

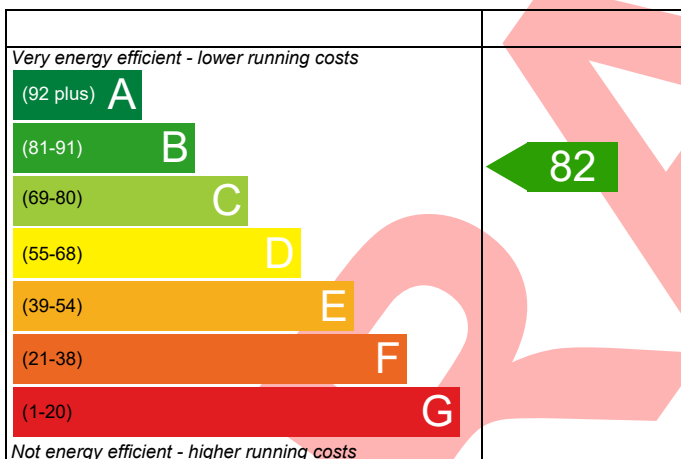
PREDICTED ENERGY ASSESSMENT

Dwelling type: House, Detached
Date of assessment: 09/11/2022
Produced by: S J Roberts Construction Limited
Total floor area: 118.6 m²

This document is a Predicted Energy Assessment for properties marketed when they are incomplete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, this rating will be updated and an official Energy Performance Certificate will be created for the property. This will include more detailed information about the energy performance of the completed property.

The energy performance has been assessed using the Government approved SAP2012 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO₂) emissions.

Energy Efficiency Rating

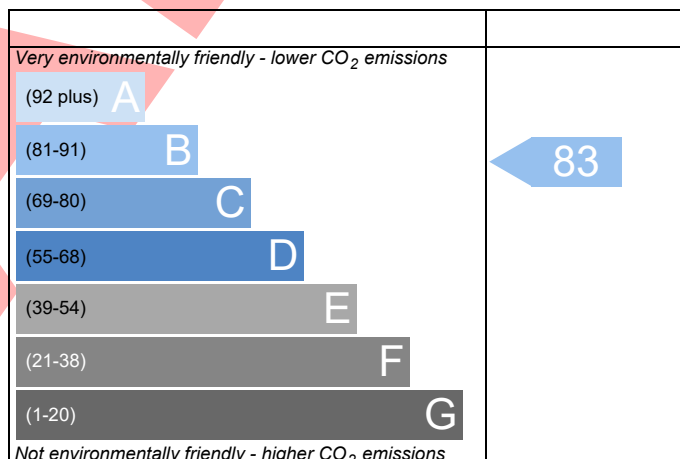


England

EU Directive
2002/91/EC

The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

Environmental Impact (CO₂) Rating



England

EU Directive
2002/91/EC

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO₂) emissions. The higher the rating the less impact it has on the environment.

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Designed)

Property Reference	HOUSE TYPE C4			Issued on Date	09/11/2022
Assessment Reference	GRANT ASHP	Prop Type Ref			
Property					
SAP Rating	82 B	DER	18.30	TER	26.98
Environmental	83 B	% DER<TER	32.17		
CO ₂ Emissions (t/year)	1.99	DFEE	55.95	TFEE	62.67
General Requirements Compliance	Pass	% DFEE<TFEE	10.72		
Assessor Details	Mr. Neil Jones, S J Roberts Construction Limited, Tel: 01743 891858, neil.jones@sjroberts.com			Assessor ID	K559-0001
Client					

SUMMARY FOR INPUT DATA FOR New Build (As Designed)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Electricity		
Fuel factor	1.55 (electricity)		
Target Carbon Dioxide Emission Rate (TER)	26.98	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	18.30	kgCO ₂ /m ²	Pass
	-8.68 (-32.2%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	62.67	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	55.95	kWh/m ² /yr	
	-6.8 (-10.8%)	kWh/m ² /yr	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.24 (max. 0.30)	0.28 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Floor	0.18 (max. 0.25)	0.23 (max. 0.70)	Pass
Roof	0.14 (max. 0.20)	0.14 (max. 0.35)	Pass
Openings	1.38 (max. 2.00)	1.40 (max. 3.30)	Pass

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	4.50 (design value)	m ³ /(h.m ²) @ 50 Pa	
Maximum	10.0	m ³ /(h.m ²) @ 50 Pa	Pass

Limiting System Efficiencies

4 Heating efficiency

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BUILDING REGULATION COMPLIANCE

Calculation Type: New Build (As Designed)

Main heating system

Heat pump with radiators or underfloor - Electric
Grant AERONA3 HPID10R32

Secondary heating system

None

5 Cylinder insulation

Hot water storage

Measured cylinder loss: 2.24 kWh/day
Permitted by DBSCG 2.86

Pass

Primary pipework insulated

Yes

Pass

6 Controls

Space heating controls

Time and temperature zone control

Pass

Hot water controls

Cylinderstat

Pass

Independent timer for DHW

Pass

7 Low energy lights

Percentage of fixed lights with low-energy fittings

100 %

Minimum

75 %

Pass

8 Mechanical ventilation

Continuous extract system (decentralised)

Specific fan power

0.1300 0.1600 0.1600

Maximum

0.7

Pass

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Midlands)

Not significant

Pass

Based on:

Overshading

Average

Windows facing North

2.26 m², No overhang

Windows facing East

9.11 m², No overhang

Windows facing South

0.72 m², No overhang

Windows facing West

7.33 m², No overhang

Air change rate

5.00 ach

Blinds/curtains

None

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type

U-value

W/m²K

Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals

4.50 (design value) m³/(h.m²) @ 50 Pa

Maximum

10.0 m³/(h.m²) @ 50 Pa

Pass

10 Key features

Party wall U-value

0.00

W/m²K

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	HOUSE TYPE C4				Issued on Date	09/11/2022
Assessment Reference	GRANT ASHP		Prop Type Ref			
Property						
SAP Rating	82 B	DER	18.30	TER	26.98	
Environmental	83 B	% DER<TER	32.17			
CO ₂ Emissions (t/year)	1.99	DFEE	55.95	TFEE	62.67	
General Requirements Compliance	Pass	% DFEE<TFEE	10.72			
Assessor Details	Mr. Neil Jones, S J Roberts Construction Limited, Tel: 01743 891858, neil.jones@sjroberts.com				Assessor ID	K559-0001
Client						

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Detached House, total floor area 119 m²

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

1a TER and DER

Fuel for main heating:Electricity

Fuel factor:1.55 (electricity)

Target Carbon Dioxide Emission Rate (TER) 26.98 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 18.30 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 62.7 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE) 55.9 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.24 (max. 0.30)	0.28 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.18 (max. 0.25)	0.23 (max. 0.70)	OK
Roof	0.14 (max. 0.20)	0.14 (max. 0.35)	OK
Openings	1.38 (max. 2.00)	1.40 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals:	4.50 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system: Heat pump with radiators or underfloor - Electric
Grant AERONA3 HPID10R32

Secondary heating system: None

5 Cylinder insulation

Hot water storage	Measured cylinder loss: 2.24 kWh/day	
Permitted by DBSCG 2.86	OK	
Primary pipework insulated:	Yes	OK

6 Controls

Space heating controls: Time and temperature zone control OK

Hot water controls: Cylinderstat OK
Independent timer for DHW OK

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%	
Minimum	75% OK

8 Mechanical ventilation

Continuous extract system (decentralised)	
Specific fan power:	0.1300 0.1600 0.1600
Maximum	0.7 OK

9 Summertime temperature

Overheating risk (Midlands): Not significant OK

Based on:

Overshading:	Average
Windows facing North:	2.26 m ² , No overhang
Windows facing East:	9.11 m ² , No overhang
Windows facing South:	0.72 m ² , No overhang
Windows facing West:	7.33 m ² , No overhang
Air change rate:	5.00 ach
Blinds/curtains:	None

10 Key features

Party wall U-value 0.00 W/m²K

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.8000 (1b)	x 2.3900 (2b)	= 121.4120 (1b) - (3b)
First floor	67.8000 (1c)	x 2.7100 (2c)	= 183.7380 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	118.6000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 305.1500 (5)

2. Ventilation rate

					main heating	secondary heating	other		total	m3 per hour		
Number of chimneys					0	+	0	+	0	=	0 * 40 =	0.0000 (6a)
Number of open flues					0	+	0	+	0	=	0 * 20 =	0.0000 (6b)
Number of intermittent fans											0 * 10 =	0.0000 (7a)
Number of passive vents											0 * 10 =	0.0000 (7b)
Number of flueless gas fires											0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =											0.0000 / (5) =	0.0000 (8)
Pressure test											Yes	(8)
Measured/design AP50											4.5000	
Infiltration rate											0.2250	(18)
Number of sides sheltered											0	(19)
Shelter factor											(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor											(21) = (18) x (20) =	0.2250 (21)
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
	0.2869	0.2813	0.2756	0.2475	0.2419	0.2138	0.2138	0.2081	0.2250	0.2419	0.2531	0.2644 (22b)
Mechanical extract ventilation - decentralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5369	0.5313	0.5256	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5031	0.5144 (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
upvc window (Uw = 1.40)			15.6200	1.3258	20.7083		(27)
FRENCH DOOR (Uw = 1.40)			3.8000	1.3258	5.0379		(27)
external door			2.1600	1.2000	2.5920		(26)
REAR DOOR			1.9100	1.4000	2.6740		(26a)
Heat Loss Floor 1			42.3000	0.1600	6.7680		(28a)
OVER GARAGE			17.0000	0.2300	3.9100		(28b)
BRICK TF	161.0000	23.4900	137.5100	0.2300	31.6273		(29a)
GARAGE	20.3200		20.3200	0.2800	5.6896		(29a)
CEILING	67.8000		67.8000	0.1400	9.4920		(30)
Total net area of external elements Aum(A, m ²)			308.4200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	88.4991		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							100.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							15.7408 (36)
Total fabric heat loss						(33) + (36) =	104.2399 (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	54.0630	53.4966	52.9302	50.3498	50.3498	50.3498	50.3498	50.3498	50.3498	50.3498	50.6644	51.7973 (38)
Heat transfer coeff	158.3030	157.7365	157.1701	154.5897	154.5897	154.5897	154.5897	154.5897	154.5897	154.5897	154.9044	156.0372 (39)
Average = Sum(39)m / 12 =												155.5232 (39)
HLP	1.3348	1.3300	1.3252	1.3035	1.3035	1.3035	1.3035	1.3035	1.3035	1.3035	1.3061	1.3157 (40)
HLP (average)												1.3113 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.8577 (42)
Average daily hot water use (litres/day)												102.0713 (43)
Daily hot water use	Jan 112.2784	Feb 108.1956	Mar 104.1127	Apr 100.0299	May 95.9470	Jun 91.8642	Jul 91.8642	Aug 95.9470	Sep 100.0299	Oct 104.1127	Nov 108.1956	Dec 112.2784 (44)
Energy conte	166.5057	145.6269	150.2739	131.0125	125.7096	108.4778	100.5206	115.3489	116.7265	136.0335	148.4912	161.2519 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Energy content (annual)												Total = Sum(45)m = 1605.9791 (45)
Distribution loss (46)m = 0.15 x (45)m												
	24.9759	21.8440	22.5411	19.6519	18.8564	16.2717	15.0781	17.3023	17.5090	20.4050	22.2737	24.1878 (46)
Water storage loss:												
Store volume												300.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												2.2400 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												1.2096 (55)
Total storage loss	37.4976	33.8688	37.4976	36.2880	37.4976	36.2880	37.4976	37.4976	36.2880	37.4976	36.2880	37.4976 (56)
If cylinder contains dedicated solar storage	37.4976	33.8688	37.4976	36.2880	37.4976	36.2880	37.4976	37.4976	36.2880	37.4976	36.2880	37.4976 (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)
Total heat required for water heating calculated for each month	227.2657	200.5069	211.0339	189.8125	186.4696	167.2778	161.2806	176.1089	175.5265	196.7935	207.2912	222.0119 (62)
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 (63)
Solar input (sum of months) = Sum(63)m =												0.0000 (63)
Output from w/h	227.2657	200.5069	211.0339	189.8125	186.4696	167.2778	161.2806	176.1089	175.5265	196.7935	207.2912	222.0119 (64)
Heat gains from water heating, kWh/month	103.9711	92.3250	98.5741	90.6016	90.4064	83.1089	82.0311	86.9615	85.8516	93.8391	96.4133	102.2242 (65)
Total per year (kWh/year) = Sum(64)m =												2321.3791 (64)

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

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	142.8870	142.8870	142.8870	142.8870	142.8870	142.8870	142.8870	142.8870	142.8870	142.8870	142.8870	142.8870 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	26.2386	23.3049	18.9528	14.3485	10.7257	9.0550	9.7843	12.7180	17.0701	21.6744	25.2972	26.9678 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	283.3792	286.3198	278.9096	263.1342	243.2206	224.5046	212.0011	209.0605	216.4707	232.2462	252.1598	270.8758 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.2887	37.2887	37.2887	37.2887	37.2887	37.2887	37.2887	37.2887	37.2887	37.2887	37.2887	37.2887 (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)	-114.3096	-114.3096	-114.3096	-114.3096	-114.3096	-114.3096	-114.3096	-114.3096	-114.3096	-114.3096	-114.3096	-114.3096 (71)
Water heating gains (Table 5)	139.7462	137.3883	132.4921	125.8356	121.5140	115.4290	110.2569	116.8837	119.2383	126.1279	133.9074	137.3982 (72)
Total internal gains	515.2300	512.8791	496.2206	469.1844	441.3264	414.8547	397.9084	404.5284	418.6452	445.9145	477.2305	501.1079 (73)

