.7693	(268)
Total CO2, kg/year			856.5993	(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	3604.4307	1.5685	5653.3746	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1996.2722	1.5212	3036.8066	(278)
Space and water heating			8690.1812	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	150.8290	1.5338	231.3466	(282)
Total Primary energy kWh/year			8921.5278	(286)

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Property Reference	CA-58		Issued on Date	13/02/2024	
Assessment Reference	CA5802B (Proposed)	Prop Type Ref	CA-58		
Property	1 Bed Flat, 8 Tunsgate, Guildford, GU1 3QT				
SAP Rating	51 E	DER	14.47	TER	13.75
Environmental	90 B	% DER < TER			-5.24
CO ₂ Emissions (t/year)	0.68	DFEE	87.81	TFEE	40.78
Compliance Check	See BREL	% DFEE < TFEE			-115.35
% DPER < TPER	-105.87	DPER	149.05	TPER	72.40
Assessor Details	Mr. Joe Solti			Assessor ID	5122-0001
Client	Accord Surveyors Ltd, .				

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	53.0000 (1b)	2.1500 (2b)	113.9500 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.0000		113.9500 (4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 113.9500 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1755 (8)
Pressure test	No	
Pressure Test Method	Blower Door	
Measured/design AP50		15.0000 (17)
Infiltration rate		0.9255 (18)
Number of sides sheltered		3 (19)

Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.7173 (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	0.9145	0.8966	0.8787	0.7890	0.7711	0.6814	0.6814	0.6635	0.7173	0.7711	0.8069	0.8428 (22b)
Effective ac	0.9182	0.9019	0.8860	0.8113	0.7973	0.7322	0.7322	0.7201	0.7572	0.7973	0.8256	0.8552 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Windows (new) (Uw = 1.40)			6.0000	1.3258	7.9545		(27)
Door (new)			2.0000	1.4000	2.8000		(26a)
Floor			53.0000	0.2500	13.2500		(28b)
Wall (existing)	38.0000	3.5000	34.5000	0.3000	10.3500		(29a)
Wall (existing-party)	14.0000		14.0000	0.7000	9.8000		(29a)
Wall (new)	17.0000	4.5000	12.5000	0.1800	2.2500		(29a)
Roof	53.0000		53.0000	0.1500	7.9500		(30)
Total net area of external elements Aum(A, m ²)			175.0000				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	54.3545	(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K		100.0000 (35)
Thermal bridges (Default value 0.200 * total exposed area)		35.0000 (36)
Point Thermal bridges		(36a) = 0.0000
Total fabric heat loss	(33) + (36) + (36a) =	89.3545 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 34.5267	Feb 33.9161	Mar 33.3176	Apr 30.5063	May 29.9803	Jun 27.5318	Jul 27.5318	Aug 27.0784	Sep 28.4749	Oct 29.9803	Nov 31.0444	Dec 32.1568 (38)
Heat transfer coeff	123.8813	123.2706	122.6721	119.8608	119.3349	116.8863	116.8863	116.4329	117.8295	119.3349	120.3989	121.5113 (39)

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Average = Sum(39)m / 12 = 119.8583

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	2.3374	2.3259	2.3146	2.2615	2.2516	2.2054	2.2054	2.1968	2.2232	2.2516	2.2717	2.2927 (40)
HLP (average)												2.2615
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												1.7786 (42)
Hot water usage for mixer showers												
69.3619	68.3196	66.8006	63.8944	61.7497	59.3579	57.9984	59.5058	61.1583	63.7263	66.6950	69.0962 (42a)	
Hot water usage for baths												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42b)	
Hot water usage for other uses												
32.8442	31.6499	30.4556	29.2612	28.0669	26.8726	26.8726	28.0669	29.2612	30.4556	31.6499	32.8442 (42c)	
Average daily hot water use (litres/day)												93.8078 (43)
Daily hot water use	102.2062	99.9695	97.2562	93.1556	89.8166	86.2305	84.8710	87.5728	90.4195	94.1819	98.3449	101.9404 (44)
Energy conte	161.8696	142.3552	149.4791	127.5254	120.9104	106.0304	102.6441	108.4334	111.4963	127.8040	140.1103	159.6141 (45)
Energy content (annual)												Total = Sum(45)m = 1558.2722
Distribution loss (46)m = 0.15 x (45)m	24.2804	21.3533	22.4219	19.1288	18.1366	15.9046	15.3966	16.2650	16.7244	19.1706	21.0165	23.9421 (46)
Water storage loss:												
Store volume												173.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.9200 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												1.0368 (55)
Total storage loss	32.1408	29.0304	32.1408	31.1040	32.1408	31.1040	32.1408	32.1408	31.1040	32.1408	31.1040	32.1408 (56)
If cylinder contains dedicated solar storage	32.1408	29.0304	32.1408	31.1040	32.1408	31.1040	32.1408	32.1408	31.1040	32.1408	31.1040	32.1408 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	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	194.0104	171.3856	181.6199	158.6294	153.0512	137.1344	134.7849	140.5742	142.6003	159.9448	171.2143	191.7549 (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	194.0104	171.3856	181.6199	158.6294	153.0512	137.1344	134.7849	140.5742	142.6003	159.9448	171.2143	191.7549 (64)
12Total per year (kWh/year)												Total per year (kWh/year) = Sum(64)m = 1936.7042 (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 =												1937 (64)
Heat gains from water heating, kWh/month	53.8216	47.3331	49.7018	42.4022	40.2027	35.2551	34.1292	36.0541	37.0725	42.4948	46.5867	53.0717 (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	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	87.9085	97.3272	87.9085	90.8388	87.9085	90.8388	87.9085	87.9085	90.8388	87.9085	90.8388	87.9085 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	155.0178	156.6264	152.5728	143.9431	133.0497	122.8114	115.9716	114.3630	118.4166	127.0463	137.9397	148.1780 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928 (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)	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424 (71)
Water heating gains (Table 5)	72.3409	70.4362	66.8035	58.8919	54.0359	48.9654	45.8725	48.4598	51.4896	57.1167	64.7037	71.3329 (72)
Total internal gains	364.9456	374.0682	356.9632	343.3522	324.6725	312.2940	299.4310	300.4097	310.4234	321.7499	343.1606	357.0978 (73)

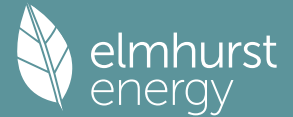
6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W						
Northeast	2.5000	11.2829	0.6300	0.7000	0.7700	8.6205 (75)						
Southwest	3.5000	36.7938	0.6300	0.7000	0.7700	39.3564 (79)						
Solar gains	47.9769	84.5858	123.3396	165.5721	197.0906	200.7836	191.4469	167.1501	137.8417	95.5360	57.9867	40.7208 (83)
Total gains	412.9225	458.6540	480.3028	508.9243	521.7631	513.0777	490.8779	467.5599	448.2652	417.2859	401.1473	397.8186 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation factor for gains for living area, nil,m (see Table 9a)												21.0000 (85)
tau	11.8841	11.9430	12.0013	12.2828	12.3369	12.5953	12.5953	12.6444	12.4945	12.3369	12.2279	12.1159
alpha	1.7923	1.7962	1.8001	1.8189	1.8225	1.8397	1.8397	1.8430	1.8330	1.8225	1.8152	1.8077
util living area	0.9549	0.9437	0.9290	0.8981	0.8480	0.7612	0.6628	0.6913	0.8151	0.9045	0.9421	0.9577 (86)
MIT	16.4780	16.7963	17.3793	18.2620	19.1555	19.9991	20.4711	20.4042	19.7531	18.6129	17.4384	16.4616 (87)
Th 2	19.1179	19.1249	19.1319	19.1647	19.1709	19.1999	19.1999	19.2053	19.1887	19.1709	19.1584	19.1454 (88)
util rest of house	0.9457	0.9320	0.9129	0.8716	0.7996	0.6629	0.4879	0.5285	0.7362	0.8745	0.9280	0.9491 (89)

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MIT 2	14.2431	14.6364	15.3581	16.4491	17.5286	18.5062	18.9737	18.9254	18.2472	16.8931	15.4436	14.2271 (90)
Living area fraction									FLA = Living area / (4) =			0.4623 (91)
MIT	15.2762	15.6348	16.2924	17.2871	18.2807	19.1963	19.6659	19.6090	18.9433	17.6881	16.3657	15.2600 (92)
Temperature adjustment												0.0000
adjusted MIT	15.2762	15.6348	16.2924	17.2871	18.2807	19.1963	19.6659	19.6090	18.9433	17.6881	16.3657	15.2600 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9147	0.8973	0.8752	0.8322	0.7673	0.6627	0.5431	0.5739	0.7219	0.8382	0.8940	0.9194	(94)
Useful gains	377.6951	411.5401	420.3473	423.5401	400.3598	339.9959	266.5739	268.3119	323.5807	349.7624	358.6300	365.7561	(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	1359.7489	1323.2885	1201.2561	1005.2873	785.3010	537.2494	358.3641	373.6294	570.6821	845.8576	1115.5843	1343.9210	(97)
Space heating kWh	730.6480	612.6950	580.9961	418.8580	286.3963	0.0000	0.0000	0.0000	0.0000	369.0948	545.0071	727.7548	(98a)
Space heating requirement - total per year (kWh/year)												4271.4500	
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	730.6480	612.6950	580.9961	418.8580	286.3963	0.0000	0.0000	0.0000	0.0000	369.0948	545.0071	727.7548	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4271.4500	
Space heating per m2										(98c) / (4) =		80.5934	(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)
Fraction of main heating from main system 2													0.0000 (203)
Fraction of total heating from main system 1													1.0000 (204)
Fraction of total heating from main system 2													0.0000 (205)
Efficiency of main space heating system 1 (in %)													100.0000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement	730.6480	612.6950	580.9961	418.8580	286.3963	0.0000	0.0000	0.0000	0.0000	369.0948	545.0071	727.7548	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	730.6480	612.6950	580.9961	418.8580	286.3963	0.0000	0.0000	0.0000	0.0000	369.0948	545.0071	727.7548	(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)
Space heating fuel used, main system 2													0.0000 (213)
Water heating requirement	194.0104	171.3856	181.6199	158.6294	153.0512	137.1344	134.7849	140.5742	142.6003	159.9448	171.2143	191.7549	(64)
Efficiency of water heater (217)m	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	(216)
Fuel for water heating, kWh/month	64.0393	56.5713	59.9495	52.3607	50.5194	45.2656	44.4901	46.4010	47.0698	52.7949	56.5148	63.2948	(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	18.6888	14.9928	13.4994	9.8902	7.6395	6.2415	6.9690	9.0586	11.7662	15.4379	17.4370	19.2082	(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													4271.4500 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)
Efficiency of water heater													302.9550
Water heating fuel used													639.2712 (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)													150.8290 (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													5061.5503 (238)