6. Solar gains

[Jan]					Area	Solar flux	g	FF			Access	Gains
					m2	Table 6a	Specific data	Specific data			factor	W
						W/m2	or Table 6b	or Table 6c			Table 6d	
North					2.2600	10.6334	0.7200	0.7000			0.7700	8.3935 (74)
East					5.3100	19.6403	0.7200	0.7000			0.7700	36.4255 (76)
South					0.7200	46.7521	0.7200	0.7000			0.7700	11.7570 (78)
West					7.3300	19.6403	0.7200	0.7000			0.7700	50.2823 (80)
East					3.8000	19.6403	0.7200	0.7000			0.7700	26.0672 (76)
Solar gains	132.9255	255.9073	415.1003	601.3776	737.2464	755.6949	718.9854	616.7765	480.9450	301.6369	164.9077	109.8971 (83)
Total gains	648.1556	768.7864	911.3209	1070.5620	1178.5728	1170.5496	1116.8938	1021.3049	899.5902	747.5514	642.1382	611.0050 (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	20.8110	20.8857	20.9610	21.3109	21.3109	21.3109	21.3109	21.3109	21.3109	21.3109	21.2676	21.1132
alpha	2.3874	2.3924	2.3974	2.4207	2.4207	2.4207	2.4207	2.4207	2.4207	2.4207	2.4178	2.4075
util living area	0.9735	0.9593	0.9302	0.8699	0.7742	0.6462	0.5212	0.5723	0.7652	0.9096	0.9617	0.9768 (86)
Tweekday	18.3738	18.4846	18.6772	18.9414	19.1443	19.2776	19.3302	19.3216	19.2188	18.9522	18.6380	18.3782
Tweekend	20.3221	20.3701	20.4551	20.5685	20.6642	20.7317	20.7629	20.7563	20.6981	20.5711	20.4307	20.3183
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	0	0	0	0	0	0	0	0	0	0	0	0
16 / 9	0	0	0	0	0	0	0	0	0	0	0	0
MIT	19.9538	20.0257	20.1590	20.3262	20.4817	20.5879	20.6341	20.6239	20.5286	20.3381	20.1110	19.9479 (87)
Th 2	19.8137	19.8174	19.8211	19.8381	19.8381	19.8381	19.8381	19.8381	19.8381	19.8381	19.8361	19.8286 (88)
util rest of house	0.9691	0.9526	0.9183	0.8465	0.7304	0.5698	0.4103	0.4629	0.7027	0.8884	0.9543	0.9730 (89)
Tweekday	18.3738	18.4846	18.6772	18.9414	19.1443	19.2776	19.3302	19.3216	19.2188	18.9522	18.6380	18.3782
Tweekend	18.3738	18.4846	18.6772	18.9414	19.1443	19.2776	19.3302	19.3216	19.2188	18.9522	18.6380	18.3782
MIT 2	18.3738	18.4846	18.6772	18.9414	19.1443	19.2776	19.3302	19.3216	19.2188	18.9522	18.6380	18.3782 (90)
Living area fraction												fLA = Living area / (4) = 0.1518 (91)
MIT	18.6136	18.7185	18.9021	19.1516	19.3473	19.4765	19.5281	19.5192	19.4176	19.1625	18.8616	18.6165 (92)
Temperature adjustment												0.0000
adjusted MIT	18.6136	18.7185	18.9021	19.1516	19.3473	19.4765	19.5281	19.5192	19.4176	19.1625	18.8616	18.6165 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9635	0.9449	0.9069	0.8300	0.7087	0.5425	0.3769	0.4283	0.6751	0.8728	0.9465	0.9680 (94)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Useful gains	624.4986	726.4226	826.5049	888.6036	835.3104	634.9701	420.9716	437.3844	607.3526	652.4860	607.7559	591.4716 (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	2265.8887	2179.6781	1949.2356	1584.7863	1182.1881	753.8489	452.6518	482.2020	822.0495	1323.6798	1821.9183	2249.5061 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	1221.1942	976.5877	835.3116	501.2515	258.0770	0.0000	0.0000	0.0000	0.0000	499.3682	874.1969	1233.5777 (98)
Space heating												6399.5649 (98)
Space heating per m2											(98) / (4) =	53.9592 (99)

8c. Space cooling requirement

Not applicable

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 %)												263.7728 (206)
Efficiency of secondary/supplementary heating system, %												100.0000 (208)
Space heating requirement												2426.1653 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	1221.1942	976.5877	835.3116	501.2515	258.0770	0.0000	0.0000	0.0000	0.0000	499.3682	874.1969	1233.5777 (98)
Space heating efficiency (main heating system 1)	263.7728	263.7728	263.7728	263.7728	263.7728	0.0000	0.0000	0.0000	0.0000	263.7728	263.7728	263.7728 (210)
Space heating fuel (main heating system)	462.9719	370.2382	316.6784	190.0315	97.8406	0.0000	0.0000	0.0000	0.0000	189.3175	331.4204	467.6667 (211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating requirement	227.2657	200.5069	211.0339	189.8125	186.4696	167.2778	161.2806	176.1089	175.5265	196.7935	207.2912	222.0119 (64)
Efficiency of water heater	189.4800	189.4800	189.4800	189.4800	189.4800	189.4800	189.4800	189.4800	189.4800	189.4800	189.4800	189.4800 (216)
(217)m	119.9418	105.8196	111.3753	100.1755	98.4112	88.2826	85.1175	92.9433	92.6359	103.8598	109.4001	117.1690 (219)
Fuel for water heating, kWh/month												1225.1314 (219)
Water heating fuel used												
Annual totals kWh/year												
Space heating fuel - main system												2426.1653 (211)
Space heating fuel - secondary												0.0000 (215)
Electricity for pumps and fans:												
(MEV)Decentralised, Database: total watage = 8.2155, total flow = 45.0000, SFP = 0.1826)												
mechanical ventilation fans (SFP = 0.1826)												67.9665 (230a)
Total electricity for the above, kWh/year												67.9665 (231)
Electricity for lighting (calculated in Appendix L)												463.3812 (232)
Total delivered energy for all uses												4182.6444 (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	2426.1653	0.5190	1259.1798 (261)
Space heating - secondary	0.0000	0.5190	0.0000 (263)
Water heating (other fuel)	1225.1314	0.5190	635.8432 (264)
Space and water heating			1895.0230 (265)
Pumps and fans	67.9665	0.5190	35.2746 (267)
Energy for lighting	463.3812	0.5190	240.4948 (268)
Total CO2, kg/year			2170.7924 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			18.3000 (273)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER		18.3000 ZC1
Total Floor Area	TFA	118.6000
Assumed number of occupants	N	2.8577
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		14.1589 ZC2
CO2 emissions from cooking, equation (L16)		1.5817 ZC3
Total CO2 emissions		34.0406 ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year		0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation		0.0000 ZC7
Net CO2 emissions		34.0406 ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.8000 (1b)	x 2.3900 (2b)	= 121.4120 (1b) - (3b)
First floor	67.8000 (1c)	x 2.7100 (2c)	= 183.7380 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	118.6000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 305.1500 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					4 * 10 = 40.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					40.0000 / (5) = 0.1311 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3811 (18)
Number of sides sheltered					0 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3811 (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	0.4859	0.4764	0.4668	0.4192	0.4097	0.3620	0.3620	0.3525	0.3811	0.4097	0.4287	0.4478 (22b)
Effective ac	0.6180	0.6135	0.6090	0.5879	0.5839	0.5655	0.5655	0.5621	0.5726	0.5839	0.5919	0.6003 (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 Opaque door			2.1600	1.0000	2.1600		(26)
TER Semi-glazed door			1.9100	1.2000	2.2920		(26a)
TER Opening Type (Uw = 1.40)			19.4200	1.3258	25.7462		(27)
Heat Loss Floor 1			42.3000	0.1300	5.4990		(28a)
OVER GARAGE			17.0000	0.1300	2.2100		(28b)
BRICK TF	161.0000	23.4900	137.5100	0.1800	24.7518		(29a)
GARAGE	20.3200		20.3200	0.1800	3.6576		(29a)
CEILING	67.8000		67.8000	0.1300	8.8140		(30)
Total net area of external elements Aum(A, m ²)			308.4200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	75.1306		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							13.3619 (36)
Total fabric heat loss						(33) + (36) =	88.4925 (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	62.2363	61.7748	61.3223	59.1973	58.7997	56.9488	56.9488	56.6061	57.6618	58.7997	59.6040	60.4449 (38)
Heat transfer coeff	150.7288	150.2673	149.8148	147.6898	147.2922	145.4413	145.4413	145.0986	146.1543	147.2922	148.0965	148.9374 (39)
Average = Sum(39)m / 12 =												147.6879 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2709	1.2670	1.2632	1.2453	1.2419	1.2263	1.2263	1.2234	1.2323	1.2419	1.2487	1.2558 (40)
HLP (average)												1.2453 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.8577 (42)
Average daily hot water use (litres/day)												102.0713 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	112.2784	108.1956	104.1127	100.0299	95.9470	91.8642	91.8642	95.9470	100.0299	104.1127	108.1956	112.2784 (44)
Energy conte	166.5057	145.6269	150.2739	131.0125	125.7096	108.4778	100.5206	115.3489	116.7265	136.0335	148.4912	161.2519 (45)
Energy content (annual)												Total = Sum(45)m = 1605.9791 (45)
Distribution loss (46)m = 0.15 x (45)m												
	24.9759	21.8440	22.5411	19.6519	18.8564	16.2717	15.0781	17.3023	17.5090	20.4050	22.2737	24.1878 (46)
Water storage loss:												

Total storage volume														300.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):														2.1127	(48)
Temperature factor from Table 2b														0.5400	(49)
Enter (49) or (54) in (55)														1.1409	(55)
Total storage loss															
35.3664	31.9439	35.3664	34.2256	35.3664	34.2256	35.3664	35.3664	34.2256	35.3664	34.2256	35.3664	34.2256	35.3664	(56)	
If cylinder contains dedicated solar storage															
35.3664	31.9439	35.3664	34.2256	35.3664	34.2256	35.3664	35.3664	34.2256	35.3664	34.2256	35.3664	34.2256	35.3664	(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	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month															
225.1345	198.5820	208.9028	187.7500	184.3384	165.2154	159.1494	173.9777	173.4641	194.6623	205.2288	219.8807	(62)			
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)			
									Solar input (sum of months) = Sum(63)m =				0.0000	(64)	
Output from w/h															
225.1345	198.5820	208.9028	187.7500	184.3384	165.2154	159.1494	173.9777	173.4641	194.6623	205.2288	219.8807	(63)			
									Total per year (kWh/year) = Sum(64)m =				2296.2860	(64)	
Heat gains from water heating, kWh/month															
102.2662	90.7850	96.8691	88.9517	88.7015	81.4589	80.3262	85.2566	84.2016	92.1342	94.7634	100.5193	(65)			

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9973	0.9942	0.9844	0.9504	0.8594	0.6774	0.4808	0.5446	0.8290	0.9717	0.9945	0.9979 (94)
Useful gains	630.5328	733.2384	846.7417	946.7335	934.2390	729.4754	494.1074	514.6055	696.4858	690.4351	618.8345	596.7306 (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	2089.6832	2025.8992	1838.9960	1537.6467	1186.2155	785.7685	502.6880	529.7434	845.6685	1282.3291	1710.6894	2076.8881 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	1085.6079	868.6681	738.2372	425.4575	187.4705	0.0000	0.0000	0.0000	0.0000	440.3691	786.1356	1101.2372 (98)
Space heating												5633.1831 (98)
Space heating per m2										(98) / (4) =		47.4973 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

8c. Space cooling requirement

Not applicable

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 %)												93.5000 (206)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement												6024.7948 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	1085.6079	868.6681	738.2372	425.4575	187.4705	0.0000	0.0000	0.0000	0.0000	440.3691	786.1356	1101.2372 (98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000 (210)
Space heating fuel (main heating system)	1161.0780	929.0568	789.5585	455.0348	200.5032	0.0000	0.0000	0.0000	0.0000	470.9830	840.7867	1177.7938 (211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating requirement	225.1345	198.5820	208.9028	187.7500	184.3384	165.2154	159.1494	173.9777	173.4641	194.6623	205.2288	219.8807 (64)
Efficiency of water heater (217)m	88.4627	88.2971	87.9004	86.9311	84.8588	79.8000	79.8000	79.8000	79.8000	86.9271	88.0558	79.8000 (216)
Fuel for water heating, kWh/month	254.4967	224.9021	237.6584	215.9756	217.2296	207.0368	199.4354	218.0172	217.3735	223.9375	233.0668	248.3841 (219)
Water heating fuel used												2697.5138 (219)
Annual totals kWh/year												
Space heating fuel - main system												6024.7948 (211)
Space heating fuel - secondary												0.0000 (215)
Electricity for pumps and fans:												
central heating pump												30.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												75.0000 (231)
Electricity for lighting (calculated in Appendix L)												463.3812 (232)
Total delivered energy for all uses												9260.6897 (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	6024.7948	0.2160	1301.3557 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2697.5138	0.2160	582.6630 (264)
Space and water heating			1884.0186 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	463.3812	0.5190	240.4948 (268)
Total CO2, kg/m2/year			2163.4385 (272)
Emissions per m2 for space and water heating			15.8855 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.0278 (272b)
Emissions per m2 for pumps and fans			0.3282 (272c)
Target Carbon Dioxide Emission Rate (TER) = (15.8855 * 1.55) + 2.0278 + 0.3282, rounded to 2 d.p.			26.9800 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.8000 (1b)	x 2.3900 (2b)	= 121.4120 (1b) - (3b)
First floor	67.8000 (1c)	x 2.7100 (2c)	= 183.7380 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	118.6000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	305.1500 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					4 * 10 = 40.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				40.0000 / (5) =	0.1311 (8)
Pressure test					Yes
Measured/design AP50					4.5000
Infiltration rate					0.3561 (18)
Number of sides sheltered					0 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		1.0000 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3561 (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	0.4540	0.4451	0.4362	0.3917	0.3828	0.3383	0.3383	0.3294	0.3561	0.3828	0.4006	0.4184 (22b)
Effective ac	0.6031	0.5991	0.5951	0.5767	0.5733	0.5572	0.5572	0.5542	0.5634	0.5733	0.5802	0.5875 (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
upvc window (Uw = 1.40)			15.6200	1.3258	20.7083		(27)
FRENCH DOOR (Uw = 1.40)			3.8000	1.3258	5.0379		(27)
external door			2.1600	1.2000	2.5920		(26)
REAR DOOR			1.9100	1.4000	2.6740		(26a)
Heat Loss Floor 1			42.3000	0.1600	6.7680		(28a)
OVER GARAGE			17.0000	0.2300	3.9100		(28b)
BRICK TF	161.0000	23.4900	137.5100	0.2300	31.6273		(29a)
GARAGE	20.3200		20.3200	0.2800	5.6896		(29a)
CEILING	67.8000		67.8000	0.1400	9.4920		(30)
Total net area of external elements Aum(A, m ²)			308.4200				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		88.4991		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							100.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							15.7408 (36)
Total fabric heat loss						(33) + (36) =	104.2399 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	60.7279	60.3249	59.9299	58.0745	57.7274	56.1114	56.1114	55.8121	56.7339	57.7274	58.4296	59.1638 (38)
Heat transfer coeff	164.9678	164.5648	164.1698	162.3144	161.9673	160.3513	160.3513	160.0521	160.9738	161.9673	162.6696	163.4037 (39)
Average = Sum(39)m / 12 =												162.3128 (39)
HLP	1.3910	1.3876	1.3842	1.3686	1.3657	1.3520	1.3520	1.3495	1.3573	1.3657	1.3716	1.3778 (40)
HLP (average)												1.3686 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.8577 (42)
Average daily hot water use (litres/day)												102.0713 (43)
Daily hot water use	112.2784	108.1956	104.1127	100.0299	95.9470	91.8642	91.8642	95.9470	100.0299	104.1127	108.1956	112.2784 (44)
Energy conte	166.5057	145.6269	150.2739	131.0125	125.7096	108.4778	100.5206	115.3489	116.7265	136.0335	148.4912	161.2519 (45)
Energy content (annual)										Total = Sum(45)m =		1605.9791 (45)
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)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

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	(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	(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	(59)
Heat gains from water heating, kWh/month	35.3825	30.9457	31.9332	27.8401	26.7133	23.0515	21.3606	24.5116	24.8044	28.9071	31.5544	34.2660 (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	142.8870	142.8870	142.8870	142.8870	142.8870	142.8870	142.8870	142.8870	142.8870	142.8870	142.8870	142.8870	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	26.2386	23.3049	18.9528	14.3485	10.7257	9.0550	9.7843	12.7180	17.0701	21.6744	25.2972	26.9678	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	283.3792	286.3198	278.9096	263.1342	243.2206	224.5046	212.0011	209.0605	216.4707	232.2462	252.1598	270.8758	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.2887	37.2887	37.2887	37.2887	37.2887	37.2887	37.2887	37.2887	37.2887	37.2887	37.2887	37.2887	(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)	-114.3096	-114.3096	-114.3096	-114.3096	-114.3096	-114.3096	-114.3096	-114.3096	-114.3096	-114.3096	-114.3096	-114.3096	(71)
Water heating gains (Table 5)	47.5571	46.0502	42.9210	38.6669	35.9050	32.0160	28.7105	32.9458	34.4505	38.8537	43.8255	46.0565	(72)
Total internal gains	423.0410	421.5410	406.6495	382.0157	355.7173	331.4417	316.3621	320.5904	333.8574	358.6403	387.1486	409.7662	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d			Gains W
North					2.2600	10.6334	0.7200	0.7000			0.7700			8.3935 (74)
East					5.3100	19.6403	0.7200	0.7000			0.7700			36.4255 (76)
South					0.7200	46.7521	0.7200	0.7000			0.7700			11.7570 (78)
West					7.3300	19.6403	0.7200	0.7000			0.7700			50.2823 (80)
East					3.8000	19.6403	0.7200	0.7000			0.7700			26.0672 (76)
Solar gains	132.9255	255.9073	415.1003	601.3776	737.2464	755.6949	718.9854	616.7765	480.9450	301.6369	164.9077	109.8971	(83)	
Total gains	555.9665	677.4482	821.7498	983.3933	1092.9637	1087.1366	1035.3474	937.3669	814.8024	660.2772	552.0564	519.6633	(84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (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	19.9702	20.0191	20.0673	20.2967	20.3402	20.5452	20.5452	20.5836	20.4657	20.3402	20.2524	20.1614	
alpha	2.3313	2.3346	2.3378	2.3531	2.3560	2.3697	2.3697	2.3722	2.3644	2.3560	2.3502	2.3441	
util living area	0.9808	0.9688	0.9439	0.8913	0.8045	0.6827	0.5609	0.6149	0.8022	0.9300	0.9723	0.9836	(86)
MIT	17.9279	18.2259	18.7640	19.4771	20.1211	20.6001	20.8242	20.7747	20.3576	19.4997	18.5876	17.8808	(87)
Th 2	19.7703	19.7729	19.7754	19.7875	19.7898	19.8003	19.8003	19.8023	19.7962	19.7898	19.7852	19.7804	(88)
util rest of house	0.9775	0.9634	0.9337	0.8701	0.7627	0.6057	0.4434	0.5010	0.7430	0.9123	0.9666	0.9807	(89)
MIT 2	16.9776	17.2747	17.8079	18.5111	19.1216	19.5534	19.7241	19.6967	19.3584	18.5478	17.6449	16.9374	(90)
Living area fraction	17.1218	17.4191	17.9530	18.6577	19.2733	19.7123	19.8910	19.8603	19.5101	18.6923	17.7880	17.0806	(91)
Temperature adjustment	17.1218	17.4191	17.9530	18.6577	19.2733	19.7123	19.8910	19.8603	19.5101	18.6923	17.7880	17.0806	(92)
adjusted MIT	17.1218	17.4191	17.9530	18.6577	19.2733	19.7123	19.8910	19.8603	19.5101	18.6923	17.7880	17.0806	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	537.5664	642.7113	750.4412	831.1299	810.2895	651.4806	469.2960	475.5176	591.3687	587.8847	526.0798	504.7815	(94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	2115.1889	2060.2036	1880.2417	1583.8153	1226.6296	819.7589	527.7240	553.8305	870.8785	1310.6821	1738.6077	2104.7344	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000	(98)
Space heating kWh	1173.7512	952.5548	840.5715	541.9335	309.7570	0.0000	0.0000	0.0000	0.0000	537.7612	873.0201	1190.3650	(98)
Space heating												6419.7143	(98)
Space heating per m ²												54.1291	(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	1507.3025	1186.5998	1216.3957	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.6730	0.7402	0.7016	0.0000	0.0000	0.0000	0.0000	(101)

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Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1014.4076	878.3674	853.3714	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1385.1738	1322.1223	1209.8380	0.0000	0.0000	0.0000	0.0000 (103)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000 (103a)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	266.9516	330.1537	265.2111	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												862.3165 (104)
Cooled fraction									FC = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	66.7379	82.5384	66.3028	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												215.5791 (107)
Space cooling per m2												1.8177 (108)
Energy for space heating												54.1291 (99)
Energy for space cooling												1.8177 (108)
Total												55.9468 (109)
Dwelling Fabric Energy Efficiency (DFEE)												55.9 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.8000 (1b)	x 2.3900 (2b)	= 121.4120 (1b) - (3b)
First floor	67.8000 (1c)	x 2.7100 (2c)	= 183.7380 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	118.6000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 305.1500 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					4 * 10 = 40.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c)					40.0000 / (5) = 0.1311 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3811 (18)
Number of sides sheltered					0 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3811 (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	0.4859	0.4764	0.4668	0.4192	0.4097	0.3620	0.3620	0.3525	0.3811	0.4097	0.4287	0.4478 (22b)
Effective ac	0.6180	0.6135	0.6090	0.5879	0.5839	0.5655	0.5655	0.5621	0.5726	0.5839	0.5919	0.6003 (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 Opaque door			2.1600	1.0000	2.1600		(26)
TER Semi-glazed door			1.9100	1.2000	2.2920		(26a)
TER Opening Type (Uw = 1.40)			19.4200	1.3258	25.7462		(27)
Heat Loss Floor 1			42.3000	0.1300	5.4990		(28a)
OVER GARAGE			17.0000	0.1300	2.2100		(28b)
BRICK TF	161.0000	23.4900	137.5100	0.1800	24.7518		(29a)
GARAGE	20.3200		20.3200	0.1800	3.6576		(29a)
CEILING	67.8000		67.8000	0.1300	8.8140		(30)
Total net area of external elements Aum(A, m ²)			308.4200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	75.1306		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							13.3619 (36)
Total fabric heat loss						(33) + (36) =	88.4925 (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	62.2363	61.7748	61.3223	59.1973	58.7997	56.9488	56.9488	56.6061	57.6618	58.7997	59.6040	60.4449 (38)
Heat transfer coeff	150.7288	150.2673	149.8148	147.6898	147.2922	145.4413	145.4413	145.0986	146.1543	147.2922	148.0965	148.9374 (39)
Average = Sum(39)m / 12 =												147.6879 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2709	1.2670	1.2632	1.2453	1.2419	1.2263	1.2263	1.2234	1.2323	1.2419	1.2487	1.2558 (40)
HLP (average)												1.2453 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.8577 (42)
Average daily hot water use (litres/day)												102.0713 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	112.2784	108.1956	104.1127	100.0299	95.9470	91.8642	91.8642	95.9470	100.0299	104.1127	108.1956	112.2784 (44)
Energy conte	166.5057	145.6269	150.2739	131.0125	125.7096	108.4778	100.5206	115.3489	116.7265	136.0335	148.4912	161.2519 (45)
Energy content (annual)												Total = Sum(45)m = 1605.9791 (45)
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:												

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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)
Heat gains from water heating, kWh/month	35.3825	30.9457	31.9332	27.8401	26.7133	23.0515	21.3606	24.5116	24.8044	28.9071	31.5544	34.2660	(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	142.8870	142.8870	142.8870	142.8870	142.8870	142.8870	142.8870	142.8870	142.8870	142.8870	142.8870	142.8870	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	26.2386	23.3049	18.9528	14.3485	10.7257	9.0550	9.7843	12.7180	17.0701	21.6744	25.2972	26.9678	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	283.3792	286.3198	278.9096	263.1342	243.2206	224.5046	212.0011	209.0605	216.4707	232.2462	252.1598	270.8758	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.2887	37.2887	37.2887	37.2887	37.2887	37.2887	37.2887	37.2887	37.2887	37.2887	37.2887	37.2887	(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)	-114.3096	-114.3096	-114.3096	-114.3096	-114.3096	-114.3096	-114.3096	-114.3096	-114.3096	-114.3096	-114.3096	-114.3096	(71)
Water heating gains (Table 5)	47.5571	46.0502	42.9210	38.6669	35.9050	32.0160	28.7105	32.9458	34.4505	38.8537	43.8255	46.0565	(72)
Total internal gains	423.0410	421.5410	406.6495	382.0157	355.7173	331.4417	316.3621	320.5904	333.8574	358.6403	387.1486	409.7662	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
North	2.2600	10.6334	0.6300	0.7000	0.7700	7.3443	(74)
East	9.1100	19.6403	0.6300	0.7000	0.7700	54.6811	(76)
South	0.7200	46.7521	0.6300	0.7000	0.7700	10.2874	(78)
West	7.3300	19.6403	0.6300	0.7000	0.7700	43.9970	(80)

Solar gains	116.3099	223.9189	363.2128	526.2054	645.0906	661.2330	629.1122	539.6795	420.8268	263.9323	144.2943	96.1599	(83)
Total gains	539.3508	645.4598	769.8623	908.2211	1000.8079	992.6748	945.4742	860.2698	754.6843	622.5726	531.4429	505.9261	(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	54.6419	54.8097	54.9753	55.7663	55.9168	56.6284	56.6284	56.7622	56.3522	55.9168	55.6131	55.2991		
alpha	4.6428	4.6540	4.6650	4.7178	4.7278	4.7752	4.7752	4.7841	4.7568	4.7278	4.7075	4.6866		
util living area	0.9994	0.9984	0.9949	0.9794	0.9268	0.7992	0.6389	0.7088	0.9219	0.9915	0.9987	0.9996	(86)	
MIT	19.4673	19.6239	19.9088	20.3014	20.6555	20.8926	20.9720	20.9549	20.7560	20.2877	19.8116	19.4490	(87)	
Th 2	19.8637	19.8668	19.8698	19.8839	19.8866	19.8990	19.8990	19.9013	19.8942	19.8866	19.8812	19.8756	(88)	
util rest of house	0.9992	0.9979	0.9929	0.9704	0.8926	0.7089	0.4975	0.5701	0.8703	0.9867	0.9982	0.9994	(89)	
MIT 2	18.4636	18.6224	18.9088	19.3073	19.6432	19.8467	19.8916	19.8876	19.7459	19.2997	18.8215	18.4546	(90)	
Living area fraction									fLA = Living area / (4) =			0.1518	(91)	
MIT	18.6159	18.7744	19.0605	19.4582	19.7969	20.0054	20.0556	20.0496	19.8992	19.4497	18.9717	18.6055	(92)	
Temperature adjustment												0.0000		
adjusted MIT	18.6159	18.7744	19.0605	19.4582	19.7969	20.0054	20.0556	20.0496	19.8992	19.4497	18.9717	18.6055	(93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9988	0.9970	0.9908	0.9658	0.8892	0.7189	0.5191	0.5908	0.8706	0.9839	0.9975	0.9991	(94)
Ext temp.	538.7029	643.5557	762.7838	877.2010	889.9370	713.6045	490.7614	508.2825	656.9910	612.5425	530.1138	505.4827	(95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Month fracti	2157.8264	2084.8652	1881.7544	1559.3320	1192.6069	786.1728	502.5861	529.5456	847.5818	1303.4852	1758.1612	2145.5222	(97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating per m2	1204.6278	968.5600	832.5142	491.1343	225.1865	0.0000	0.0000	0.0000	0.0000	514.0613	884.1941	1220.1894	(98)
												6340.4676	(98)
												53.4609	(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	1367.1487	1076.2660	1102.7493	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7967	0.8735	0.8334	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1089.2191	940.1077	918.9979	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1274.7638	1217.0758	1119.7245	0.0000	0.0000	0.0000	0.0000	(103)

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Month fraction	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000 (103a)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	133.5922	206.0643	149.3406	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												488.9971 (104)
Cooled fraction									fC = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	33.3981	51.5161	37.3351	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												122.2493 (107)
Space cooling per m2												1.0308 (108)
Energy for space heating												53.4609 (99)
Energy for space cooling												1.0308 (108)
Total												54.4917 (109)
Target Fabric Energy Efficiency (TFEE)												62.7 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF HEAT DEMAND 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF HEAT DEMAND 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.8000 (1b)	x 2.3900 (2b)	= 121.4120 (1b) - (3b)
First floor	67.8000 (1c)	x 2.7100 (2c)	= 183.7380 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	118.6000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 305.1500 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c)					0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					4.5000
Infiltration rate					0.2250 (18)
Number of sides sheltered					0 (19)
Shelter factor			(20) = 1 - [0.075 x (19)]	=	1.0000 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20)	=	0.2250 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.5000	4.5000	4.4000	3.9000	3.8000	3.4000	3.3000	3.3000	3.5000	3.8000	3.9000	4.1000 (22)
Wind factor	1.1250	1.1250	1.1000	0.9750	0.9500	0.8500	0.8250	0.8250	0.8750	0.9500	0.9750	1.0250 (22a)
Adj infilt rate	0.2531	0.2531	0.2475	0.2194	0.2138	0.1913	0.1856	0.1856	0.1969	0.2138	0.2194	0.2306 (22b)
Mechanical extract ventilation - decentralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5031	0.5031	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (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
upvc window (Uw = 1.40)			15.6200	1.3258	20.7083		(27)
FRENCH DOOR (Uw = 1.40)			3.8000	1.3258	5.0379		(27)
external door			2.1600	1.2000	2.5920		(26)
REAR DOOR			1.9100	1.4000	2.6740		(26a)
Heat Loss Floor 1			42.3000	0.1600	6.7680		(28a)
OVER GARAGE			17.0000	0.2300	3.9100		(28b)
BRICK TF	161.0000	23.4900	137.5100	0.2300	31.6273		(29a)
GARAGE	20.3200		20.3200	0.2800	5.6896		(29a)
CEILING	67.8000		67.8000	0.1400	9.4920		(30)
Total net area of external elements Aum(A, m ²)			308.4200				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		88.4991		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							100.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							15.7408 (36)
Total fabric heat loss						(33) + (36) =	104.2399 (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	50.6644	50.6644	50.3498	50.3498	50.3498	50.3498	50.3498	50.3498	50.3498	50.3498	50.3498	50.3498 (38)
Heat transfer coeff	154.9044	154.9044	154.5897	154.5897	154.5897	154.5897	154.5897	154.5897	154.5897	154.5897	154.5897	154.5897 (39)
Average = Sum(39)m / 12 =												154.6421 (39)
HLP	1.3061	1.3061	1.3035	1.3035	1.3035	1.3035	1.3035	1.3035	1.3035	1.3035	1.3035	1.3035 (40)
HLP (average)												1.3039 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.8577 (42)
Average daily hot water use (litres/day)												102.0713 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	112.2784	108.1956	104.1127	100.0299	95.9470	91.8642	91.8642	95.9470	100.0299	104.1127	108.1956	112.2784 (44)
	166.5057	145.6269	150.2739	131.0125	125.7096	108.4778	100.5206	115.3489	116.7265	136.0335	148.4912	161.2519 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF HEAT DEMAND 09 Jan 2014