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

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	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	4271.4500	0.1533	654.8372 (261)
Space heating - main system 2	0.0000	0.0000	0.0000 (262)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	639.2712	0.1410	90.1588 (264)
Space and water heating			744.9960 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	150.8290	0.1443	21.7693 (268)
Total CO2, kg/year			766.7653 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			14.4700 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	4271.4500	1.5676	6695.8053 (275)
Space heating - main system 2	0.0000	0.0000	0.0000 (276)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	639.2712	1.5215	972.6501 (278)
Space and water heating			7668.4554 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	150.8290	1.5338	231.3466 (282)
Total Primary energy kWh/year			7899.8021 (286)
Dwelling Primary energy Rate (DPER)			149.0500 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	53.0000 (1b)	2.1500 (2b)	113.9500 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	113.9500 (5)

2. Ventilation rate

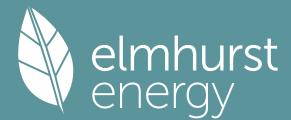
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1755 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4255 (18)
Number of sides sheltered	3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3298 (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	0.4205	0.4122	0.4040	0.3628	0.3545	0.3133	0.3133	0.3050	0.3298	0.3545	0.3710	0.3875 (22b)
Effective ac	0.5884	0.5850	0.5816	0.5658	0.5628	0.5491	0.5491	0.5465	0.5544	0.5628	0.5688	0.5751 (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
TER Semi-glazed door			2.0000	1.0000	2.0000		(26a)
TER Opening Type (Uw = 1.20)			6.0000	1.1450	6.8702		(27)
Floor			53.0000	0.1300	6.8900		(28b)
Wall (existing)	38.0000	3.5000	34.5000	0.1800	6.2100		(29a)
Wall (existing-party)	14.0000		14.0000	0.1800	2.5200		(29a)
Wall (new)	17.0000	4.5000	12.5000	0.1800	2.2500		(29a)
Roof	53.0000		53.0000	0.1100	5.8300		(30)
Total net area of external elements Aum(A, m2)			175.0000				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	32.5702	(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							100.0000 (35)
Thermal bridges (User defined value 0.050 * total exposed area)							8.7500 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss					(33) + (36) + (36a) =		41.3202 (37)

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Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	22.1257	21.9966	21.8701	21.2759	21.1647	20.6471	20.6471	20.5513	20.8465	21.1647	21.3896	21.6247 (38)
Average = Sum(39)m / 12 =	63.4459	63.3168	63.1903	62.5961	62.4849	61.9673	61.9673	61.8715	62.1667	62.4849	62.7098	62.9450 (39)
												62.5956

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1971	1.1947	1.1923	1.1811	1.1790	1.1692	1.1692	1.1674	1.1730	1.1790	1.1832	1.1876 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7786 (42)
Hot water usage for mixer showers	69.3619	68.3196	66.8006	63.8944	61.7497	59.3579	57.9984	59.5058	61.1583	63.7263	66.6950	69.0962 (42a)
Hot water usage for baths	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42b)
Hot water usage for other uses	32.8442	31.6499	30.4556	29.2612	28.0669	26.8726	26.8726	28.0669	29.2612	30.4556	31.6499	32.8442 (42c)
Average daily hot water use (litres/day)												93.8078 (43)
Daily hot water use	102.2062	99.9695	97.2562	93.1556	89.8166	86.2305	84.8710	87.5728	90.4195	94.1819	98.3449	101.9404 (44)
Energy conte	161.8696	142.3552	149.4791	127.5254	120.9104	106.0304	102.6441	108.4334	111.4963	127.8040	140.1103	159.6141 (45)
Energy content (annual)												Total = Sum(45)m = 1558.2722
Distribution loss (46)m = 0.15 x (45)m	24.2804	21.3533	22.4219	19.1288	18.1366	15.9046	15.3966	16.2650	16.7244	19.1706	21.0165	23.9421 (46)
Water storage loss:												150.0000 (47)
Store volume												1.3938 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.7527 (55)
Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	208.4645	184.4409	196.0740	172.6172	167.5053	151.1222	149.2390	155.0283	156.5882	174.3989	185.2022	206.2090 (62)
WWHRS	-31.7094	-28.0440	-29.3661	-24.3163	-22.6619	-19.3920	-18.1769	-19.3293	-20.0637	-23.6528	-26.7958	-31.1222 (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	176.7551	156.3969	166.7079	148.3009	144.8433	131.7303	131.0621	135.6990	136.5245	150.7460	158.4064	175.0868 (64)
Total per year (kWh/year)												Total per year (kWh/year) = Sum(64)m = 1812.2593 (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	91.0976	81.0017	86.9777	78.4757	77.4786	71.3286	71.4051	73.3300	73.1460	79.7707	82.6602	90.3476 (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	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	87.9085	97.3272	87.9085	90.8388	87.9085	90.8388	87.9085	87.9085	90.8388	87.9085	90.8388	87.9085 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	155.0178	156.6264	152.5728	143.9431	133.0497	122.8114	115.9716	114.3630	118.4166	127.0463	137.9397	148.1780 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928 (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)	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424 (71)
Water heating gains (Table 5)	122.4430	120.5382	116.9056	108.9940	104.1379	99.0675	95.9746	98.5618	101.5917	107.2187	114.8058	121.4349 (72)
Total internal gains	418.0477	427.1703	410.0652	396.4543	377.7745	362.3961	349.5331	350.5118	360.5255	374.8519	396.2627	410.1998 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W						
Northeast	2.5000	11.2829	0.6300	0.7000	0.7700	8.6205 (75)						
Southwest	3.5000	36.7938	0.6300	0.7000	0.7700	39.3564 (79)						
Solar gains	47.9769	84.5858	123.3396	165.5721	197.0906	200.7836	191.4469	167.1501	137.8417	95.5360	57.9867	40.7208 (83)
Total gains	466.0245	511.7560	533.4049	562.0264	574.8651	563.1797	540.9799	517.6619	498.3672	470.3879	454.2494	450.9206 (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	23.2044	23.2517	23.2982	23.5194	23.5612	23.7580	23.7580	23.7948	23.6818	23.5612	23.4767	23.3890
alpha	2.5470	2.5501	2.5532	2.5680	2.5707	2.5839	2.5839	2.5863	2.5788	2.5707	2.5651	2.5593
util living area	0.9269	0.9060	0.8770	0.8170	0.7238	0.5866	0.4574	0.4901	0.6647	0.8243	0.9003	0.9320 (86)

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MIT	18.6240	18.8942	19.2995	19.8647	20.3714	20.7468	20.9037	20.8819	20.6271	20.0015	19.2399	18.5798 (87)
Th 2	19.9223	19.9243	19.9262	19.9352	19.9369	19.9447	19.9447	19.9462	19.9417	19.9369	19.9335	19.9299 (88)
util rest of house												
	0.9168	0.8931	0.8594	0.7893	0.6791	0.5159	0.3627	0.3960	0.5997	0.7924	0.8845	0.9225 (89)
MIT 2	17.1828	17.5213	18.0286	18.7280	19.3293	19.7452	19.8904	19.8756	19.6269	18.9071	17.9665	17.1318 (90)
Living area fraction									fLA = Living area / (4) =			0.4623 (91)
MIT	17.8490	18.1559	18.6161	19.2535	19.8110	20.2082	20.3588	20.3407	20.0893	19.4130	18.5551	17.8012 (92)
Temperature adjustment												0.0000
adjusted MIT	17.8490	18.1559	18.6161	19.2535	19.8110	20.2082	20.3588	20.3407	20.0893	19.4130	18.5551	17.8012 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8913	0.8664	0.8333	0.7689	0.6733	0.5346	0.4013	0.4329	0.6096	0.7741	0.8590	0.8978 (94)
Useful gains	415.3866	443.3934	444.4880	432.1322	387.0346	301.0633	217.1201	224.0922	303.7919	364.1062	390.2088	404.8518 (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	859.6292	839.3238	765.6199	648.0867	506.8177	347.5253	232.9247	243.8193	372.3320	550.6772	718.3483	856.1246 (97)
Space heating kWh	330.5164	266.0652	238.9221	155.4873	89.1186	0.0000	0.0000	0.0000	0.0000	138.8089	236.2604	335.7469 (98a)
Space heating requirement - total per year (kWh/year)												1790.9260
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	330.5164	266.0652	238.9221	155.4873	89.1186	0.0000	0.0000	0.0000	0.0000	138.8089	236.2604	335.7469 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1790.9260
Space heating per m2												(98c) / (4) = 33.7911 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												92.3000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	330.5164	266.0652	238.9221	155.4873	89.1186	0.0000	0.0000	0.0000	0.0000	138.8089	236.2604	335.7469 (98)
Space heating efficiency (main heating system 1)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000 (210)
Space heating fuel (main heating system)	358.0893	288.2614	258.8539	168.4586	96.5532	0.0000	0.0000	0.0000	0.0000	150.3888	255.9701	363.7562 (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	176.7551	156.3969	166.7079	148.3009	144.8433	131.7303	131.0621	135.6990	136.5245	150.7460	158.4064	175.0868 (64)
Efficiency of water heater (217)m	85.4423	85.2410	84.8663	84.1661	83.0045	79.8000	79.8000	79.8000	79.8000	83.8752	84.9544	79.8000 (216)
Fuel for water heating, kWh/month	206.8708	183.4761	196.4360	176.2004	174.5007	165.0755	164.2382	170.0489	171.0833	179.7266	186.4605	204.7916 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685 (231)
Lighting	18.2656	14.6534	13.1937	9.6663	7.4665	6.1002	6.8112	8.8535	11.4998	15.0884	17.0423	18.7733 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-25.2507	-35.8284	-51.8373	-58.7010	-63.6886	-59.6364	-58.9608	-55.5132	-49.4228	-41.2301	-27.8661	-21.8088 (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	-13.5505	-28.5943	-56.9820	-85.7778	-113.5791	-114.1329	-112.7298	-95.3189	-69.7366	-40.8849	-18.0944	-10.7035 (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												1940.3315 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												79.8000
Water heating fuel used												2178.9086 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
Total electricity for the above, kWh/year												86.0000 (231)
Electricity for lighting (calculated in Appendix L)												147.4142 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-1309.8289 (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												3042.8254 (238)

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

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	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1940.3315	0.2100	407.4696 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2178.9086	0.2100	457.5708 (264)
Space and water heating			865.0404 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	147.4142	0.1443	21.2764 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-549.7443	0.1344	-73.8987
PV Unit electricity exported	-760.0846	0.1258	-95.6499
Total			-169.5486 (269)
Total CO2, kg/year			728.6975 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			13.7500 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	1940.3315	1.1300	2192.5746 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2178.9086	1.1300	2462.1667 (278)
Space and water heating			4654.7412 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	147.4142	1.5338	226.1089 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-549.7443	1.4968	-822.8561
PV Unit electricity exported	-760.0846	0.4619	-351.0999
Total			-1173.9560 (283)
Total Primary energy kWh/year			3836.9949 (286)
Target Primary Energy Rate (TPER)			72.4000 (287)

SAP 10 WORKSHEET FOR New Build (As Designed) (Version 10.2, February 2022) CALCULATION OF FABRIC ENERGY EFFICIENCY

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	53.0000 (1b)	x 2.1500 (2b)	= 113.9500 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 113.9500 (5)

2. Ventilation rate

		m3 per hour
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	2 * 10 =	20.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1755 (8)
Pressure test	No	
Pressure Test Method	Blower Door	
Measured/design AP50	15.0000	(17)
Infiltration rate	0.9255	(18)
Number of sides sheltered	3	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.7173 (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	0.9145	0.8966	0.8787	0.7890	0.7711	0.6814	0.6814	0.6635	0.7173	0.7711	0.8069	0.8428 (22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000 (23c)
Effective ac	0.9182	0.9019	0.8860	0.8113	0.7973	0.7322	0.7322	0.7201	0.7572	0.7973	0.8256	0.8552 (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
Windows (new) (Uw = 1.40)			6.0000	1.3258	7.9545		(27)
Door (new)			2.0000	1.4000	2.8000		(26a)
Floor			53.0000	0.2500	13.2500		(28b)
Wall (existing)	38.0000	3.5000	34.5000	0.3000	10.3500		(29a)

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Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	11.8841	11.9430	12.0013	12.2828	12.3369	12.5953	12.5953	12.6444	12.4945	12.3369	12.2279	12.1159
alpha	1.7923	1.7962	1.8001	1.8189	1.8225	1.8397	1.8397	1.8430	1.8330	1.8225	1.8152	1.8077
util living area	0.9604	0.9496	0.9355	0.9050	0.8563	0.7709	0.6735	0.7031	0.8251	0.9121	0.9482	0.9630 (86)
MIT	16.4002	16.7226	17.3130	18.2109	19.1166	19.9736	20.4553	20.3849	19.7211	18.5641	17.3732	16.3839 (87)
Th 2	19.1179	19.1249	19.1319	19.1647	19.1709	19.1999	19.1999	19.2053	19.1887	19.1709	19.1584	19.1454 (88)
util rest of house	0.9522	0.9390	0.9207	0.8800	0.8096	0.6745	0.4990	0.5415	0.7486	0.8839	0.9354	0.9553 (89)
MIT 2	15.1392	15.4614	16.0494	16.9486	17.8262	18.6289	19.0123	18.9725	18.4130	17.3076	16.1280	15.1376 (90)
Living area fraction									fLA = Living area / (4) =			0.4623 (91)
MIT	15.7221	16.0444	16.6335	17.5321	18.4227	19.2505	19.6793	19.6254	19.0177	17.8885	16.7036	15.7138 (92)
Temperature adjustment												0.0000
adjusted MIT	15.7221	16.0444	16.6335	17.5321	18.4227	19.2505	19.6793	19.6254	19.0177	17.8885	16.7036	15.7138 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9287	0.9121	0.8909	0.8483	0.7838	0.6779	0.5558	0.5885	0.7390	0.8551	0.9092	0.9330 (94)
Useful gains	353.4221	389.6359	401.7279	411.0594	392.1545	335.3917	263.8445	264.7852	316.9956	337.3303	339.6359	341.6041 (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	1414.9852	1373.7797	1243.1007	1034.6560	802.2547	543.5833	359.9308	375.5380	579.4489	869.7664	1156.2656	1399.0518 (97)
Space heating kWh	789.8029	661.3446	625.9814	448.9896	305.1145	0.0000	0.0000	0.0000	0.0000	396.1325	587.9734	786.7411 (98a)
Space heating requirement - total per year (kWh/year)												4602.0800
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	789.8029	661.3446	625.9814	448.9896	305.1145	0.0000	0.0000	0.0000	0.0000	396.1325	587.9734	786.7411 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4602.0800
Space heating per m2												(98c) / (4) = 86.8317 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	1098.7316	864.9589	884.8901	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.4131	0.4768	0.4521	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	453.8447	412.4225	400.0159	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	539.3383	517.8736	490.7405	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	61.5554	78.4557	67.4991	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction									fc = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	15.3888	19.6139	16.8748	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												51.8775 (107)
Energy for space heating												86.8317 (99)
Energy for space cooling												0.9788 (108)
Total												87.8105 (109)
Fabric Energy Efficiency (DFEE)												87.8 (109)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	53.0000 (1b)	x 2.1500 (2b)	= 113.9500 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	113.9500 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1755 (8)
Pressure test	Yes
Pressure Test Method	Blower Door

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Measured/design AP50													5.0000 (17)
Infiltration rate													0.4255 (18)
Number of sides sheltered													3 (19)
Shelter factor													(20) = 1 - [0.075 x (19)] = 0.7750 (20)
Infiltration rate adjusted to include shelter factor													(21) = (18) x (20) = 0.3298 (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	0.4205	0.4122	0.4040	0.3628	0.3545	0.3133	0.3133	0.3050	0.3298	0.3545	0.3710	0.3875	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)													0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =													0.0000 (23c)
Effective ac	0.5884	0.5850	0.5816	0.5658	0.5628	0.5491	0.5491	0.5465	0.5544	0.5628	0.5688	0.5751	(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	
TER Semi-glazed door			2.0000	1.0000	2.0000			(26a)
TER Opening Type (Uw = 1.20)			6.0000	1.1450	6.8702			(27)
Floor			53.0000	0.1300	6.8900			(28b)
Wall (existing)	38.0000	3.5000	34.5000	0.1800	6.2100			(29a)
Wall (existing-party)	14.0000		14.0000	0.1800	2.5200			(29a)
Wall (new)	17.0000	4.5000	12.5000	0.1800	2.2500			(29a)
Roof	53.0000		53.0000	0.1100	5.8300			(30)
Total net area of external elements Aum(A, m2)			175.0000					(31)
Fabric heat loss, W/K = Sum (A x U)					(26) ... (30) + (32) = 32.5702			(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								100.0000 (35)
Thermal bridges (User defined value 0.050 * total exposed area)								8.7500 (36)
Point Thermal bridges								(36a) = 0.0000
Total fabric heat loss								(33) + (36) + (36a) = 41.3202 (37)

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	22.1257	21.9966	21.8701	21.2759	21.1647	20.6471	20.6471	20.5513	20.8465	21.1647	21.3896	21.6247	(38)
Heat transfer coeff	63.4459	63.3168	63.1903	62.5961	62.4849	61.9673	61.9673	61.8715	62.1667	62.4849	62.7098	62.9450	(39)
Average = Sum(39)m / 12 =													62.5956