Energy content (annual)												Total = Sum(45)m =	1605.9791 (45)
Distribution loss (46)m = 0.15 x (45)m													
	24.9759	21.8440	22.5411	19.6519	18.8564	16.2717	15.0781	17.3023	17.5090	20.4050	22.2737	24.1878	(46)
Water storage loss:													
Store volume												300.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												2.2400	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												1.2096	(55)
Total storage loss													
	37.4976	33.8688	37.4976	36.2880	37.4976	36.2880	37.4976	37.4976	36.2880	37.4976	36.2880	37.4976	(56)
If cylinder contains dedicated solar storage													
	37.4976	33.8688	37.4976	36.2880	37.4976	36.2880	37.4976	37.4976	36.2880	37.4976	36.2880	37.4976	(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)
Total heat required for water heating calculated for each month													
	227.2657	200.5069	211.0339	189.8125	186.4696	167.2778	161.2806	176.1089	175.5265	196.7935	207.2912	222.0119	(62)
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	(63)
												Solar input (sum of months) = Sum(63)m =	0.0000 (63)
Output from w/h													
	227.2657	200.5069	211.0339	189.8125	186.4696	167.2778	161.2806	176.1089	175.5265	196.7935	207.2912	222.0119	(64)
												Total per year (kWh/year) = Sum(64)m =	2321.3791 (64)
RHI water heating demand												2321	(64)
Heat gains from water heating, kWh/month													
	103.9711	92.3250	98.5741	90.6016	90.4064	83.1089	82.0311	86.9615	85.8516	93.8391	96.4133	102.2242	(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	171.4643	171.4643	171.4643	171.4643	171.4643	171.4643	171.4643	171.4643	171.4643	171.4643	171.4643	171.4643	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	65.5964	58.2621	47.3820	35.8712	26.8141	22.6376	24.4607	31.7950	42.6752	54.1860	63.2430	67.4195	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	422.9541	427.3430	416.2830	392.7376	363.0158	335.0815	316.4196	312.0307	323.0907	346.6361	376.3579	404.2922	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	55.0042	55.0042	55.0042	55.0042	55.0042	55.0042	55.0042	55.0042	55.0042	55.0042	55.0042	55.0042	(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)													
	-114.3096	-114.3096	-114.3096	-114.3096	-114.3096	-114.3096	-114.3096	-114.3096	-114.3096	-114.3096	-114.3096	-114.3096	(71)
Water heating gains (Table 5)													
	139.7462	137.3883	132.4921	125.8356	121.5140	115.4290	110.2569	116.8837	119.2383	126.1279	133.9074	137.3982	(72)
Total internal gains	740.4556	735.1525	708.3160	666.6034	623.5029	585.3070	563.2962	572.8684	597.1631	639.1089	685.6673	721.2689	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d			Gains W
North					2.2600	11.3201	0.7200	0.7000			0.7700			8.9356 (74)
East					5.3100	21.0039	0.7200	0.7000			0.7700			38.9546 (76)
South					0.7200	49.0238	0.7200	0.7000			0.7700			12.3283 (78)
West					7.3300	21.0039	0.7200	0.7000			0.7700			53.7735 (80)
East					3.8000	21.0039	0.7200	0.7000			0.7700			27.8771 (76)
Solar gains	141.8692	277.3305	450.9981	666.2505	769.0290	851.3569	781.0936	684.5168	540.4434	335.6252	198.1419	129.6335	(83)	
Total gains	882.3248	1012.4830	1159.3142	1332.8539	1392.5319	1436.6639	1344.3898	1257.3851	1137.6064	974.7340	883.8092	850.9024	(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	21.2676	21.2676	21.3109	21.3109	21.3109	21.3109	21.3109	21.3109	21.3109	21.3109	21.3109	21.3109	
alpha	2.4178	2.4178	2.4207	2.4207	2.4207	2.4207	2.4207	2.4207	2.4207	2.4207	2.4207	2.4207	
util living area	0.9498	0.9304	0.8893	0.8133	0.7151	0.5559	0.4527	0.4853	0.6898	0.8591	0.9280	0.9539	(86)
Tweekday	18.5254	18.6183	18.8101	19.0217	19.1876	19.3040	19.3368	19.3330	19.2504	19.0201	18.7447	18.5081	
Tweekend	20.3814	20.4233	20.5093	20.6073	20.6870	20.7487	20.7690	20.7658	20.7168	20.6039	20.4785	20.3728	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	0	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	0	0	0	0	0	0	0	0	0	0	0	0	
MIT	20.0453	20.1079	20.2427	20.3869	20.5169	20.6139	20.6436	20.6386	20.5578	20.3888	20.1856	20.0321	(87)
Th 2	19.8361	19.8361	19.8381	19.8381	19.8381	19.8381	19.8381	19.8381	19.8381	19.8381	19.8381	19.8381	(88)
util rest of house	0.9421	0.9199	0.8722	0.7835	0.6664	0.4778	0.3502	0.3810	0.6222	0.8302	0.9153	0.9468	(89)
Tweekday	18.5254	18.6183	18.8101	19.0217	19.1876	19.3040	19.3368	19.3330	19.2504	19.0201	18.7447	18.5081	
Tweekend	18.5254	18.6183	18.8101	19.0217	19.1876	19.3040	19.3368	19.3330	19.2504	19.0201	18.7447	18.5081	
MIT 2	18.5254	18.6183	18.8101	19.0217	19.1876	19.3040	19.3368	19.3330	19.2504	19.0201	18.7447	18.5081	(90)
Living area fraction												fLA = Living area / (4) =	0.1518 (91)
MIT	18.7561	18.8444	19.0275	19.2289	19.3893	19.5028	19.5351	19.5311	19.4488	19.2278	18.9634	18.7394	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7561	18.8444	19.0275	19.2289	19.3893	19.5028	19.5351	19.5311	19.4488	19.2278	18.9634	18.7394	(93)

8. Space heating requirement

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF HEAT DEMAND 09 Jan 2014

Utilisation	0.9335	0.9092	0.8580	0.7654	0.6449	0.4528	0.3210	0.3505	0.5959	0.8118	0.9036	0.9386 (94)
Useful gains	823.6442	920.5879	994.7098	1020.1153	898.1123	650.5144	431.5134	440.6778	677.8643	791.2409	798.5723	798.6583 (95)
Ext temp.	4.3000	4.8000	6.6000	9.0000	11.8000	14.8000	16.6000	16.5000	14.0000	10.5000	7.1000	4.2000 (96)
Heat loss rate W	2239.3061	2175.5371	1921.1669	1581.2875	1173.2296	727.0010	453.7351	468.5813	842.3308	1349.2296	1833.9551	2247.6463 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	1053.2525	843.3259	689.2841	404.0440	204.6873	0.0000	0.0000	0.0000	0.0000	415.1436	745.4756	1078.0471 (98)
Space heating												5433.2599 (98)
RHI space heating demand												5433 (98)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF ENERGY RATINGS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.8000 (1b)	x 2.3900 (2b)	= 121.4120 (1b) - (3b)
First floor	67.8000 (1c)	x 2.7100 (2c)	= 183.7380 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	118.6000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 305.1500 (5)

2. Ventilation rate

					main heating	secondary heating	other		total	m3 per hour		
Number of chimneys					0	+	0	+	0	=	0 * 40 =	0.0000 (6a)
Number of open flues					0	+	0	+	0	=	0 * 20 =	0.0000 (6b)
Number of intermittent fans											0 * 10 =	0.0000 (7a)
Number of passive vents											0 * 10 =	0.0000 (7b)
Number of flueless gas fires											0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =											0.0000 / (5) =	0.0000 (8)
Pressure test											Yes	(8)
Measured/design AP50											4.5000	
Infiltration rate											0.2250	(18)
Number of sides sheltered											0	(19)
Shelter factor											(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor											(21) = (18) x (20) =	0.2250 (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												
	0.2869	0.2813	0.2756	0.2475	0.2419	0.2138	0.2138	0.2081	0.2250	0.2419	0.2531	0.2644 (22b)
Mechanical extract ventilation - decentralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5369	0.5313	0.5256	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5031	0.5144 (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
upvc window (Uw = 1.40)			15.6200	1.3258	20.7083		(27)
FRENCH DOOR (Uw = 1.40)			3.8000	1.3258	5.0379		(27)
external door			2.1600	1.2000	2.5920		(26)
REAR DOOR			1.9100	1.4000	2.6740		(26a)
Heat Loss Floor 1			42.3000	0.1600	6.7680		(28a)
OVER GARAGE			17.0000	0.2300	3.9100		(28b)
BRICK TF	161.0000	23.4900	137.5100	0.2300	31.6273		(29a)
GARAGE	20.3200		20.3200	0.2800	5.6896		(29a)
CEILING	67.8000		67.8000	0.1400	9.4920		(30)
Total net area of external elements Aum(A, m ²)			308.4200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	88.4991		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							100.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							15.7408 (36)
Total fabric heat loss						(33) + (36) =	104.2399 (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	54.0630	53.4966	52.9302	50.3498	50.3498	50.3498	50.3498	50.3498	50.3498	50.3498	50.6644	51.7973 (38)
Heat transfer coeff	158.3030	157.7365	157.1701	154.5897	154.5897	154.5897	154.5897	154.5897	154.5897	154.5897	154.9044	156.0372 (39)
Average = Sum(39)m / 12 =												155.5232 (39)
HLP	1.3348	1.3300	1.3252	1.3035	1.3035	1.3035	1.3035	1.3035	1.3035	1.3035	1.3061	1.3157 (40)
HLP (average)												1.3113 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.8577 (42)
Average daily hot water use (litres/day)												102.0713 (43)
Daily hot water use	Jan 112.2784	Feb 108.1956	Mar 104.1127	Apr 100.0299	May 95.9470	Jun 91.8642	Jul 91.8642	Aug 95.9470	Sep 100.0299	Oct 104.1127	Nov 108.1956	Dec 112.2784 (44)
Energy conte	166.5057	145.6269	150.2739	131.0125	125.7096	108.4778	100.5206	115.3489	116.7265	136.0335	148.4912	161.2519 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Energy content (annual)												Total = Sum(45)m =	1605.9791 (45)
Distribution loss (46)m = 0.15 x (45)m													
	24.9759	21.8440	22.5411	19.6519	18.8564	16.2717	15.0781	17.3023	17.5090	20.4050	22.2737	24.1878	(46)
Water storage loss:													
Store volume												300.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												2.2400	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												1.2096	(55)
Total storage loss													
	37.4976	33.8688	37.4976	36.2880	37.4976	36.2880	37.4976	37.4976	36.2880	37.4976	36.2880	37.4976	(56)
If cylinder contains dedicated solar storage													
	37.4976	33.8688	37.4976	36.2880	37.4976	36.2880	37.4976	37.4976	36.2880	37.4976	36.2880	37.4976	(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)
Total heat required for water heating calculated for each month													
	227.2657	200.5069	211.0339	189.8125	186.4696	167.2778	161.2806	176.1089	175.5265	196.7935	207.2912	222.0119	(62)
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	(63)
Solar input (sum of months) = Sum(63)m =												0.0000	(63)
Output from w/h													
	227.2657	200.5069	211.0339	189.8125	186.4696	167.2778	161.2806	176.1089	175.5265	196.7935	207.2912	222.0119	(64)
Total per year (kWh/year) = Sum(64)m =												2321.3791	(64)
Heat gains from water heating, kWh/month													
	103.9711	92.3250	98.5741	90.6016	90.4064	83.1089	82.0311	86.9615	85.8516	93.8391	96.4133	102.2242	(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	171.4643	171.4643	171.4643	171.4643	171.4643	171.4643	171.4643	171.4643	171.4643	171.4643	171.4643	171.4643	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	65.5964	58.2621	47.3820	35.8712	26.8141	22.6376	24.4607	31.7950	42.6752	54.1860	63.2430	67.4195	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	422.9541	427.3430	416.2830	392.7376	363.0158	335.0815	316.4196	312.0307	323.0907	346.6361	376.3579	404.2922	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	55.0042	55.0042	55.0042	55.0042	55.0042	55.0042	55.0042	55.0042	55.0042	55.0042	55.0042	55.0042	(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)													
	-114.3096	-114.3096	-114.3096	-114.3096	-114.3096	-114.3096	-114.3096	-114.3096	-114.3096	-114.3096	-114.3096	-114.3096	(71)
Water heating gains (Table 5)													
	139.7462	137.3883	132.4921	125.8356	121.5140	115.4290	110.2569	116.8837	119.2383	126.1279	133.9074	137.3982	(72)
Total internal gains													
	740.4556	735.1525	708.3160	666.6034	623.5029	585.3070	563.2962	572.8684	597.1631	639.1089	685.6673	721.2689	(73)

6. Solar gains

[Jan]													
	Area	Solar flux		g		FF		Access		Gains			
	m2	Table 6a		or Table 6b		Specific data		or Table 6c		factor			
		W/m2								Table 6d			
North	2.2600	10.6334		0.7200		0.7000		0.7700		8.3935		(74)	
East	5.3100	19.6403		0.7200		0.7000		0.7700		36.4255		(76)	
South	0.7200	46.7521		0.7200		0.7000		0.7700		11.7570		(78)	
West	7.3300	19.6403		0.7200		0.7000		0.7700		50.2823		(80)	
East	3.8000	19.6403		0.7200		0.7000		0.7700		26.0672		(76)	
Solar gains	132.9255	255.9073	415.1003	601.3776	737.2464	755.6949	718.9854	616.7765	480.9450	301.6369	164.9077	109.8971	(83)
Total gains	873.3811	991.0597	1123.4164	1267.9810	1360.7493	1341.0019	1282.2815	1189.6449	1078.1081	940.7457	850.5750	831.1660	(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	20.8110	20.8857	20.9610	21.3109	21.3109	21.3109	21.3109	21.3109	21.3109	21.3109	21.2676	21.1132	
alpha	2.3874	2.3924	2.3974	2.4207	2.4207	2.4207	2.4207	2.4207	2.4207	2.4207	2.4178	2.4075	
util living area	0.9513	0.9331	0.8977	0.8291	0.7269	0.5945	0.4699	0.5142	0.7039	0.8651	0.9332	0.9561	(86)
Tweekday	18.4755	18.5792	18.7570	18.9987	19.1777	19.2921	19.3353	19.3290	19.2469	19.0166	18.7273	18.4797	
Tweekend	20.3679	20.4130	20.4920	20.5962	20.6819	20.7412	20.7676	20.7626	20.7144	20.6021	20.4714	20.3639	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	0	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	0	0	0	0	0	0	0	0	0	0	0	0	
MIT	20.0244	20.0921	20.2159	20.3695	20.5090	20.6024	20.6414	20.6336	20.5541	20.3858	20.1745	20.0182	(87)
Th 2	19.8137	19.8174	19.8211	19.8381	19.8381	19.8381	19.8381	19.8381	19.8381	19.8381	19.8361	19.8286	(88)
util rest of house	0.9437	0.9228	0.8815	0.8011	0.6794	0.5180	0.3649	0.4092	0.6360	0.8366	0.9212	0.9493	(89)
Tweekday	18.4755	18.5792	18.7570	18.9987	19.1777	19.2921	19.3353	19.3290	19.2469	19.0166	18.7273	18.4797	
Tweekend	18.4755	18.5792	18.7570	18.9987	19.1777	19.2921	19.3353	19.3290	19.2469	19.0166	18.7273	18.4797	
MIT 2	18.4755	18.5792	18.7570	18.9987	19.1777	19.2921	19.3353	19.3290	19.2469	19.0166	18.7273	18.4797	(90)
Living area fraction													
MIT	18.7106	18.8088	18.9784	19.2068	19.3797	19.4909	19.5335	19.5270	19.4453	19.2244	18.9470	18.7132	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7106	18.8088	18.9784	19.2068	19.3797	19.4909	19.5335	19.5270	19.4453	19.2244	18.9470	18.7132	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9351	0.9122	0.8678	0.7833	0.6580	0.4923	0.3347	0.3778	0.6091	0.8183	0.9099	0.9414	(94)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Useful gains	816.7232	904.0080	974.8528	993.2604	895.4001	660.2046	429.1175	449.3964	656.6480	769.8183	773.9484	782.4614 (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												
Month fracti	2281.2355	2193.9210	1961.2339	1593.3220	1187.2055	756.0891	453.4875	483.3968	826.3258	1333.2411	1835.1494	2264.6027 (97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
1089.5972	866.8215	733.8675	432.0443	217.1032	0.0000	0.0000	0.0000	0.0000	0.0000	419.1866	764.0647	1102.7131 (98)
Space heating												5625.3983 (98)
Space heating per m2											(98) / (4) =	47.4317 (99)

8c. Space cooling requirement

Not applicable

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 %)												263.7728 (206)
Efficiency of secondary/supplementary heating system, %												100.0000 (208)
Space heating requirement												2132.6678 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	1089.5972	866.8215	733.8675	432.0443	217.1032	0.0000	0.0000	0.0000	0.0000	419.1866	764.0647	1102.7131 (98)
Space heating efficiency (main heating system 1)	263.7728	263.7728	263.7728	263.7728	263.7728	0.0000	0.0000	0.0000	0.0000	263.7728	263.7728	263.7728 (210)
Space heating fuel (main heating system)	413.0817	328.6243	278.2195	163.7941	82.3069	0.0000	0.0000	0.0000	0.0000	158.9195	289.6677	418.0541 (211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating requirement	227.2657	200.5069	211.0339	189.8125	186.4696	167.2778	161.2806	176.1089	175.5265	196.7935	207.2912	222.0119 (64)
Efficiency of water heater	189.4800	189.4800	189.4800	189.4800	189.4800	189.4800	189.4800	189.4800	189.4800	189.4800	189.4800	189.4800 (216)
(217)m	189.4800	189.4800	189.4800	189.4800	189.4800	189.4800	189.4800	189.4800	189.4800	189.4800	189.4800	189.4800 (217)
Fuel for water heating, kWh/month	119.9418	105.8196	111.3753	100.1755	98.4112	88.2826	85.1175	92.9433	92.6359	103.8598	109.4001	117.1690 (219)
Water heating fuel used												1225.1314 (219)
Annual totals kWh/year												
Space heating fuel - main system												2132.6678 (211)
Space heating fuel - secondary												0.0000 (215)
Electricity for pumps and fans:												
(MEV)Decentralised, Database: total watage = 8.2155, total flow = 45.0000, SFP = 0.1826)												
mechanical ventilation fans (SFP = 0.1826)												67.9665 (230a)
Total electricity for the above, kWh/year												67.9665 (231)
Electricity for lighting (calculated in Appendix L)												463.3812 (232)
Total delivered energy for all uses												3889.1469 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2132.6678	13.1900	281.2989 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1225.1314	13.1900	161.5948 (247)
Mechanical ventilation fans	67.9665	13.1900	8.9648 (249)
Pumps and fans for heating	0.0000	0.0000	0.0000 (249)
Energy for lighting	463.3812	13.1900	61.1200 (250)
Additional standing charges			0.0000 (251)
Total energy cost			512.9785 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200 (256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	1.3169 (257)
SAP value		81.6287
SAP rating (Section 12)		82 (258)
SAP band		B

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2132.6678	0.5190	1106.8546 (261)
Space heating - secondary	0.0000	0.5190	0.0000 (263)
Water heating (other fuel)	1225.1314	0.5190	635.8432 (264)
Space and water heating			1742.6978 (265)
Pumps and fans	67.9665	0.5190	35.2746 (267)
Energy for lighting	463.3812	0.5190	240.4948 (268)
Total kg/year			2018.4672 (272)
CO2 emissions per m2			17.0200 (273)
EI value			83.4673
EI rating			83 (274)
EI band			B

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

Calculation of stars for heating and DHW	

Main heating energy efficiency	$13.19 \times (1 + 0.29 \times 0.75) / 2.6377 = 6.088$, stars = 3
Main heating environmental impact	$0.519 \times (1 + 0.29 \times 0.75) / 2.6377 = 0.2396$, stars = 4
Water heating energy efficiency	$13.19 / 1.8948 = 6.961$, stars = 3
Water heating environmental impact	$0.519 / 1.8948 = 0.2739$, stars = 4

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.8000 (1b)	x 2.3900 (2b)	= 121.4120 (1b) - (3b)
First floor	67.8000 (1c)	x 2.7100 (2c)	= 183.7380 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	118.6000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 305.1500 (5)

2. Ventilation rate

						main heating	secondary heating	other		total	m3 per hour			
Number of chimneys						0	+	0	+	0	=	0 * 40 =	0.0000 (6a)	
Number of open flues						0	+	0	+	0	=	0 * 20 =	0.0000 (6b)	
Number of intermittent fans												0 * 10 =	0.0000 (7a)	
Number of passive vents												0 * 10 =	0.0000 (7b)	
Number of flueless gas fires												0 * 40 =	0.0000 (7c)	
Infiltration due to chimneys, flues and fans											= (6a)+(6b)+(7a)+(7b)+(7c) =		0.0000 / (5) =	0.0000 (8)
Pressure test													Yes	
Measured/design AP50													4.5000	
Infiltration rate													0.2250	(18)
Number of sides sheltered													0	(19)
Shelter factor											(20) = 1 - [0.075 x (19)] =		1.0000	(20)
Infiltration rate adjusted to include shelter factor											(21) = (18) x (20) =		0.2250	(21)
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Wind factor	4.5000	4.5000	4.4000	3.9000	3.8000	3.4000	3.3000	3.3000	3.5000	3.8000	3.9000	4.1000	(22)	
Adj infilt rate	1.1250	1.1250	1.1000	0.9750	0.9500	0.8500	0.8250	0.8250	0.8750	0.9500	0.9750	1.0250	(22a)	
	0.2531	0.2531	0.2475	0.2194	0.2138	0.1913	0.1856	0.1856	0.1969	0.2138	0.2194	0.2306	(22b)	
Mechanical extract ventilation - decentralised														
If mechanical ventilation:													0.5000	(23a)
Effective ac	0.5031	0.5031	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	(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
upvc window (Uw = 1.40)			15.6200	1.3258	20.7083		(27)
FRENCH DOOR (Uw = 1.40)			3.8000	1.3258	5.0379		(27)
external door			2.1600	1.2000	2.5920		(26)
REAR DOOR			1.9100	1.4000	2.6740		(26a)
Heat Loss Floor 1			42.3000	0.1600	6.7680		(28a)
OVER GARAGE			17.0000	0.2300	3.9100		(28b)
BRICK TF	161.0000	23.4900	137.5100	0.2300	31.6273		(29a)
GARAGE	20.3200		20.3200	0.2800	5.6896		(29a)
CEILING	67.8000		67.8000	0.1400	9.4920		(30)
Total net area of external elements Aum(A, m ²)			308.4200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	88.4991		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							100.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							15.7408 (36)
Total fabric heat loss						(33) + (36) =	104.2399 (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	50.6644	50.6644	50.3498	50.3498	50.3498	50.3498	50.3498	50.3498	50.3498	50.3498	50.3498	50.3498 (38)
Heat transfer coeff	154.9044	154.9044	154.5897	154.5897	154.5897	154.5897	154.5897	154.5897	154.5897	154.5897	154.5897	154.5897 (39)
Average = Sum(39)m / 12 =												154.6421 (39)
HLP	1.3061	1.3061	1.3035	1.3035	1.3035	1.3035	1.3035	1.3035	1.3035	1.3035	1.3035	1.3035 (40)
HLP (average)												1.3039 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.8577 (42)
Average daily hot water use (litres/day)												102.0713 (43)
Daily hot water use	Jan 112.2784	Feb 108.1956	Mar 104.1127	Apr 100.0299	May 95.9470	Jun 91.8642	Jul 91.8642	Aug 95.9470	Sep 100.0299	Oct 104.1127	Nov 108.1956	Dec 112.2784 (44)
Energy conte	166.5057	145.6269	150.2739	131.0125	125.7096	108.4778	100.5206	115.3489	116.7265	136.0335	148.4912	161.2519 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 09 Jan 2014

Energy content (annual)												Total = Sum(45)m =	1605.9791 (45)
Distribution loss (46)m = 0.15 x (45)m													
	24.9759	21.8440	22.5411	19.6519	18.8564	16.2717	15.0781	17.3023	17.5090	20.4050	22.2737	24.1878 (46)	
Water storage loss:													
Store volume												300.0000 (47)	
a) If manufacturer declared loss factor is known (kWh/day):												2.2400 (48)	
Temperature factor from Table 2b												0.5400 (49)	
Enter (49) or (54) in (55)												1.2096 (55)	
Total storage loss	37.4976	33.8688	37.4976	36.2880	37.4976	36.2880	37.4976	37.4976	36.2880	37.4976	36.2880	37.4976 (56)	
If cylinder contains dedicated solar storage	37.4976	33.8688	37.4976	36.2880	37.4976	36.2880	37.4976	37.4976	36.2880	37.4976	36.2880	37.4976 (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)	
Total heat required for water heating calculated for each month	227.2657	200.5069	211.0339	189.8125	186.4696	167.2778	161.2806	176.1089	175.5265	196.7935	207.2912	222.0119 (62)	
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 (63)	
	Solar input (sum of months) = Sum(63)m =											0.0000 (63)	
Output from w/h	227.2657	200.5069	211.0339	189.8125	186.4696	167.2778	161.2806	176.1089	175.5265	196.7935	207.2912	222.0119 (64)	
	Total per year (kWh/year) = Sum(64)m =											2321.3791 (64)	
Heat gains from water heating, kWh/month	103.9711	92.3250	98.5741	90.6016	90.4064	83.1089	82.0311	86.9615	85.8516	93.8391	96.4133	102.2242 (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	171.4643	171.4643	171.4643	171.4643	171.4643	171.4643	171.4643	171.4643	171.4643	171.4643	171.4643	171.4643	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	65.5964	58.2621	47.3820	35.8712	26.8141	22.6376	24.4607	31.7950	42.6752	54.1860	63.2430	67.4195	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	422.9541	427.3430	416.2830	392.7376	363.0158	335.0815	316.4196	312.0307	323.0907	346.6361	376.3579	404.2922	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.0042	55.0042	55.0042	55.0042	55.0042	55.0042	55.0042	55.0042	55.0042	55.0042	55.0042	55.0042	(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)	-114.3096	-114.3096	-114.3096	-114.3096	-114.3096	-114.3096	-114.3096	-114.3096	-114.3096	-114.3096	-114.3096	-114.3096	(71)
Water heating gains (Table 5)	139.7462	137.3883	132.4921	125.8356	121.5140	115.4290	110.2569	116.8837	119.2383	126.1279	133.9074	137.3982	(72)
Total internal gains	740.4556	735.1525	708.3160	666.6034	623.5029	585.3070	563.2962	572.8684	597.1631	639.1089	685.6673	721.2689	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
North					2.2600	11.3201	0.7200	0.7000	0.7700	8.9356 (74)			
East					5.3100	21.0039	0.7200	0.7000	0.7700	38.9546 (76)			
South					0.7200	49.0238	0.7200	0.7000	0.7700	12.3283 (78)			
West					7.3300	21.0039	0.7200	0.7000	0.7700	53.7735 (80)			
East					3.8000	21.0039	0.7200	0.7000	0.7700	27.8771 (76)			
Solar gains	141.8692	277.3305	450.9981	666.2505	769.0290	851.3569	781.0936	684.5168	540.4434	335.6252	198.1419	129.6335	(83)
Total gains	882.3248	1012.4830	1159.3142	1332.8539	1392.5319	1436.6639	1344.3898	1257.3851	1137.6064	974.7340	883.8092	850.9024	(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	21.2676	21.2676	21.3109	21.3109	21.3109	21.3109	21.3109	21.3109	21.3109	21.3109	21.3109	21.3109	
alpha	2.4178	2.4178	2.4207	2.4207	2.4207	2.4207	2.4207	2.4207	2.4207	2.4207	2.4207	2.4207	
util living area	0.9498	0.9304	0.8893	0.8133	0.7151	0.5559	0.4527	0.4853	0.6898	0.8591	0.9280	0.9539	(86)
Tweekday	18.5254	18.6183	18.8101	19.0217	19.1876	19.3040	19.3368	19.3330	19.2504	19.0201	18.7447	18.5081	
Tweekend	20.3814	20.4233	20.5093	20.6073	20.6870	20.7487	20.7690	20.7658	20.7168	20.6039	20.4785	20.3728	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	0	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	0	0	0	0	0	0	0	0	0	0	0	0	
MIT	20.0453	20.1079	20.2427	20.3869	20.5169	20.6139	20.6436	20.6386	20.5578	20.3888	20.1856	20.0321	(87)
Th 2	19.8361	19.8361	19.8381	19.8381	19.8381	19.8381	19.8381	19.8381	19.8381	19.8381	19.8381	19.8381	(88)
util rest of house	0.9421	0.9199	0.8722	0.7835	0.6664	0.4778	0.3502	0.3810	0.6222	0.8302	0.9153	0.9468	(89)
Tweekday	18.5254	18.6183	18.8101	19.0217	19.1876	19.3040	19.3368	19.3330	19.2504	19.0201	18.7447	18.5081	
Tweekend	18.5254	18.6183	18.8101	19.0217	19.1876	19.3040	19.3368	19.3330	19.2504	19.0201	18.7447	18.5081	
MIT 2	18.5254	18.6183	18.8101	19.0217	19.1876	19.3040	19.3368	19.3330	19.2504	19.0201	18.7447	18.5081	(90)
Living area fraction												fLA = Living area / (4) =	0.1518 (91)
MIT	18.7561	18.8444	19.0275	19.2289	19.3893	19.5028	19.5351	19.5311	19.4488	19.2278	18.9634	18.7394	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7561	18.8444	19.0275	19.2289	19.3893	19.5028	19.5351	19.5311	19.4488	19.2278	18.9634	18.7394	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9335	0.9092	0.8580	0.7654	0.6449	0.4528	0.3210	0.3505	0.5959	0.8118	0.9036	0.9386	(94)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 09 Jan 2014