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.1971	1.1947	1.1923	1.1811	1.1790	1.1692	1.1692	1.1674	1.1730	1.1790	1.1832	1.1876	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.7786 (42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	23.3623	23.0153	22.5267	21.6258	20.9512	20.2033	19.7992	20.2844	20.8127	21.6131	22.5325	23.2833	(42b)
Hot water usage for other uses	32.8442	31.6499	30.4556	29.2612	28.0669	26.8726	26.8726	28.0669	29.2612	30.4556	31.6499	32.8442	(42c)
Average daily hot water use (litres/day)													51.5189 (43)
Daily hot water use	56.2065	54.6652	52.9823	50.8871	49.0181	47.0758	46.6718	48.3513	50.0739	52.0686	54.1824	56.1275	(44)
Energy conte	89.0174	77.8425	81.4318	69.6618	65.9878	57.8852	56.4455	59.8690	61.7461	70.6566	77.1928	87.8821	(45)
Energy content (annual)													Total = Sum(45)m = 855.6187
Distribution loss (46)m = 0.15 x (45)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	(46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
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	(59)
Total heat required for water heating calculated for each month													
WWHS	75.6648	66.1661	69.2170	59.2126	56.0897	49.2024	47.9787	50.8887	52.4842	60.0581	65.6138	74.6998	(62)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
FGHS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
Output from w/h	75.6648	66.1661	69.2170	59.2126	56.0897	49.2024	47.9787	50.8887	52.4842	60.0581	65.6138	74.6998	(64)
Total per year (kWh/year)													Total per year (kWh/year) = Sum(64)m = 727.2759 (64)
Electric shower(s)	43.2771	38.5603	42.1064	40.1816	40.9356	39.0486	40.3502	40.9356	40.1816	42.1064	41.3146	43.2771	(64a)
Heat gains from water heating, kWh/month	29.7355	26.1816	27.8308	24.8485	24.2563	22.0627	22.0822	22.9561	23.1665	25.5411	26.7321	29.4942	(65)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =													492.2750 (64a)

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	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	88.9281	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	87.9085	97.3272	87.9085	90.8388	87.9085	90.8388	87.9085	87.9085	90.8388	87.9085	90.8388	87.9085	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	155.0178	156.6264	152.5728	143.9431	133.0497	122.8114	115.9716	114.3630	118.4166	127.0463	137.9397	148.1780	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	31.8928	(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)

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Losses e.g. evaporation (negative values) (Table 5)	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	(71)
Water heating gains (Table 5)	39.9670	38.9607	37.4070	34.5119	32.6026	30.6427	29.6804	30.8549	32.1756	34.3295	37.1279	39.6428 (72)
Total internal gains	332.5717	342.5928	327.5667	318.9721	303.2392	293.9713	283.2389	282.8048	291.1094	298.9627	315.5848	325.4077 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W						
Northeast	2.5000	11.2829	0.6300	0.7000	0.7700	8.6205 (75)						
Southwest	3.5000	36.7938	0.6300	0.7000	0.7700	39.3564 (79)						
Solar gains	47.9769	84.5858	123.3396	165.5721	197.0906	200.7836	191.4469	167.1501	137.8417	95.5360	57.9867	40.7208 (83)
Total gains	380.5486	427.1786	450.9064	484.5442	500.3297	494.7549	474.6858	449.9550	428.9512	394.4987	373.5715	366.1285 (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	23.2044	23.2517	23.2982	23.5194	23.5612	23.7580	23.7580	23.7948	23.6818	23.5612	23.4767	23.3890
alpha	2.5470	2.5501	2.5532	2.5680	2.5707	2.5839	2.5839	2.5863	2.5788	2.5707	2.5651	2.5593
util living area	0.9515	0.9338	0.9096	0.8564	0.7715	0.6375	0.5068	0.5444	0.7206	0.8691	0.9316	0.9557 (86)
MIT	18.3596	18.6489	19.0808	19.6965	20.2567	20.6897	20.8773	20.8483	20.5425	19.8305	19.0082	18.3126 (87)
Th 2	19.9223	19.9243	19.9262	19.9352	19.9369	19.9447	19.9447	19.9462	19.9417	19.9369	19.9335	19.9299 (88)
util rest of house	0.9443	0.9241	0.8957	0.8327	0.7300	0.5666	0.4062	0.4454	0.6583	0.8427	0.9200	0.9491 (89)
MIT 2	17.5304	17.8155	18.2405	18.8416	19.3677	19.7502	19.8894	19.8736	19.6334	18.9808	18.1795	17.4892 (90)
Living area fraction	17.9137	18.2007	18.6289	19.2368	19.7787	20.1845	20.3461	20.3241	20.0536	19.3736	18.5626	17.8698 (92)
Temperature adjustment	17.9137	18.2007	18.6289	19.2368	19.7787	20.1845	20.3461	20.3241	20.0536	19.3736	18.5626	0.0000
adjusted MIT	17.9137	18.2007	18.6289	19.2368	19.7787	20.1845	20.3461	20.3241	20.0536	19.3736	18.5626	17.8698 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9266	0.9041	0.8747	0.8143	0.7231	0.5839	0.4464	0.4830	0.6656	0.8259	0.9008	0.9323 (94)
Useful gains	352.6296	386.2157	394.4203	394.5819	361.8070	288.8773	211.8947	217.3397	285.5204	325.8149	336.4982	341.3283 (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	863.7342	842.1614	766.4319	647.0416	504.7943	346.0565	232.1356	242.7930	370.1176	548.2168	718.8166	860.4470 (97)
Space heating kWh	380.2618	306.3955	276.7766	181.7710	106.3825	0.0000	0.0000	0.0000	0.0000	165.4670	275.2692	386.2243 (98a)
Space heating requirement - total per year (kWh/year)												2078.5479
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	380.2618	306.3955	276.7766	181.7710	106.3825	0.0000	0.0000	0.0000	0.0000	165.4670	275.2692	386.2243 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2078.5479
Space heating per m2												(98c) / (4) = 39.2179 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	582.4929	458.5583	470.2233	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.6927	0.7633	0.7364	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	403.4908	350.0096	346.2643	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	539.3383	517.8736	490.7405	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	97.8102	124.8908	107.4903	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction												fc = cooled area / (4) = 1.0000 (105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	24.4525	31.2227	26.8726	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												82.5478 (107)
Energy for space heating												39.2179 (99)
Energy for space cooling												1.5575 (108)
Total												40.7754 (109)
Fabric Energy Efficiency (TFEE)												40.8 (109)

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

1. Overall dwelling characteristics

Full SAP Calculation Printout



	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	53.0000 (1b)	2.1500 (2b)	113.9500 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.0000		113.9500 (4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 113.9500 (5)

2. Ventilation rate

		m ³ per hour
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	2 * 10 =	20.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1755 (8)
Pressure test		No
Pressure Test Method		Blower Door
Measured/design AP50		15.0000 (17)
Infiltration rate		0.9255 (18)
Number of sides sheltered		3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.7173 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.9145	0.8966	0.8787	0.7890	0.7711	0.6814	0.6814	0.6635	0.7173	0.7711	0.8069	0.8428 (22b)
	0.9182	0.9019	0.8860	0.8113	0.7973	0.7322	0.7322	0.7201	0.7572	0.7973	0.8256	0.8552 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K					
Windows (new) (Uw = 1.40)			6.0000	1.3258	7.9545		(27)					
Door (new)			2.0000	1.4000	2.8000		(26a)					
Floor			53.0000	0.2500	13.2500		(28b)					
Wall (existing)	38.0000	3.5000	34.5000	0.3000	10.3500		(29a)					
Wall (existing-party)	14.0000		14.0000	0.7000	9.8000		(29a)					
Wall (new)	17.0000	4.5000	12.5000	0.1800	2.2500		(29a)					
Roof	53.0000		53.0000	0.1500	7.9500		(30)					
Total net area of external elements Aum(A, m ²)			175.0000				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 54.3545		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							100.0000 (35)					
Thermal bridges (Default value 0.200 * total exposed area)							35.0000 (36)					
Point Thermal bridges							0.0000					
Total fabric heat loss						(33) + (36) + (36a) =	89.3545 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 34.5267	Feb 33.9161	Mar 33.3176	Apr 30.5063	May 29.9803	Jun 27.5318	Jul 27.5318	Aug 27.0784	Sep 28.4749	Oct 29.9803	Nov 31.0444	Dec 32.1568 (38)
Heat transfer coeff	123.8813	123.2706	122.6721	119.8608	119.3349	116.8863	116.8863	116.4329	117.8295	119.3349	120.3989	121.5113 (39)
Average = Sum(39)m / 12 =												119.8583
HLP	Jan 2.3374	Feb 2.3259	Mar 2.3146	Apr 2.2615	May 2.2516	Jun 2.2054	Jul 2.2054	Aug 2.1968	Sep 2.2232	Oct 2.2516	Nov 2.2717	Dec 2.2927 (40)
HLP (average)												2.2615
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												1.7786 (42)
Hot water usage for mixer showers												
69.3619	68.3196	66.8006	63.8944	61.7497	59.3579	57.9984	59.5058	61.1583	63.7263	66.6950	69.0962 (42a)	
Hot water usage for baths												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42b)	
Hot water usage for other uses												
32.8442	31.6499	30.4556	29.2612	28.0669	26.8726	26.8726	28.0669	29.2612	30.4556	31.6499	32.8442 (42c)	
Average daily hot water use (litres/day)												93.8078 (43)
Daily hot water use	Jan 102.2062	Feb 99.9695	Mar 97.2562	Apr 93.1556	May 89.8166	Jun 86.2305	Jul 84.8710	Aug 87.5728	Sep 90.4195	Oct 94.1819	Nov 98.3449	Dec 101.9404 (44)
Energy conte	161.8696	142.3552	149.4791	127.5254	120.9104	106.0304	102.6441	108.4334	111.4963	127.8040	140.1103	159.6141 (45)
Energy content (annual)												Total = Sum(45)m = 1558.2722
Distribution loss (46)m = 0.15 x (45)m	24.2804	21.3533	22.4219	19.1288	18.1366	15.9046	15.3966	16.2650	16.7244	19.1706	21.0165	23.9421 (46)
Water storage loss:												
Store volume												173.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.9200 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												1.0368 (55)
Total storage loss												
32.1408	29.0304	32.1408	31.1040	32.1408	31.1040	32.1408	32.1408	32.1408	31.1040	32.1408	31.1040	32.1408 (56)
If cylinder contains dedicated solar storage												
32.1408	29.0304	32.1408	31.1040	32.1408	31.1040	32.1408	32.1408	32.1408	31.1040	32.1408	31.1040	32.1408 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	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)