Useful gains	823.6442	920.5879	994.7098	1020.1153	898.1123	650.5144	431.5134	440.6778	677.8643	791.2409	798.5723	798.6583 (95)
Ext temp.	4.3000	4.8000	6.6000	9.0000	11.8000	14.8000	16.6000	16.5000	14.0000	10.5000	7.1000	4.2000 (96)
Heat loss rate W	2239.3061	2175.5371	1921.1669	1581.2875	1173.2296	727.0010	453.7351	468.5813	842.3308	1349.2296	1833.9551	2247.6463 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	1053.2525	843.3259	689.2841	404.0440	204.6873	0.0000	0.0000	0.0000	0.0000	415.1436	745.4756	1078.0471 (98)
Space heating												5433.2599 (98)
Space heating per m2											(98) / (4) =	45.8116 (99)

8c. Space cooling requirement

Not applicable

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 %)												262.6501 (206)
Efficiency of secondary/supplementary heating system, %												100.0000 (208)
Space heating requirement												2068.6308 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	1053.2525	843.3259	689.2841	404.0440	204.6873	0.0000	0.0000	0.0000	0.0000	415.1436	745.4756	1078.0471 (98)
Space heating efficiency (main heating system 1)	262.6501	262.6501	262.6501	262.6501	262.6501	0.0000	0.0000	0.0000	0.0000	262.6501	262.6501	262.6501 (210)
Space heating fuel (main heating system)	401.0098	321.0835	262.4344	153.8336	77.9316	0.0000	0.0000	0.0000	0.0000	158.0596	283.8285	410.4500 (211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating requirement	227.2657	200.5069	211.0339	189.8125	186.4696	167.2778	161.2806	176.1089	175.5265	196.7935	207.2912	222.0119 (64)
Efficiency of water heater	189.4800	189.4800	189.4800	189.4800	189.4800	189.4800	189.4800	189.4800	189.4800	189.4800	189.4800	189.4800 (216)
(217)m	189.4800	189.4800	189.4800	189.4800	189.4800	189.4800	189.4800	189.4800	189.4800	189.4800	189.4800	189.4800 (217)
Fuel for water heating, kWh/month	119.9418	105.8196	111.3753	100.1755	98.4112	88.2826	85.1175	92.9433	92.6359	103.8598	109.4001	117.1690 (219)
Water heating fuel used												1225.1314 (219)
Annual totals kWh/year												
Space heating fuel - main system												2068.6308 (211)
Space heating fuel - secondary												0.0000 (215)
Electricity for pumps and fans:												
(MEV)Decentralised, Database: total watage = 8.2155, total flow = 45.0000, SFP = 0.1826)												
mechanical ventilation fans (SFP = 0.1826)												67.9665 (230a)
Total electricity for the above, kWh/year												67.9665 (231)
Electricity for lighting (calculated in Appendix L)												463.3812 (232)
Total delivered energy for all uses												3825.1099 (238)

10a. Fuel costs - using BEDF prices (506)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2068.6308	20.4300	422.6213 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1225.1314	20.4300	250.2944 (247)
Mechanical ventilation fans	67.9665	20.4300	13.8855 (249)
Pumps and fans for heating	0.0000	0.0000	0.0000 (249)
Energy for lighting	463.3812	20.4300	94.6688 (250)
Additional standing charges			0.0000 (251)
Total energy cost			781.4699 (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	2068.6308	0.5190	1073.6194 (261)
Space heating - secondary	0.0000	0.5190	0.0000 (263)
Water heating (other fuel)	1225.1314	0.5190	635.8432 (264)
Space and water heating			1709.4626 (265)
Pumps and fans	67.9665	0.5190	35.2746 (267)
Energy for lighting	463.3812	0.5190	240.4948 (268)
Total kg/year			1985.2320 (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	2068.6308	3.0700	6350.6966 (261)
Space heating - secondary	0.0000	3.0700	0.0000 (263)
Water heating (other fuel)	1225.1314	3.0700	3761.1535 (264)
Space and water heating			10111.8501 (265)
Pumps and fans	67.9665	3.0700	208.6571 (267)
Energy for lighting	463.3812	3.0700	1422.5802 (268)
Primary energy kWh/year			11743.0873 (272)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY 09 Jan 2014

Primary energy kWh/m²/year

99.0142 (273)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating: B 82
Current environmental impact rating: B 83

(For testing purposes):

A	Not considered
B	Not considered
C	Not considered
D	Not considered
E Low energy lighting	Already installed
F	Not considered
G	Not considered
H	Not considered
I	Not considered
J	Not considered
K	Not considered
M	Not considered
N Solar water heating	Recommended
O	Not considered
P	Not considered
R	Not considered
S	Not considered
T	Not considered
U Solar photovoltaic panels	Recommended
A2	Not considered
A3	Not considered
T2	Not considered
W	Not considered
X	Not considered
Y	Not considered
J2	Not considered
Q2	Not considered
Z1	Not considered
Z2	Not considered
Z3	Not considered
Z4	Not considered
Z5	Not considered
V2 Wind turbine	Not applicable
L2	Not considered
Q3	Not considered
O3	Not considered

Recommended measures:	SAP change	Cost change	CO2 change
N Solar water heating	+ 2.1	-£ 94	-240 kg (12.1%)
U Solar photovoltaic panels	+ 8.2	-£ 388	-985 kg (56.4%)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
Solar water heating	£94	2.02 kg/m ²	B 84 B 85
Solar photovoltaic panels	£388	8.30 kg/m ²	A 92 A 93
Total Savings	£482	10.32 kg/m²	

Potential energy efficiency rating: A 92
Potential environmental impact rating: A 93

Fuel prices for cost data on this page from database revision number 506 TEST (30 Sep 2022)
Recommendation texts revision number 4.9c (22 Feb 2014)

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

	Current	Potential	Saving
Electricity	£781	£687	£94
Space heating	£437	£437	-£0
Water heating	£250	£155	£95
Lighting	£95	£95	£0
Generated (PV)	-£0	-£388	£388
Total cost of fuels	£781	£299	£482
Total cost of uses	£782	£299	£483
Delivered energy	32 kWh/m ²	12 kWh/m ²	20 kWh/m ²
Carbon dioxide emissions	2.0 tonnes	0.8 tonnes	1.2 tonnes
CO2 emissions per m ²	17 kg/m ²	6 kg/m ²	10 kg/m ²
Primary energy	99 kWh/m ²	38 kWh/m ²	61 kWh/m ²

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.8000 (1b)	x 2.3900 (2b)	= 121.4120 (1b) - (3b)
First floor	67.8000 (1c)	x 2.7100 (2c)	= 183.7380 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	118.6000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 305.1500 (5)

2. Ventilation rate

					main heating	secondary heating	other		total	m3 per hour		
Number of chimneys					0	+	0	+	0	=	0 * 40 =	0.0000 (6a)
Number of open flues					0	+	0	+	0	=	0 * 20 =	0.0000 (6b)
Number of intermittent fans											0 * 10 =	0.0000 (7a)
Number of passive vents											0 * 10 =	0.0000 (7b)
Number of flueless gas fires											0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =											0.0000 / (5) =	0.0000 (8)
Pressure test											Yes	
Measured/design AP50											4.5000	
Infiltration rate											0.2250 (18)	
Number of sides sheltered											0 (19)	
Shelter factor											(20) = 1 - [0.075 x (19)] =	1.0000 (20)
Infiltration rate adjusted to include shelter factor											(21) = (18) x (20) =	0.2250 (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	0.2869	0.2813	0.2756	0.2475	0.2419	0.2138	0.2138	0.2081	0.2250	0.2419	0.2531	0.2644 (22b)
Mechanical extract ventilation - decentralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5369	0.5313	0.5256	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5031	0.5144 (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
upvc window (Uw = 1.40)			15.6200	1.3258	20.7083		(27)
FRENCH DOOR (Uw = 1.40)			3.8000	1.3258	5.0379		(27)
external door			2.1600	1.2000	2.5920		(26)
REAR DOOR			1.9100	1.4000	2.6740		(26a)
Heat Loss Floor 1			42.3000	0.1600	6.7680		(28a)
OVER GARAGE			17.0000	0.2300	3.9100		(28b)
BRICK TF	161.0000	23.4900	137.5100	0.2300	31.6273		(29a)
GARAGE	20.3200		20.3200	0.2800	5.6896		(29a)
CEILING	67.8000		67.8000	0.1400	9.4920		(30)
Total net area of external elements Aum(A, m2)			308.4200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	88.4991		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							100.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							15.7408 (36)
Total fabric heat loss						(33) + (36) =	104.2399 (37)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.8577 (42)
Average daily hot water use (litres/day)												102.0713 (43)
Daily hot water use	Jan 112.2784	Feb 108.1956	Mar 104.1127	Apr 100.0299	May 95.9470	Jun 91.8642	Jul 91.8642	Aug 95.9470	Sep 100.0299	Oct 104.1127	Nov 108.1956	Dec 112.2784 (44)
Energy conte	166.5057	145.6269	150.2739	131.0125	125.7096	108.4778	100.5206	115.3489	116.7265	136.0335	148.4912	161.2519 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

Energy content (annual)												Total = Sum(45)m =	1605.9791 (45)
Distribution loss (46)m = 0.15 x (45)m													
	24.9759	21.8440	22.5411	19.6519	18.8564	16.2717	15.0781	17.3023	17.5090	20.4050	22.2737	24.1878	(46)
Water storage loss:													
Store volume												300.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												2.2400	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												1.2096	(55)
Total storage loss													
	37.4976	33.8688	37.4976	36.2880	37.4976	36.2880	37.4976	37.4976	36.2880	37.4976	36.2880	37.4976	(56)
If cylinder contains dedicated solar storage													
	37.4976	33.8688	37.4976	36.2880	37.4976	36.2880	37.4976	37.4976	36.2880	37.4976	36.2880	37.4976	(57)
Primary loss	23.2624	21.0112	21.8667	15.7584	10.4681	9.9053	10.2355	11.1660	17.1091	21.8667	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month													
	227.2657	200.5069	209.6382	183.0589	173.6753	154.6711	148.2537	164.0125	170.1237	195.3978	207.2912	222.0119	(62)
Aperture area of solar collector												3.0000	(H1)
Zero-loss collector efficiency												0.7000	(H2)
Collector heat loss coefficient												1.8000	(H3)
Collector 2nd order heat loss coefficient												0.0050	(H3a)
Collector effective heat loss coefficient												1.8063	(H3b)
Collector performance ratio												2.5804	(H4)
Annual solar radiation per m2												1079.5246	(H5)
Overshading factor												0.8000	(H6)
Solar energy available												1813.6014	(H7)
Adjustment factor for showers												1.0000	(H7a)
Solar-to-load ratio												1.1293	(H8)
Utilisation factor												0.5875	(H9)
Collector performance factor												0.8793	(H10)
Dedicated solar storage volume												75.0000	(H11)
Effective solar volume												75.0000	(H13)
Daily hot water demand												102.0713	(H14)
Volume ratio Veff/V												0.7348	(H15)
Solar storage volume factor												0.9384	(H16)
Solar input												-879.1331	(H17)
Solar input	-25.4931	-42.5407	-72.4516	-97.0995	-119.9582	-117.9380	-116.3794	-101.6813	-79.6368	-54.3826	-30.2385	-21.3334	(63)
												-879.1331	(63)
Solar input (sum of months) = Sum(63)m =													
Output from w/h													
	201.7726	157.9663	137.1866	85.9594	53.7171	36.7331	31.8743	62.3312	90.4868	141.0152	177.0527	200.6785	(64)
Total per year (kWh/year) = Sum(64)m =												1376.7736	(64)
Heat gains from water heating, kWh/month													
	103.9711	92.3250	97.4575	85.1988	80.1710	73.0235	71.6096	77.2844	81.5293	92.7225	96.4133	102.2242	(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	171.4643	171.4643	171.4643	171.4643	171.4643	171.4643	171.4643	171.4643	171.4643	171.4643	171.4643	171.4643	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	65.5964	58.2621	47.3820	35.8712	26.8141	22.6376	24.4607	31.7950	42.6752	54.1860	63.2430	67.4195	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	422.9541	427.3430	416.2830	392.7376	363.0158	335.0815	316.4196	312.0307	323.0907	346.6361	376.3579	404.2922	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.0042	55.0042	55.0042	55.0042	55.0042	55.0042	55.0042	55.0042	55.0042	55.0042	55.0042	55.0042	(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)	-114.3096	-114.3096	-114.3096	-114.3096	-114.3096	-114.3096	-114.3096	-114.3096	-114.3096	-114.3096	-114.3096	-114.3096	(71)
Water heating gains (Table 5)	139.7462	137.3883	130.9913	118.3316	107.7567	101.4215	96.2494	103.8768	113.2351	124.6271	133.9074	137.3982	(72)
Total internal gains	740.4556	735.1525	706.8152	659.0994	609.7456	571.2996	549.2887	559.8614	591.1599	637.6081	685.6673	721.2689	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a		g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W	
North					2.2600	10.6334		0.7200	0.7000	0.7700		8.3935 (74)	
East					5.3100	19.6403		0.7200	0.7000	0.7700		36.4255 (76)	
South					0.7200	46.7521		0.7200	0.7000	0.7700		11.7570 (78)	
West					7.3300	19.6403		0.7200	0.7000	0.7700		50.2823 (80)	
East					3.8000	19.6403		0.7200	0.7000	0.7700		26.0672 (76)	

Solar gains	132.9255	255.9073	415.1003	601.3776	737.2464	755.6949	718.9854	616.7765	480.9450	301.6369	164.9077	109.8971	(83)
Total gains	873.3811	991.0597	1121.9156	1260.4770	1346.9920	1326.9944	1268.2741	1176.6380	1072.1049	939.2449	850.5750	831.1660	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (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	20.8110	20.8857	20.9610	21.3109	21.3109	21.3109	21.3109	21.3109	21.3109	21.3109	21.2676	21.1132	
alpha	2.3874	2.3924	2.3974	2.4207	2.4207	2.4207	2.4207	2.4207	2.4207	2.4207	2.4178	2.4075	
util living area	0.9513	0.9331	0.8980	0.8307	0.7303	0.5985	0.4739	0.5183	0.7059	0.8654	0.9332	0.9561	(86)
Tweekday	18.4755	18.5792	18.7565	18.9967	19.1754	19.2910	19.3349	19.3285	19.2461	19.0161	18.7273	18.4797	
Tweekend	20.3679	20.4130	20.4917	20.5952	20.6807	20.7405	20.7673	20.7622	20.7139	20.6018	20.4714	20.3639	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	0	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	0	0	0	0	0	0	0	0	0	0	0	0	
MIT	20.0244	20.0921	20.2155	20.3680	20.5071	20.6014	20.6408	20.6330	20.5533	20.3855	20.1745	20.0182	(87)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

Th 2	19.8137	19.8174	19.8211	19.8381	19.8381	19.8381	19.8381	19.8381	19.8381	19.8381	19.8361	19.8286 (88)
util rest of house	0.9437	0.9228	0.8818	0.8028	0.6831	0.5220	0.3684	0.4130	0.6381	0.8370	0.9212	0.9493 (89)
Tuesday	18.4755	18.5792	18.7565	18.9967	19.1754	19.2910	19.3349	19.3285	19.2461	19.0161	18.7273	18.4797
Tuesday	18.4755	18.5792	18.7565	18.9967	19.1754	19.2910	19.3349	19.3285	19.2461	19.0161	18.7273	18.4797
MIT 2	18.4755	18.5792	18.7565	18.9967	19.1754	19.2910	19.3349	19.3285	19.2461	19.0161	18.7273	18.4797 (90)
Living area fraction									fLA = Living area / (4) =			0.1518 (91)
MIT	18.7106	18.8088	18.9779	19.2048	19.3775	19.4899	19.5331	19.5265	19.4445	19.2239	18.9470	18.7132 (92)
Temperature adjustment												0.0000
adjusted MIT	18.7106	18.8088	18.9779	19.2048	19.3775	19.4899	19.5331	19.5265	19.4445	19.2239	18.9470	18.7132 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9351	0.9122	0.8680	0.7851	0.6617	0.4961	0.3379	0.3813	0.6111	0.8187	0.9099	0.9414 (94)
Useful gains	816.7232	904.0080	973.8692	989.5931	891.2937	658.3873	428.5337	448.6178	655.2148	768.9891	773.9484	782.4614 (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	2281.2355	2193.9210	1961.1541	1593.0222	1186.8622	755.9274	453.4273	483.3190	826.2010	1333.1732	1835.1494	2264.6027 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	1089.5972	866.8215	734.5399	434.4690	219.9030	0.0000	0.0000	0.0000	0.0000	419.7530	764.0647	1102.7131 (98)
Space heating												5631.8614 (98)
Space heating per m2										(98) / (4) =		47.4862 (99)

8c. Space cooling requirement

Not applicable

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 %)		263.7728 (206)
Efficiency of secondary/supplementary heating system, %		100.0000 (208)
Space heating requirement		2135.1181 (211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	1089.5972	866.8215	734.5399	434.4690	219.9030	0.0000	0.0000	0.0000	0.0000	419.7530	764.0647	1102.7131	(98)
Space heating efficiency (main heating system 1)	263.7728	263.7728	263.7728	263.7728	263.7728	0.0000	0.0000	0.0000	0.0000	263.7728	263.7728	263.7728	(210)
Space heating fuel (main heating system)	413.0817	328.6243	278.4744	164.7133	83.3683	0.0000	0.0000	0.0000	0.0000	159.1343	289.6677	418.0541	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	201.7726	157.9663	137.1866	85.9594	53.7171	36.7331	31.8743	62.3312	90.4868	141.0152	177.0527	200.6785	(64)
Efficiency of water heater	189.4800	189.4800	189.4800	189.4800	189.4800	189.4800	189.4800	189.4800	189.4800	189.4800	189.4800	189.4800	(216)
(217)m	189.4800	189.4800	189.4800	189.4800	189.4800	189.4800	189.4800	189.4800	189.4800	189.4800	189.4800	189.4800	(216)
Fuel for water heating, kWh/month	106.4875	83.3683	72.4016	45.3660	28.3497	19.3863	16.8220	32.8959	47.7553	74.4222	93.4414	105.9101	(219)
Water heating fuel used												726.6063	(219)
Annual totals kWh/year													
Space heating fuel - main system												2135.1181	(211)
Space heating fuel - secondary												0.0000	(215)

Electricity for pumps and fans:

(MEV)Decentralised, Database: total watage = 8.2155, total flow = 45.0000, SFP = 0.1826)		
mechanical ventilation fans (SFP = 0.1826)		67.9665 (230a)
pump for solar water heating		50.0000 (230g)
Total electricity for the above, kWh/year		117.9665 (231)
Electricity for lighting (calculated in Appendix L)		463.3812 (232)

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

PV Unit 0 (0.80 * 2.50 * 1080 * 0.80) =	-1727.2394	-1727.2394 (233)
Total delivered energy for all uses		1715.8326 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2135.1181	13.1900	281.6221 (240)	
Space heating - secondary	0.0000	0.0000	0.0000 (242)	
Water heating (other fuel)	726.6063	13.1900	95.8394 (247)	
Mechanical ventilation fans	67.9665	13.1900	8.9648 (249)	
Pumps and fans for heating	0.0000	0.0000	0.0000 (249)	
Pump for solar water heating	50.0000	13.1900	6.5950 (249)	
Energy for lighting	463.3812	13.1900	61.1200 (250)	
Additional standing charges			0.0000 (251)	
Energy saving/generation technologies				
PV Unit	-1727.2394	13.1900	-227.8229 (252)	
Total energy cost			226.3183 (255)	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.4200 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	0.5810 (257)
SAP value		91.8949
SAP rating (Section 12)		92 (258)
SAP band		A

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	2135.1181	0.5190	1108.1263 (261)
Space heating - secondary	0.0000	0.5190	0.0000 (263)
Water heating (other fuel)	726.6063	0.5190	377.1087 (264)
Space and water heating			1485.2349 (265)
Pumps and fans	117.9665	0.5190	61.2246 (267)
Energy for lighting	463.3812	0.5190	240.4948 (268)
Energy saving/generation technologies			
PV Unit	-1727.2394	0.5190	-896.4372 (269)
Total kg/year			890.5171 (272)
CO2 emissions per m2			7.5100 (273)
EI value			92.7060
EI rating			93 (274)
EI band			A

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
 CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.8000 (1b)	x 2.3900 (2b)	= 121.4120 (1b) - (3b)
First floor	67.8000 (1c)	x 2.7100 (2c)	= 183.7380 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	118.6000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	305.1500 (5)

2. Ventilation rate

						main heating	secondary heating	other		total	m3 per hour		
Number of chimneys						0	+	0	+	0	=	0 * 40 =	0.0000 (6a)
Number of open flues						0	+	0	+	0	=	0 * 20 =	0.0000 (6b)
Number of intermittent fans												0 * 10 =	0.0000 (7a)
Number of passive vents												0 * 10 =	0.0000 (7b)
Number of flueless gas fires												0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =												0.0000 / (5) =	0.0000 (8)
Pressure test												Yes	
Measured/design AP50												4.5000	
Infiltration rate												0.2250 (18)	
Number of sides sheltered												0 (19)	
Shelter factor										(20) = 1 - [0.075 x (19)] =	1.0000 (20)		
Infiltration rate adjusted to include shelter factor										(21) = (18) x (20) =	0.2250 (21)		
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind factor	4.5000	4.5000	4.4000	3.9000	3.8000	3.4000	3.3000	3.3000	3.5000	3.8000	3.9000	4.1000 (22)	
Wind factor	1.1250	1.1250	1.1000	0.9750	0.9500	0.8500	0.8250	0.8250	0.8750	0.9500	0.9750	1.0250 (22a)	
Adj infilt rate													
	0.2531	0.2531	0.2475	0.2194	0.2138	0.1913	0.1856	0.1856	0.1969	0.2138	0.2194	0.2306 (22b)	
Mechanical extract ventilation - decentralised													
If mechanical ventilation:													0.5000 (23a)
Effective ac	0.5031	0.5031	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000 (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
upvc window (Uw = 1.40)			15.6200	1.3258	20.7083		(27)
FRENCH DOOR (Uw = 1.40)			3.8000	1.3258	5.0379		(27)
external door			2.1600	1.2000	2.5920		(26)
REAR DOOR			1.9100	1.4000	2.6740		(26a)
Heat Loss Floor 1			42.3000	0.1600	6.7680		(28a)
OVER GARAGE			17.0000	0.2300	3.9100		(28b)
BRICK TF	161.0000	23.4900	137.5100	0.2300	31.6273		(29a)
GARAGE	20.3200		20.3200	0.2800	5.6896		(29a)
CEILING	67.8000		67.8000	0.1400	9.4920		(30)
Total net area of external elements Aum(A, m ²)			308.4200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	88.4991		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							100.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							15.7408 (36)
Total fabric heat loss						(33) + (36) =	104.2399 (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	50.6644	50.6644	50.3498	50.3498	50.3498	50.3498	50.3498	50.3498	50.3498	50.3498	50.3498	50.3498 (38)
Heat transfer coeff	154.9044	154.9044	154.5897	154.5897	154.5897	154.5897	154.5897	154.5897	154.5897	154.5897	154.5897	154.5897 (39)
Average = Sum(39)m / 12 =												154.6421 (39)
HLP	1.3061	1.3061	1.3035	1.3035	1.3035	1.3035	1.3035	1.3035	1.3035	1.3035	1.3035	1.3035 (40)
HLP (average)												1.3039 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.8577 (42)
Average daily hot water use (litres/day)												102.0713 (43)
Daily hot water use	Jan 112.2784	Feb 108.1956	Mar 104.1127	Apr 100.0299	May 95.9470	Jun 91.8642	Jul 91.8642	Aug 95.9470	Sep 100.0299	Oct 104.1127	Nov 108.1956	Dec 112.2784 (44)
Energy conte	166.5057	145.6269	150.2739	131.0125	125.7096	108.4778	100.5206	115.3489	116.7265	136.0335	148.4912	161.2519 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING 09 Jan 2014

Energy content (annual)												Total = Sum(45)m =	1605.9791 (45)
Distribution loss (46)m = 0.15 x (45)m													
	24.9759	21.8440	22.5411	19.6519	18.8564	16.2717	15.0781	17.3023	17.5090	20.4050	22.2737	24.1878	(46)
Water storage loss:													
Store volume												300.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												2.2400	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												1.2096	(55)
Total storage loss													
	37.4976	33.8688	37.4976	36.2880	37.4976	36.2880	37.4976	37.4976	36.2880	37.4976	36.2880	37.4976	(56)
If cylinder contains dedicated solar storage													
	37.4976	33.8688	37.4976	36.2880	37.4976	36.2880	37.4976	37.4976	36.2880	37.4976	36.2880	37.4976	(57)
Primary loss	23.2624	21.0112	21.8667	15.7584	10.4681	9.9053	10.2355	11.1660	17.1091	21.8667	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month													
	227.2657	200.5069	209.6382	183.0589	173.6753	154.6711	148.2537	164.0125	170.1237	195.3978	207.2912	222.0119	(62)
Aperture area of solar collector												3.0000	(H1)
Zero-loss collector efficiency												0.7000	(H2)
Collector heat loss coefficient												1.8000	(H3)
Collector 2nd order heat loss coefficient												0.0050	(H3a)
Collector effective heat loss coefficient												1.8063	(H3b)
Collector performance ratio												2.5804	(H4)
Annual solar radiation per m2												1185.6484	(H5)
Overshading factor												0.8000	(H6)
Solar energy available												1991.8893	(H7)
Adjustment factor for showers												1.0000	(H7a)
Solar-to-load ratio												1.2403	(H8)
Utilisation factor												0.5535	(H9)
Collector performance factor												0.8793	(H10)
Dedicated solar storage volume												75.0000	(H11)
Effective solar volume												75.0000	(H13)
Daily hot water demand												102.0713	(H14)
Volume ratio Veff/V												0.7348	(H15)
Solar storage volume factor												0.9384	(H16)
Solar input												-909.6364	(H17)
Solar input	-25.5114	-43.2331	-73.8651	-101.0492	-117.6444	-124.9687	-118.8961	-106.0454	-84.0057	-56.7551	-34.0671	-23.5952	(63)
												-909.6364	(63)
Solar input (sum of months) = Sum(63)m =													
Output from w/h													
	201.7543	157.2738	135.7731	82.0097	56.0309	29.7024	29.3576	57.9670	86.1180	138.6427	173.2241	198.4167	(64)
Total per year (kWh/year) = Sum(64)m =												1346.2703	(64)
Heat gains from water heating, kWh/month													
	103.9711	92.3250	97.4575	85.1988	80.1710	73.0235	71.6096	77.2844	81.5293	92.7225	96.4133	102.2242	(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	171.4643	171.4643	171.4643	171.4643	171.4643	171.4643	171.4643	171.4643	171.4643	171.4643	171.4643	171.4643	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	65.5964	58.2621	47.3820	35.8712	26.8141	22.6376	24.4607	31.7950	42.6752	54.1860	63.2430	67.4195	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	422.9541	427.3430	416.2830	392.7376	363.0158	335.0815	316.4196	312.0307	323.0907	346.6361	376.3579	404.2922	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	55.0042	55.0042	55.0042	55.0042	55.0042	55.0042	55.0042	55.0042	55.0042	55.0042	55.0042	55.0042	(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)													
	-114.3096	-114.3096	-114.3096	-114.3096	-114.3096	-114.3096	-114.3096	-114.3096	-114.3096	-114.3096	-114.3096	-114.3096	(71)
Water heating gains (Table 5)													
	139.7462	137.3883	130.9913	118.3316	107.7567	101.4215	96.2494	103.8768	113.2351	124.6271	133.9074	137.3982	(72)
Total internal gains	740.4556	735.1525	706.8152	659.0994	609.7456	571.2996	549.2887	559.8614	591.1599	637.6081	685.6673	721.2689	(73)

6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains	
	m2	Table 6a	Specific data	Specific data	factor	W	
		W/m2	or Table 6b	or Table 6c	Table 6d		
North	2.2600	11.3201	0.7200	0.7000	0.7700	8.9356	(74)
East	5.3100	21.0039	0.7200	0.7000	0.7700	38.9546	(76)
South	0.7200	49.0238	0.7200	0.7000	0.7700	12.3283	(78)
West	7.3300	21.0039	0.7200	0.7000	0.7700	53.7735	(80)
East	3.8000	21.0039	0.7200	0.7000	0.7700	27.8771	(76)

Solar gains	141.8692	277.3305	450.9981	666.2505	769.0290	851.3569	781.0936	684.5168	540.4434	335.6252	198.1419	129.6335	(83)
Total gains	882.3248	1012.4830	1157.8134	1325.3499	1378.7745	1422.6564	1330.3823	1244.3782	1131.6032	973.2332	883.8092	850.9024	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (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	21.2676	21.2676	21.3109	21.3109	21.3109	21.3109	21.3109	21.3109	21.3109	21.3109	21.3109	21.3109	
alpha	2.4178	2.4178	2.4207	2.4207	2.4207	2.4207	2.4207	2.4207	2.4207	2.4207	2.4207	2.4207	
util living area	0.9498	0.9304	0.8896	0.8149	0.7186	0.5597	0.4565	0.4892	0.6917	0.8595	0.9280	0.9539	(86)
Tweekday	18.5254	18.6183	18.8096	19.0199	19.1854	19.3031	19.3364	19.3326	19.2496	19.0196	18.7447	18.5081	
Tweekend	20.3814	20.4233	20.5091	20.6064	20.6858	20.7481	20.7687	20.7655	20.7164	20.6037	20.4785	20.3728	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	0	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	0	0	0	0	0	0	0	0	0	0	0	0	
MIT	20.0453	20.1079	20.2424	20.3854	20.5151	20.6131	20.6431	20.6381	20.5571	20.3884	20.1856	20.0321	(87)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING 09 Jan 2014