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Total heat required for water heating calculated for each month												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
WWHRS	194.0104	171.3856	181.6199	158.6294	153.0512	137.1344	134.7849	140.5742	142.6003	159.9448	171.2143	191.7549 (62)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63b)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
Output from w/h	194.0104	171.3856	181.6199	158.6294	153.0512	137.1344	134.7849	140.5742	142.6003	159.9448	171.2143	191.7549 (64)
Total per year (kWh/year) = Sum(64)m = 1936.7042 (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	53.8216	47.3331	49.7018	42.4022	40.2027	35.2551	34.1292	36.0541	37.0725	42.4948	46.5867	53.0717 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	21.3514	18.9641	15.4227	11.6760	8.7279	7.3685	7.9619	10.3492	13.8906	17.6374	20.5854	21.9448 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	231.3698	233.7707	227.7206	214.8404	198.5816	183.3006	173.0920	170.6911	176.7412	189.6214	205.8802	221.1612 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	47.4499	47.4499	47.4499	47.4499	47.4499	47.4499	47.4499	47.4499	47.4499	47.4499	47.4499	47.4499 (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)	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424 (71)
Water heating gains (Table 5)	72.3409	70.4362	66.8035	58.8919	54.0359	48.9654	45.8725	48.4598	51.4896	57.1167	64.7037	71.3329 (72)
Total internal gains	408.0833	406.1922	392.9679	368.4295	344.3666	322.6557	309.9475	312.5212	325.1427	347.3965	374.1905	397.4601 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b g	Specific data or Table 6c FF	Access factor Table 6d	Gains W						
Northeast	2.5000	11.2829	0.6300	0.7000	0.7700	8.6205 (75)						
Southwest	3.5000	36.7938	0.6300	0.7000	0.7700	39.3564 (79)						
Solar gains	47.9769	84.5858	123.3396	165.5721	197.0906	200.7836	191.4469	167.1501	137.8417	95.5360	57.9867	40.7208 (83)
Total gains	456.0602	490.7780	516.3075	534.0016	541.4572	523.4393	501.3944	479.6713	462.9844	442.9325	432.1772	438.1809 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												
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	11.8841	11.9430	12.0013	12.2828	12.3369	12.5953	12.5953	12.6444	12.4945	12.3369	12.2279	12.1159
alpha	1.7923	1.7962	1.8001	1.8189	1.8225	1.8397	1.8397	1.8430	1.8330	1.8225	1.8152	1.8077
util living area	0.9474	0.9376	0.9210	0.8908	0.8405	0.7557	0.6561	0.6834	0.8076	0.8960	0.9350	0.9507 (86)
MIT	16.5799	16.8702	17.4589	18.3134	19.1903	20.0132	20.4811	20.4170	19.7768	18.6665	17.5104	16.5589 (87)
Th 2	19.1179	19.1249	19.1319	19.1647	19.1709	19.1999	19.1999	19.2053	19.1887	19.1709	19.1584	19.1454 (88)
util rest of house	0.9368	0.9247	0.9033	0.8629	0.7905	0.6565	0.4808	0.5199	0.7269	0.8638	0.9195	0.9409 (89)
MIT 2	14.3670	14.7256	15.4529	16.5085	17.5661	18.5186	18.9794	18.9334	18.2699	16.9544	15.5301	14.3457 (90)
Living area fraction	15.3899	15.7170	16.3802	17.3429	18.3169	19.2095	19.6736	19.6192	18.9665	17.7459	16.4455	15.3688 (91)
MIT	15.3899	15.7170	16.3802	17.3429	18.3169	19.2095	19.6736	19.6192	18.9665	17.7459	16.4455	15.3688 (92)
Temperature adjustment												0.0000
adjusted MIT	15.3899	15.7170	16.3802	17.3429	18.3169	19.2095	19.6736	19.6192	18.9665	17.7459	16.4455	15.3688 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9030	0.8882	0.8640	0.8232	0.7588	0.6572	0.5368	0.5663	0.7137	0.8271	0.8837	0.9084 (94)
Useful gains	411.8084	435.9180	446.0850	439.5704	410.8802	343.9886	269.1266	271.6436	330.4332	366.3671	381.9128	398.0626 (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	1373.8363	1333.4192	1212.0199	1011.9700	789.6273	538.7856	359.2599	374.8202	573.4141	852.7506	1125.1866	1357.1355 (97)
Space heating kWh	715.7488	603.1208	569.8556	412.1278	281.7878	0.0000	0.0000	0.0000	0.0000	361.8693	535.1571	713.5502 (98a)
Space heating requirement - total per year (kWh/year)												4193.2175
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	715.7488	603.1208	569.8556	412.1278	281.7878	0.0000	0.0000	0.0000	0.0000	361.8693	535.1571	713.5502 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4193.2175
Space heating per m2										(98c) / (4) =		79.1173 (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)
Fraction of main heating from main system 2	0.0000 (203)
Fraction of total heating from main system 1	1.0000 (204)
Fraction of total heating from main system 2	0.0000 (205)
Efficiency of main space heating system 1 (in %)	100.0000 (206)
Efficiency of main space heating system 2 (in %)	0.0000 (207)

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Efficiency of secondary/supplementary heating system, %												0.0000 (208)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	715.7488	603.1208	569.8556	412.1278	281.7878	0.0000	0.0000	0.0000	0.0000	361.8693	535.1571	713.5502	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	715.7488	603.1208	569.8556	412.1278	281.7878	0.0000	0.0000	0.0000	0.0000	361.8693	535.1571	713.5502	(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)
Space heating fuel used, main system 2													(213)
Water heating requirement	194.0104	171.3856	181.6199	158.6294	153.0512	137.1344	134.7849	140.5742	142.6003	159.9448	171.2143	191.7549	(64)
Efficiency of water heater (217)m	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	(216)
Fuel for water heating, kWh/month	64.0393	56.5713	59.9495	52.3607	50.5194	45.2656	44.4901	46.4010	47.0698	52.7949	56.5148	63.2948	(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 (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	(231)
Lighting (233a)m	18.6888	14.9928	13.4994	9.8902	7.6395	6.2415	6.9690	9.0586	11.7662	15.4379	17.4370	19.2082	(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													4193.2175 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)
Efficiency of water heater													302.9550
Water heating fuel used													639.2712 (219)
Space cooling fuel													0.0000 (221)
Electricity for pumps and fans:													0.0000 (231)
Total electricity for the above, kWh/year													150.8290 (232)
Electricity for lighting (calculated in Appendix L)													
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													4983.3177 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	4193.2175	16.4900	691.4616	(240)
Space heating - main system 2	0.0000	16.4900	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	639.2712	16.4900	105.4158	(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	150.8290	16.4900	24.8717	(250)
Additional standing charges			0.0000	(251)
Total energy cost			821.7491	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	3.0187	(257)
SAP value		51.0674	
SAP rating (Section 12)		51	(258)
SAP band		E	

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	4193.2175	0.1533	642.8162	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	639.2712	0.1410	90.1588	(264)
Space and water heating			732.9750	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	150.8290	0.1443	21.7693	(268)
Total CO2, kg/year			754.7443	(272)
CO2 emissions per m2			14.2400	(273)
EI value			89.6800	

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EI rating
EI band

90 (274)
B

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	53.0000	2.1500	113.9500
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.0000		113.9500
Dwelling volume			113.9500

2. Ventilation rate

		m ³ per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	2 * 10 =	20.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c)	20.0000 / (5) =	0.1755	(8)
Pressure test	No		
Pressure Test Method	Blower Door		
Measured/design AP50	15.0000		(17)
Infiltration rate	0.9255		(18)
Number of sides sheltered	3		(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.7173	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	3.7000	3.4000	3.4000	3.2000	3.3000	3.0000	3.0000	2.8000	2.7000	2.8000	2.8000	3.1000
Wind factor	0.9250	0.8500	0.8500	0.8000	0.8250	0.7500	0.7500	0.7000	0.6750	0.7000	0.7000	0.7500
Adj infilt rate	0.6635	0.6097	0.6097	0.5738	0.5918	0.5380	0.5380	0.5021	0.4842	0.5021	0.5021	0.5559
Effective ac	0.7201	0.6859	0.6859	0.6646	0.6751	0.6447	0.6447	0.6260	0.6172	0.6260	0.6260	0.6545

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Windows (new) (Uw = 1.40)			6.0000	1.3258	7.9545		(27)
Door (new)			2.0000	1.4000	2.8000		(26a)
Floor			53.0000	0.2500	13.2500		(28b)
Wall (existing)	38.0000	3.5000	34.5000	0.3000	10.3500		(29a)
Wall (existing-party)	14.0000		14.0000	0.7000	9.8000		(29a)
Wall (new)	17.0000	4.5000	12.5000	0.1800	2.2500		(29a)
Roof	53.0000		53.0000	0.1500	7.9500		(30)
Total net area of external elements Aum(A, m ²)			175.0000				(31)
Fabric heat loss, W/K = Sum (A x U)					54.3545		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							100.0000 (35)
Thermal bridges (Default value 0.200 * total exposed area)							35.0000 (36)
Point Thermal bridges							0.0000 (36a)
Total fabric heat loss							(33) + (36) + (36a) = 89.3545 (37)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	27.0784	25.7906	25.7906	24.9926	25.3856	24.2429	24.2429	23.5416	23.2091	23.5416	23.5416	24.6117
Heat transfer coeff	116.4329	115.1452	115.1452	114.3471	114.7401	113.5975	113.5975	112.8962	112.5636	112.8962	112.8962	113.9662
Average = Sum(39)m / 12 =												114.0186
HLP	2.1968	2.1726	2.1726	2.1575	2.1649	2.1433	2.1433	2.1301	2.1238	2.1301	2.1301	2.1503
HLP (average)												2.1513
Days in month	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												1.7786 (42)
Hot water usage for mixer showers	69.3619	68.3196	66.8006	63.8944	61.7497	59.3579	57.9984	59.5058	61.1583	63.7263	66.6950	69.0962
Hot water usage for baths	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Hot water usage for other uses	32.8442	31.6499	30.4556	29.2612	28.0669	26.8726	26.8726	28.0669	29.2612	30.4556	31.6499	32.8442
Average daily hot water use (litres/day)												93.8078 (43)

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Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	639.2712	0.1410	90.1588 (264)
Space and water heating			657.4097 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	150.8290	0.1443	21.7693 (268)
Total CO2, kg/year			679.1790 (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	3695.6451	1.5683	5795.7681 (275)
Space heating - main system 2	0.0000	0.0000	0.0000 (276)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	639.2712	1.5215	972.6501 (278)
Space and water heating			6768.4182 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	150.8290	1.5338	231.3466 (282)
Total Primary energy kWh/year			6999.7648 (286)

 SAP 10 EPC IMPROVEMENTS

CA5802B (Proposed)

Current energy efficiency rating: E 51
 Current environmental impact rating: B 90

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

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

Recommended measures (none)	Typical annual savings	Energy efficiency	Environmental impact
Total Savings	£0	0.00 kg/m ²	

Potential energy efficiency rating: E 51
 Potential environmental impact rating: B 90

Fuel prices for cost data on this page from database revision number 536 TEST (31 Jan 2024)
 Recommendation texts revision number 6.1 (11 Jun 2019)

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

	Current	Potential	Saving
Electricity	£1129	£1129	£0
Space heating	£930	£930	£0
Water heating	£161	£161	£0
Lighting	£38	£38	£0
Total cost of fuels	£1129	£1129	£0
Total cost of uses	£1129	£1129	£0
Delivered energy	85 kWh/m ²	85 kWh/m ²	0 kWh/m ²
Carbon dioxide emissions	0.7 tonnes	0.7 tonnes	0.0 tonnes
CO2 emissions per m ²	13 kg/m ²	13 kg/m ²	0 kg/m ²
Primary energy	132 kWh/m ²	132 kWh/m ²	0 kWh/m ²

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	53.0000 (1b)	x 2.1500 (2b)	= 113.9500 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	53.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 113.9500 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)

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Number of flueless gas fires 0 * 40 = 0.0000 (7c)

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 20.0000 / (5) = 0.1755 (8)

Pressure test No

Pressure Test Method Blower Door

Measured/design AP50 15.0000 (17)

Infiltration rate 0.9255 (18)

Number of sides sheltered 3 (19)

Shelter factor (20) = 1 - [0.075 x (19)] = 0.7750 (20)

Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.7173 (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	0.9145	0.8966	0.8787	0.7890	0.7711	0.6814	0.6814	0.6635	0.7173	0.7711	0.8069	0.8428 (22b)
Effective ac	0.9182	0.9019	0.8860	0.8113	0.7973	0.7322	0.7322	0.7201	0.7572	0.7973	0.8256	0.8552 (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
Windows (new) (Uw = 1.40)			6.0000	1.3258	7.9545		(27)
Door (new)			2.0000	1.4000	2.8000		(26a)
Floor			53.0000	0.2500	13.2500		(28b)
Wall (existing)	38.0000	3.5000	34.5000	0.3000	10.3500		(29a)
Wall (existing-party)	14.0000		14.0000	0.7000	9.8000		(29a)
Wall (new)	17.0000	4.5000	12.5000	0.1800	2.2500		(29a)
Roof	53.0000		53.0000	0.1500	7.9500		(30)
Total net area of external elements Aum(A, m2)			175.0000				(31)
Fabric heat loss, W/K = Sum (A x U)					54.3545		(32) + (30) + (31) = (33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							100.0000 (35)
Thermal bridges (Default value 0.200 * total exposed area)							35.0000 (36)
Point Thermal bridges							(36a) = 0.0000
Total fabric heat loss							(33) + (36) + (36a) = 89.3545 (37)

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

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	34.5267	33.9161	33.3176	30.5063	29.9803	27.5318	27.5318	27.0784	28.4749	29.9803	31.0444	32.1568 (38)
Heat transfer coeff	123.8813	123.2706	122.6721	119.8608	119.3349	116.8863	116.8863	116.4329	117.8295	119.3349	120.3989	121.5113 (39)
Average = Sum(39)m / 12 =												119.8583

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	2.3374	2.3259	2.3146	2.2615	2.2516	2.2054	2.2054	2.1968	2.2232	2.2516	2.2717	2.2927 (40)
HLP (average)												2.2615
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.7786 (42)
Hot water usage for mixer showers	69.3619	68.3196	66.8006	63.8944	61.7497	59.3579	57.9984	59.5058	61.1583	63.7263	66.6950	69.0962 (42a)
Hot water usage for baths	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42b)
Hot water usage for other uses	32.8442	31.6499	30.4556	29.2612	28.0669	26.8726	26.8726	28.0669	29.2612	30.4556	31.6499	32.8442 (42c)
Average daily hot water use (litres/day)												93.8078 (43)
Daily hot water use	102.2062	99.9695	97.2562	93.1556	89.8166	86.2305	84.8710	87.5728	90.4195	94.1819	98.3449	101.9404 (44)
Energy content (annual)	161.8696	142.3552	149.4791	127.5254	120.9104	106.0304	102.6441	108.4334	111.4963	127.8040	140.1103	159.6141 (45)
Distribution loss (46)m = 0.15 x (45)m	24.2804	21.3533	22.4219	19.1288	18.1366	15.9046	15.3966	16.2650	16.7244	19.1706	21.0165	23.9421 (46)
Water storage loss:												173.0000 (47)
Store volume												1.9200 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												1.0368 (55)
Enter (49) or (54) in (55)												
Total storage loss	32.1408	29.0304	32.1408	31.1040	32.1408	31.1040	32.1408	32.1408	31.1040	32.1408	31.1040	32.1408 (56)
If cylinder contains dedicated solar storage	32.1408	29.0304	32.1408	31.1040	32.1408	31.1040	32.1408	32.1408	31.1040	32.1408	31.1040	32.1408 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	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	194.0104	171.3856	181.6199	158.6294	153.0512	137.1344	134.7849	140.5742	142.6003	159.9448	171.2143	191.7549 (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	194.0104	171.3856	181.6199	158.6294	153.0512	137.1344	134.7849	140.5742	142.6003	159.9448	171.2143	191.7549 (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	53.8216	47.3331	49.7018	42.4022	40.2027	35.2551	34.1292	36.0541	37.0725	42.4948	46.5867	53.0717 (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	106.7137	106.7137	106.7137	106.7137	106.7137	106.7137	106.7137	106.7137	106.7137	106.7137	106.7137	106.7137 (66)

Full SAP Calculation Printout



Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	21.3514	18.9641	15.4227	11.6760	8.7279	7.3685	7.9619	10.3492	13.8906	17.6374	20.5854	21.9448 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	231.3698	233.7707	227.7206	214.8404	198.5816	183.3006	173.0920	170.6911	176.7412	189.6214	205.8802	221.1612 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	47.4499	47.4499	47.4499	47.4499	47.4499	47.4499	47.4499	47.4499	47.4499	47.4499	47.4499	47.4499 (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)	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424 (71)
Water heating gains (Table 5)	72.3409	70.4362	66.8035	58.8919	54.0359	48.9654	45.8725	48.4598	51.4896	57.1167	64.7037	71.3329 (72)
Total internal gains	408.0833	406.1922	392.9679	368.4295	344.3666	322.6557	309.9475	312.5212	325.1427	347.3965	374.1905	397.4601 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W						
Northeast	2.5000	11.2829	0.6300	0.7000	0.7700	8.6205 (75)						
Southwest	3.5000	36.7938	0.6300	0.7000	0.7700	39.3564 (79)						
Solar gains	47.9769	84.5858	123.3396	165.5721	197.0906	200.7836	191.4469	167.1501	137.8417	95.5360	57.9867	40.7208 (83)
Total gains	456.0602	490.7780	516.3075	534.0016	541.4572	523.4393	501.3944	479.6713	462.9844	442.9325	432.1772	438.1809 (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	11.8841	11.9430	12.0013	12.2828	12.3369	12.5953	12.5953	12.6444	12.4945	12.3369	12.2279	12.1159
alpha	1.7923	1.7962	1.8001	1.8189	1.8225	1.8397	1.8397	1.8430	1.8330	1.8225	1.8152	1.8077
util living area	0.9474	0.9376	0.9210	0.8908	0.8405	0.7557	0.6561	0.6834	0.8076	0.8960	0.9350	0.9507 (86)
MIT	16.5799	16.8702	17.4589	18.3134	19.1903	20.0132	20.4811	20.4170	19.7768	18.6665	17.5104	16.5589 (87)
Th 2	19.1179	19.1249	19.1319	19.1647	19.1709	19.1999	19.1999	19.2053	19.1887	19.1709	19.1584	19.1454 (88)
util rest of house	0.9368	0.9247	0.9033	0.8629	0.7905	0.6565	0.4808	0.5199	0.7269	0.8638	0.9195	0.9409 (89)
MIT 2	14.3670	14.7256	15.4529	16.5085	17.5661	18.5186	18.9794	18.9334	18.2699	16.9544	15.5301	14.3457 (90)
Living area fraction	fLA = Living area / (4) = 0.4623 (91)											
MIT	15.3899	15.7170	16.3802	17.3429	18.3169	19.2095	19.6736	19.6192	18.9665	17.7459	16.4455	15.3688 (92)
Temperature adjustment	0.0000											
adjusted MIT	15.3899	15.7170	16.3802	17.3429	18.3169	19.2095	19.6736	19.6192	18.9665	17.7459	16.4455	15.3688 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9030	0.8882	0.8640	0.8232	0.7588	0.6572	0.5368	0.5663	0.7137	0.8271	0.8837	0.9084 (94)
Useful gains	411.8084	435.9180	446.0850	439.5704	410.8802	343.9886	269.1266	271.6436	330.4332	366.3671	381.9128	398.0626 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	16.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	1373.8363	1333.4192	1212.0199	1011.9700	789.6273	538.7856	359.2599	374.8202	573.4141	852.7506	1125.1866	1357.1355 (97)
Space heating kWh	715.7488	603.1208	569.8556	412.1278	281.7878	0.0000	0.0000	0.0000	0.0000	361.8693	535.1571	713.5502 (98a)
Space heating requirement - total per year (kWh/year)	4193.2175											
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	715.7488	603.1208	569.8556	412.1278	281.7878	0.0000	0.0000	0.0000	0.0000	361.8693	535.1571	713.5502 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	4193.2175											
Space heating per m2	(98c) / (4) = 79.1173 (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)											
Fraction of main heating from main system 2	0.0000 (203)											
Fraction of total heating from main system 1	1.0000 (204)											
Fraction of total heating from main system 2	0.0000 (205)											
Efficiency of main space heating system 1 (in %)	100.0000 (206)											
Efficiency of main space heating system 2 (in %)	0.0000 (207)											
Efficiency of secondary/supplementary heating system, %	0.0000 (208)											
Space heating requirement	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating efficiency (main heating system 1)	715.7488	603.1208	569.8556	412.1278	281.7878	0.0000	0.0000	0.0000	0.0000	361.8693	535.1571	713.5502 (98)
Space heating fuel (main heating system)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000 (210)
Space heating efficiency (main heating system 2)	715.7488	603.1208	569.8556	412.1278	281.7878	0.0000	0.0000	0.0000	0.0000	361.8693	535.1571	713.5502 (211)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (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)
Space heating fuel used, main system 2	0.0000 (213)											
Water heating requirement	194.0104	171.3856	181.6199	158.6294	153.0512	137.1344	134.7849	140.5742	142.6003	159.9448	171.2143	191.7549 (64)
Efficiency of water heater (217)m	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550 (216)
Fuel for water heating, kWh/month	302.9550 (217)											

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Space cooling fuel requirement	64.0393	56.5713	59.9495	52.3607	50.5194	45.2656	44.4901	46.4010	47.0698	52.7949	56.5148	63.2948	(219)
(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	18.6888	14.9928	13.4994	9.8902	7.6395	6.2415	6.9690	9.0586	11.7662	15.4379	17.4370	19.2082	(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												4193.2175	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												302.9550	
Water heating fuel used												639.2712	(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)												150.8290	(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												4983.3177	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	4193.2175	16.4900	691.4616 (240)
Space heating - main system 2	0.0000	16.4900	0.0000 (241)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	639.2712	16.4900	105.4158 (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	150.8290	16.4900	24.8717 (250)
Additional standing charges			0.0000 (251)
Total energy cost			821.7491 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	3.0187 (257)
SAP value		51.0674
SAP rating (Section 12)		51 (258)
SAP band		E

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	4193.2175	0.1533	642.8162 (261)
Space heating - main system 2	0.0000	0.0000	0.0000 (262)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	639.2712	0.1410	90.1588 (264)
Space and water heating			732.9750 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	150.8290	0.1443	21.7693 (268)
Total CO2, kg/year			754.7443 (272)
CO2 emissions per m2			14.2400 (273)
EI value			89.6800
EI rating			90 (274)
EI band			B

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	53.0000 (1b)	x 2.1500 (2b)	= 113.9500 (1b) - (3b)

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Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n) 53.0000 (4)
 Dwelling volume (3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 113.9500 (5)

2. Ventilation rate

m3 per hour

Number of open chimneys 0 * 80 = 0.0000 (6a)
 Number of open flues 0 * 20 = 0.0000 (6b)
 Number of chimneys / flues attached to closed fire 0 * 10 = 0.0000 (6c)
 Number of flues attached to solid fuel boiler 0 * 20 = 0.0000 (6d)
 Number of flues attached to other heater 0 * 35 = 0.0000 (6e)
 Number of blocked chimneys 0 * 20 = 0.0000 (6f)
 Number of intermittent extract fans 2 * 10 = 20.0000 (7a)
 Number of passive vents 0 * 10 = 0.0000 (7b)
 Number of flueless gas fires 0 * 40 = 0.0000 (7c)

Air changes per hour

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 20.0000 / (5) = 0.1755 (8)
 Pressure test No
 Pressure Test Method Blower Door
 Measured/design AP50 15.0000 (17)
 Infiltration rate 0.9255 (18)
 Number of sides sheltered 3 (19)

Shelter factor (20) = 1 - [0.075 x (19)] = 0.7750 (20)
 Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.7173 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	3.7000	3.4000	3.4000	3.2000	3.3000	3.0000	3.0000	2.8000	2.7000	2.8000	2.8000	3.1000
Wind factor	0.9250	0.8500	0.8500	0.8000	0.8250	0.7500	0.7500	0.7000	0.6750	0.7000	0.7000	0.7750
Adj infiltr rate	0.6635	0.6097	0.6097	0.5738	0.5918	0.5380	0.5380	0.5021	0.4842	0.5021	0.5021	0.5559
Effective ac	0.7201	0.6859	0.6859	0.6646	0.6751	0.6447	0.6447	0.6260	0.6172	0.6260	0.6260	0.6545

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					
Windows (new) (Uw = 1.40)			6.0000	1.3258	7.9545		(27)					
Door (new)			2.0000	1.4000	2.8000		(26a)					
Floor			53.0000	0.2500	13.2500		(28b)					
Wall (existing)	38.0000	3.5000	34.5000	0.3000	10.3500		(29a)					
Wall (existing-party)	14.0000		14.0000	0.7000	9.8000		(29a)					
Wall (new)	17.0000	4.5000	12.5000	0.1800	2.2500		(29a)					
Roof	53.0000		53.0000	0.1500	7.9500		(30)					
Total net area of external elements Aum(A, m2)			175.0000				(31)					
Fabric heat loss, W/K = Sum (A x U)					54.3545		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							100.0000 (35)					
Thermal bridges (Default value 0.200 * total exposed area)							35.0000 (36)					
Point Thermal bridges							(36a) = 0.0000					
Total fabric heat loss							(33) + (36) + (36a) = 89.3545 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	27.0784	25.7906	25.7906	24.9926	25.3856	24.2429	24.2429	23.5416	23.2091	23.5416	23.5416	24.6117
Heat transfer coeff	116.4329	115.1452	115.1452	114.3471	114.7401	113.5975	113.5975	112.8962	112.5636	112.8962	112.8962	113.9662
Average = Sum(39)m / 12 =												114.0186 (39)
HLP	2.1968	2.1726	2.1726	2.1575	2.1649	2.1433	2.1433	2.1301	2.1238	2.1301	2.1301	2.1503
HLP (average)												2.1513 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												
Hot water usage for mixer showers	69.3619	68.3196	66.8006	63.8944	61.7497	59.3579	57.9984	59.5058	61.1583	63.7263	66.6950	69.0962
Hot water usage for baths	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Hot water usage for other uses	32.8442	31.6499	30.4556	29.2612	28.0669	26.8726	26.8726	28.0669	29.2612	30.4556	31.6499	32.8442
Average daily hot water use (litres/day)												
Daily hot water use	102.2062	99.9695	97.2562	93.1556	89.8166	86.2305	84.8710	87.5728	90.4195	94.1819	98.3449	101.9404
Energy conte	161.8696	142.3552	149.4791	127.5254	120.9104	106.0304	102.6441	108.4334	111.4963	127.8040	140.1103	159.6141
Energy content (annual)												
Distribution loss (46)m = 0.15 x (45)m	24.2804	21.3533	22.4219	19.1288	18.1366	15.9046	15.3966	16.2650	16.7244	19.1706	21.0165	23.9421
Water storage loss:												
Store volume												173.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.9200 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												1.0368 (55)
Total storage loss	32.1408	29.0304	32.1408	31.1040	32.1408	31.1040	32.1408	32.1408	31.1040	32.1408	31.1040	32.1408
If cylinder contains dedicated solar storage	32.1408	29.0304	32.1408	31.1040	32.1408	31.1040	32.1408	32.1408	31.1040	32.1408	31.1040	32.1408
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total heat required for water heating calculated for each month	194.0104	171.3856	181.6199	158.6294	153.0512	137.1344	134.7849	140.5742	142.6003	159.9448	171.2143	191.7549
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

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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	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	0.0000 (63d)
Output from w/h	194.0104	171.3856	181.6199	158.6294	153.0512	137.1344	134.7849	140.5742	142.6003	159.9448	171.2143	191.7549	(64)
	Total per year (kWh/year) = Sum(64)m =											1936.7042 (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	53.8216	47.3331	49.7018	42.4022	40.2027	35.2551	34.1292	36.0541	37.0725	42.4948	46.5867	53.0717	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	21.3514	18.9641	15.4227	11.6760	8.7279	7.3685	7.9619	10.3492	13.8906	17.6374	20.5854	21.9448	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	231.3698	233.7707	227.7206	214.8404	198.5816	183.3006	173.0920	170.6911	176.7412	189.6214	205.8802	221.1612	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	47.4499	47.4499	47.4499	47.4499	47.4499	47.4499	47.4499	47.4499	47.4499	47.4499	47.4499	47.4499	(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)	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	-71.1424	(71)
Water heating gains (Table 5)	72.3409	70.4362	66.8035	58.8919	54.0359	48.9654	45.8725	48.4598	51.4896	57.1167	64.7037	71.3329	(72)
Total internal gains	408.0833	406.1922	392.9679	368.4295	344.3666	322.6557	309.9475	312.5212	325.1427	347.3965	374.1905	397.4601	(73)

6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains						
	m2	Table 6a	Specific data	Specific data	factor	W						
		W/m2	or Table 6b	or Table 6c	Table 6d							
Northeast	2.5000	13.7667	0.6300	0.7000	0.7700	10.5182 (75)						
Southwest	3.5000	42.7351	0.6300	0.7000	0.7700	45.7114 (79)						
Solar gains	56.2295	83.8654	124.0270	171.6531	198.6385	217.8596	205.4500	180.9170	148.8741	105.5046	65.3165	44.2864 (83)
Total gains	464.3129	490.0576	516.9949	540.0825	543.0051	540.5153	515.3976	493.4382	474.0168	452.9011	439.5069	441.7464 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(85)
alpha	1.8430	1.8524	1.8524	1.8583	1.8554	1.8640	1.8640	1.8694	1.8719	1.8694	1.8694	1.8612	
util living area	0.9414	0.9334	0.9131	0.8791	0.8159	0.7024	0.5737	0.6051	0.7766	0.8812	0.9267	0.9460	(86)
MIT	16.9667	17.1856	17.8123	18.5842	19.4933	20.2696	20.6774	20.6272	19.9914	18.9461	17.8724	16.9402	(87)
Th 2	19.2053	19.2208	19.2208	19.2304	19.2257	19.2395	19.2395	19.2480	19.2520	19.2480	19.2480	19.2350	(88)
util rest of house	0.9296	0.9200	0.8937	0.8483	0.7563	0.5794	0.3570	0.4005	0.6837	0.8447	0.9092	0.9352	(89)
MIT 2	14.8606	15.1338	15.9088	16.8569	17.9418	18.7992	19.1501	19.1272	18.5333	17.3165	15.9979	14.8342	(90)
Living area fraction	15.8342	16.0823	16.7887	17.6554	18.6590	19.4789	19.8561	19.8206	19.2073	18.0698	16.8644	15.8077	(91)
Temperature adjustment	15.8342	16.0823	16.7887	17.6554	18.6590	19.4789	19.8561	19.8206	19.2073	18.0698	16.8644	15.8077	(92)
adjusted MIT	15.8342	16.0823	16.7887	17.6554	18.6590	19.4789	19.8561	19.8206	19.2073	18.0698	16.8644	15.8077	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8950	0.8836	0.8547	0.8099	0.7313	0.5998	0.4458	0.4797	0.6807	0.8099	0.8730	0.9022	(94)
Useful gains	415.5728	433.0215	441.8824	437.4006	397.1067	324.1959	229.7475	236.6914	322.6583	366.8109	383.7052	398.5479	(95)
Ext temp.	4.9000	5.3000	7.1000	9.4000	12.5000	15.4000	17.4000	17.2000	14.6000	11.1000	7.7000	4.8000	(96)
Heat loss rate W	1273.0965	1241.5250	1115.6114	943.9792	706.6854	463.3530	279.0094	295.8581	518.6170	786.8638	1034.6241	1254.5085	(97)
Space heating kWh	637.9976	543.3144	501.2544	364.7366	230.3265	0.0000	0.0000	0.0000	0.0000	312.5194	468.6617	636.8346	(98a)
Space heating requirement - total per year (kWh/year)												3695.6451	
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	637.9976	543.3144	501.2544	364.7366	230.3265	0.0000	0.0000	0.0000	0.0000	312.5194	468.6617	636.8346	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3695.6451	
Space heating per m2												(98c) / (4) =	69.7292 (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)	
Fraction of main heating from main system 2												0.0000 (203)	
Fraction of total heating from main system 1												1.0000 (204)	
Fraction of total heating from main system 2												0.0000 (205)	
Efficiency of main space heating system 1 (in %)												100.0000 (206)	
Efficiency of main space heating system 2 (in %)												0.0000 (207)	
Efficiency of secondary/supplementary heating system, %												0.0000 (208)	
Space heating requirement	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	

Full SAP Calculation Printout



Space heating efficiency (main heating system 1)	637.9976	543.3144	501.2544	364.7366	230.3265	0.0000	0.0000	0.0000	0.0000	312.5194	468.6617	636.8346	(98)
Space heating fuel (main heating system)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating efficiency (main heating system 2)	637.9976	543.3144	501.2544	364.7366	230.3265	0.0000	0.0000	0.0000	0.0000	312.5194	468.6617	636.8346	(211)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel used, main 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	(215)
Space heating fuel used, main 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)
Water heating													
Water heating requirement	194.0104	171.3856	181.6199	158.6294	153.0512	137.1344	134.7849	140.5742	142.6003	159.9448	171.2143	191.7549	(64)
Efficiency of water heater (217)m	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	302.9550	(216)
Fuel for water heating, kWh/month	64.0393	56.5713	59.9495	52.3607	50.5194	45.2656	44.4901	46.4010	47.0698	52.7949	56.5148	63.2948	(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	18.6888	14.9928	13.4994	9.8902	7.6395	6.2415	6.9690	9.0586	11.7662	15.4379	17.4370	19.2082	(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												3695.6451	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												302.9550	(216)
Water heating fuel used												639.2712	(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)												150.8290	(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												4485.7454	(238)

10a. Fuel costs - using BEDF prices (536)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	3695.6451	25.1600	929.8243	(240)
Space heating - main system 2	0.0000	25.1600	0.0000	(241)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	639.2712	25.1600	160.8406	(247)
Energy for instantaneous electric shower(s)	0.0000	25.1600	0.0000	(247a)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(249)
Energy for lighting	150.8290	25.1600	37.9486	(250)
Additional standing charges			0.0000	(251)
Total energy cost			1128.6135	(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	3695.6451	0.1535	567.2509	(261)
Space heating - main system 2	0.0000	0.0000	0.0000	(262)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	639.2712	0.1410	90.1588	(264)
Space and water heating			657.4097	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	150.8290	0.1443	21.7693	(268)
Total CO2, kg/year			679.1790	(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	3695.6451	1.5683	5795.7681	(275)
Space heating - main system 2	0.0000	0.0000	0.0000	(276)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	639.2712	1.5215	972.6501	(278)
Space and water heating			6768.4182	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	150.8290	1.5338	231.3466	(282)
Total Primary energy kWh/year			6999.7648	(286)

Part G Compliance Report

PROJECT DETAILS

Project Reference: CA5801G
Client:
Property: London Camera Exchange
8 Tunsgate
Guildford GU1 3QT

Local Authority: Guildford Borough Council
Agent: Accord Surveyors Ltd

Assessor: Joe Solti
Address: Therm Energy Ltd
Contact: 01903 884357
Software: G-Calc 2015 version 3.0.2
Prepared on: 13-Feb-24

RESULT SUMMARY

By following the Government's national calculation methodology for assessing water efficiency in new dwellings this 1 bed dwelling, as designed, achieves a water consumption of 109.7 litres per person per day.

Compliance with Building Regulation 36(1) has been demonstrated.

Table 1: The Water Calculator for New Dwellings

Installation Type	Unit of measure	Value	Use factor	Fixed use	litres/person/day
WC(single flush)	Flush volume (litres)		4.42	0.00	0
WC(dual flush)	Full flush vol.	6	1.46	0.00	8.76
	Part flush vol.	3	2.96	0.00	8.88
WC(multiple fittings)	Average effective Flush vol. (litres)		4.42	0.00	0
Taps(excl. Kitchen)	Flow rate (litres/min)	6	1.58	1.58	11.06
Bath (shower also present)	Capacity to overflow (litres)	0	0.11	0.00	0
Shower (bath also present)	Flow rate (litres/min)	0	4.37	0.00	0
Bath only	Capacity to overflow (litres)	0	0.50	0.00	0
Shower only	Flow rate (litres/minute)	9	5.6	0.00	50.4
Kitchen sink taps	Flow rate (litres/minute)	9	0.44	10.36	14.32
Washing Machine	litres/kg dry load	8.17	2.1	0.0	17.16
Dishwasher	litres/place setting	1.25	3.6	0.0	4.5
Waste disposal	litres/use	0	3.08	0.0	0
Water softener	litres/person/day	0	1.0	0.0	0
Total calculated use (litres/person/day)					115.08
Contribution from greywater (litres/person/day)					-
Contribution from rainwater (litres/person/day)					-
Normalisation factor					0.91
Total Water Consumption. Code for Sustainable Homes (litres/person/day)					104.7
External water use					5.0
Total Water Consumption. (36(1)) (litres/person/day)					109.7

Summary of fitting types "As Designed"			
Type	Description	Flow rates, volumes etc.	Qty
Taps	Taps	6 litres/min	1
Baths	Baths	litres to overflow	1
Dishwashers	Dishwasher	1.25 litres/place	1
Washing Machines	Washing Machine	8.17 litres/kg	1
Showers	Showers	9 litres/min	1
WC's	Toilets	6 / 3 litres flush vols.	1
Kitchen/Utility taps	Taps	9 litres/min	1

The lower section of this table is to be filled in by the builder prior to completion. The descriptions, values and quantities should represent the 'as built' specification. Please note the values above represent design values and should not be exceeded without prior consultation with the agent/designer (Accord Surveyos Ltd).
The completed table should be returned to the assessor: Joe Solti (Contact: 01903 884357).

Declaration of fitting types "As Built"			
Type	Make and Model	Flow rates, volumes etc.	Qty
Taps			
Baths			
Dishwashers			
Washing Machines			
Showers			
WC's			
Kitchen/Utility taps			

Project ref: CA5801G - London Camera Exchange

The above declaration of fittings, values and quantities is a true reflection of those installed on this project.

Name: Signature: Date:

-----End of Report-----