Th 2	19.8361	19.8361	19.8381	19.8381	19.8381	19.8381	19.8381	19.8381	19.8381	19.8381	19.8381	19.8381	(88)
util rest of house	0.9421	0.9199	0.8724	0.7852	0.6701	0.4814	0.3534	0.3844	0.6242	0.8306	0.9153	0.9468	(89)
Tuesday	18.5254	18.6183	18.8096	19.0199	19.1854	19.3031	19.3364	19.3326	19.2496	19.0196	18.7447	18.5081	
Tuesday	18.5254	18.6183	18.8096	19.0199	19.1854	19.3031	19.3364	19.3326	19.2496	19.0196	18.7447	18.5081	
MIT 2	18.5254	18.6183	18.8096	19.0199	19.1854	19.3031	19.3364	19.3326	19.2496	19.0196	18.7447	18.5081	(90)
Living area fraction									fLA = Living area / (4) =			0.1518	(91)
MIT	18.7561	18.8444	19.0270	19.2271	19.3872	19.5020	19.5347	19.5307	19.4481	19.2274	18.9634	18.7394	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7561	18.8444	19.0270	19.2271	19.3872	19.5020	19.5347	19.5307	19.4481	19.2274	18.9634	18.7394	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9335	0.9092	0.8583	0.7671	0.6486	0.4563	0.3240	0.3536	0.5978	0.8122	0.9036	0.9386	(94)
Useful gains	823.6442	920.5879	993.7600	1016.6833	894.2350	649.0927	430.9991	440.0558	676.5189	790.4307	798.5723	798.6583	(95)
Ext temp.	4.3000	4.8000	6.6000	9.0000	11.8000	14.8000	16.6000	16.5000	14.0000	10.5000	7.1000	4.2000	(96)
Heat loss rate W	2239.3061	2175.5371	1921.0905	1581.0065	1172.9050	726.8731	453.6819	468.5180	842.2138	1349.1632	1833.9551	2247.6463	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	1053.2525	843.3259	689.9339	406.3127	207.3304	0.0000	0.0000	0.0000	0.0000	415.6970	745.4756	1078.0471	(98)
Space heating												5439.3751	(98)
Space heating per m2												(98) / (4) =	45.8632 (99)

8c. Space cooling requirement

Not applicable

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 %)													262.6501 (206)
Efficiency of secondary/supplementary heating system, %													100.0000 (208)
Space heating requirement													2070.9591 (211)
Space heating requirement	1053.2525	843.3259	689.9339	406.3127	207.3304	0.0000	0.0000	0.0000	0.0000	415.6970	745.4756	1078.0471	(98)
Space heating efficiency (main heating system 1)	262.6501	262.6501	262.6501	262.6501	262.6501	0.0000	0.0000	0.0000	0.0000	262.6501	262.6501	262.6501	(210)
Space heating fuel (main heating system)	401.0098	321.0835	262.6818	154.6974	78.9379	0.0000	0.0000	0.0000	0.0000	158.2703	283.8285	410.4500	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	201.7543	157.2738	135.7731	82.0097	56.0309	29.7024	29.3576	57.9670	86.1180	138.6427	173.2241	198.4167	(64)
Efficiency of water heater	189.4800	189.4800	189.4800	189.4800	189.4800	189.4800	189.4800	189.4800	189.4800	189.4800	189.4800	189.4800	(216)
Fuel for water heating, kWh/month	106.4779	83.0028	71.6557	43.2815	29.5709	15.6758	15.4938	30.5927	45.4496	73.1701	91.4208	104.7164	(219)
Water heating fuel used												710.5079	(219)
Annual totals kWh/year													
Space heating fuel - main system												2070.9591	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEV)Decentralised, Database: total watage = 8.2155, total flow = 45.0000, SFP = 0.1826)													
mechanical ventilation fans (SFP = 0.1826)													67.9665 (230a)
pump for solar water heating													50.0000 (230g)
Total electricity for the above, kWh/year													117.9665 (231)
Electricity for lighting (calculated in Appendix L)													463.3812 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 2.50 * 1186 * 0.80) =										-1897.0374		-1897.0374	(233)
Total delivered energy for all uses												1465.7771	(238)

10a. Fuel costs - using BEDF prices (506)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2070.9591	20.4300	423.0969	(240)
Space heating - secondary	0.0000	0.0000	0.0000	(242)
Water heating (other fuel)	710.5079	20.4300	145.1568	(247)
Mechanical ventilation fans	67.9665	20.4300	13.8855	(249)
Pumps and fans for heating	0.0000	0.0000	0.0000	(249)
Pump for solar water heating	50.0000	20.4300	10.2150	(249)
Energy for lighting	463.3812	20.4300	94.6688	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit	-1897.0374	20.4300	-387.5647	(252)
Total energy cost			299.4583	(255)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF EPC COSTS, EMISSIONS AND PRIMARY ENERGY FOR IMPROVED DWELLING 09 Jan 2014

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	2070.9591	0.5190	1074.8277 (261)
Space heating - secondary	0.0000	0.5190	0.0000 (263)
Water heating (other fuel)	710.5079	0.5190	368.7536 (264)
Space and water heating			1443.5813 (265)
Pumps and fans	117.9665	0.5190	61.2246 (267)
Energy for lighting	463.3812	0.5190	240.4948 (268)
Energy saving/generation technologies			
PV Unit	-1897.0374	0.5190	-984.5624 (269)
Total kg/year			760.7383 (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	2070.9591	3.0700	6357.8443 (261)
Space heating - secondary	0.0000	3.0700	0.0000 (263)
Water heating (other fuel)	710.5079	3.0700	2181.2591 (264)
Space and water heating			8539.1034 (265)
Pumps and fans	117.9665	3.0700	362.1571 (267)
Energy for lighting	463.3812	3.0700	1422.5802 (268)
Energy saving/generation technologies			
PV Unit	-1897.0374	3.0700	-5823.9049 (269)
Primary energy kWh/year			4499.9358 (272)
Primary energy kWh/m2/year			37.9421 (273)

BASIC COMPLIANCE REPORT

Calculation Type: New Build (As Designed)

Property Reference	HOUSE TYPE C4	Issued on Date	09/11/2022
Assessment Reference	GRANT ASHP	Prop Type Ref	
Property			

SAP Rating	82 B	DER	18.30	TER	26.98
Environmental	83 B	% DER<TER	32.17		
CO₂ Emissions (t/year)	1.99	DFEE	55.95	TFEE	62.67
General Requirements Compliance	Pass	% DFEE<TFEE	10.72		

Assessor Details	Mr. Neil Jones, S J Roberts Construction Limited, Tel: 01743 891858, neil.jones@sjroberts.com	Assessor ID	K559-0001
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Client	
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SUMMARY FOR INPUT DATA FOR New Build (As Designed)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Electricity		
Fuel factor	1.55 (electricity)		
Target Carbon Dioxide Emission Rate (TER)	26.98	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	18.30	kgCO ₂ /m ²	Pass
	-8.68 (-32.2%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	62.67	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	55.95	kWh/m ² /yr	
	-6.8 (-10.8%)	kWh/m ² /yr	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.24 (max. 0.30)	0.28 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Floor	0.18 (max. 0.25)	0.23 (max. 0.70)	Pass
Roof	0.14 (max. 0.20)	0.14 (max. 0.35)	Pass
Openings	1.38 (max. 2.00)	1.40 (max. 3.30)	Pass

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	4.50 (design value)	
Maximum	10.0	Pass

Limiting System Efficiencies

4 Heating efficiency

Main heating system	Heat pump with radiators or underfloor - Electric Grant AERONA3 HPID10R32	
Secondary heating system	None	

BASIC COMPLIANCE REPORT

Calculation Type: New Build (As Designed)

5 Cylinder insulation

Hot water storage	Measured cylinder loss: 2.24 kWh/day Permitted by DBSCG 2.86	Pass
Primary pipework insulated	Yes	Pass

6 Controls

Space heating controls	Time and temperature zone control	Pass
Hot water controls	Cylinderstat	Pass
	Independent timer for DHW	Pass

7 Low energy lights

Percentage of fixed lights with low-energy fittings	100	%	
Minimum	75	%	Pass

8 Mechanical ventilation

Continuous extract system (decentralised)		
Specific fan power	0.1300 0.1600 0.1600	
Maximum	0.7	Pass

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Midlands)	Not significant	Pass
Based on:		
Overshading	Average	
Windows facing North	2.26 m ² , No overhang	
Windows facing East	9.11 m ² , No overhang	
Windows facing South	0.72 m ² , No overhang	
Windows facing West	7.33 m ² , No overhang	
Air change rate	5.00 ach	
Blinds/curtains	None	

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type	U-value	
		W/m ² K
		Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals	4.50 (design value)	
Maximum	10.0	Pass

10 Key features

Party wall U-value	0.00	W/m ² K
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This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

Property Reference	HOUSE TYPE C4	Issued on Date	09/11/2022
Assessment Reference	GRANT ASHP	Prop Type Ref	
Property			

SAP Rating	82 B	DER	18.30	TER	26.98
Environmental	83 B	% DER<TER	32.17		
CO ₂ Emissions (t/year)	1.99	DFEE	55.95	TFEE	62.67
General Requirements Compliance	Pass	% DFEE<TFEE	10.72		

Assessor Details	Mr. Neil Jones, S J Roberts Construction Limited, Tel: 01743 891858, neil.jones@sjroberts.com	Assessor ID	K559-0001
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Client	
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SUMMARY FOR INPUT DATA FOR: New Build (As Designed)

Orientation	West
Property Tenure	Rented (social)
Transaction Type	New dwelling
Terrain Type	Suburban
1.0 Property Type	House, Detached
2.0 Number of Storeys	2
3.0 Date Built	2022
4.0 Sheltered Sides	0
5.0 Sunlight/Shade	Average or unknown

6.0 Measurements		Heat Loss Perimeter	Internal Floor Area	Average Storey Height
	Ground Floor:	36.00 m	50.80 m ²	2.39 m
	1st Storey:	35.16 m	67.80 m ²	2.71 m

7.0 Living Area	18.00	m ²
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8.0 Thermal Mass Parameter	Simple calculation - Low	
Thermal Mass	100.00	kJ/m ² K

9.0 External Walls		U-Value (W/m ² K)	Gross Area (m ²)	Nett Area (m ²)
Description	Type			
BRICK TF	Timber Frame	0.23	161.00	137.51
GARAGE	Cavity Wall	0.28	20.32	20.32

9.1 Party Walls		U-Value (W/m ² K)	Area (m ²)
Description	Type		

10.0 External Roofs		U-Value (W/m ² K)	Gross Area (m ²)	Nett Area (m ²)
Description	Type			
CEILING	External Plane Roof	0.14	67.80	67.80

11.0 Heat Loss Floors		U-Value (W/m ² K)	Area (m ²)
Description	Type		
Heat Loss Floor 1	Ground Floor - Solid	0.16	42.30
OVER GARAGE	Exposed Floor - Timber	0.23	17.00

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Argon Filled	G-value	Frame Type	Frame Factor	U Value (W/m²K)
upvc window	Manufacturer	Window	Double Low-E Hard 0.15			0.72		0.70	1.40
FRENCH DOOR	Manufacturer	Window	Double Low-E Hard 0.15			0.72		0.70	1.40
external door	Manufacturer	Solid Door							1.20
REAR DOOR	Manufacturer	Half Glazed Door	Double Low-E Hard 0.15			0.72		0.70	1.40

13.0 Openings

Name	Opening Type	Location	Orientation	Curtain Type	Overhang Ratio	Wide Overhang	Width (m)	Height (m)	Count	Area (m²)	Curtain Closed
FRONT WINDOW	Window	[1] BRICK TF	West	None	0.00					7.33	
REAR WINDOW	Window	[1] BRICK TF	East	None	0.00					5.31	
GABLE WINDOW	Window	[1] BRICK TF	North	None	0.00					2.26	
FRONT DOOR	Solid Door	[1] BRICK TF	West							2.16	
FRENCH DOOR	Window	[1] BRICK TF	East	None	0.00					3.80	
GABLE	Window	[1] BRICK TF	South	None	0.00					0.72	
REAR DOOR	Half Glazed Door	[1] BRICK TF	East							1.91	

14.0 Conservatory

None

15.0 Draught Proofing

100 %

16.0 Draught Lobby

No

17.0 Thermal Bridging

Calculate Bridges

17.1 List of Bridges

Source Type	Bridge Type	Length	Psi	Imported	Reference:
Independently assessed	E2 Other lintels (including other steel lintels)	16.75	0.141	Yes	TRADA
Independently assessed	E3 Sill	13.00	0.027	No	TRADA
Independently assessed	E4 Jamb	40.82	0.038	Yes	TRADA
Independently assessed	E5 Ground floor (normal)	36.00	0.131	Yes	TRADA
Independently assessed	E6 Intermediate floor within a dwelling	35.16	0.094	Yes	TRADA
Independently assessed	E10 Eaves (insulation at ceiling level)	19.66	0.060	No	TRADA
Independently assessed	E12 Gable (insulation at ceiling level)	17.63	0.062	No	TRADA
Independently assessed	E16 Corner (normal)	20.40	0.058	Yes	TRADA

Y-value 0.051 W/m²K

18.0 Pressure Testing

Yes

Designed AP₅₀ 4.50 m³/(h.m²) @ 50 Pa

Property Tested ?

As Built AP₅₀ m³/(h.m²) @ 50 Pa

19.0 Mechanical Ventilation

Summer Overheating

Windows open in hot weather	Windows fully open
Cross ventilation possible	No
Night Ventilation	No
Air change rate	5.00

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	No
Mechanical Ventilation data Type	Database
Type	Mechanical extract ventilation -

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

	decentralised
MV Reference Number	500275
Duct Type	Rigid

19.1 Mechanical extract ventilation - Decentralised

SFP	Fan/Room Type	Count
0.13	Through Wall Fan Kitchen	1
0.16	Through Wall Fan Other Wet Room	2
0.16	In Room Fan Other Wet Room	2

20.0 Fans, Open Fireplaces, Flues

	MHS	SHS	Other	Total
Number of Chimneys	0		0	0
Number of open flues	0		0	0
Number of intermittent fans				0
Number of passive vents				0
Number of flueless gas fires				0

21.0 Fixed Cooling System

No

22.0 Lighting

Internal

Total number of light fittings	24	
Total number of L.E.L. fittings	24	
Percentage of L.E.L. fittings	100.00	%

External

External lights fitted	Yes
Light and motion sensor	Yes

23.0 Electricity Tariff

Standard

24.0 Main Heating 1

	Database	
Description	ASHP	
Percentage of Heat	100	%
Database Ref. No.	103891	
Fuel Type	Electricity	
Main Heating	PET	
SAP Code	224	
In Winter	277.7	
In Summer	315.8	
Controls	CHD Time and temperature zone control	
PCDF Controls	0	
Sap Code	2207	
Is MHS Pumped	Pump in heated space	
Heat Emitter	Radiators and Underfloor	
Underfloor Heating	Yes - Pipes in Concrete	
Flow Temperature	36° - 45°C	

25.0 Main Heating 2

None

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

Community Heating	None
28.0 Water Heating	HWP From main heating 1
Water Heating	Main Heating 1
Flue Gas Heat Recovery System	No
Waste Water Heat Recovery Instantaneous System 1	No
Waste Water Heat Recovery Instantaneous System 2	No
Waste Water Heat Recovery Storage System	No
Solar Panel	No
Water use <= 125 litres/person/day	Yes
SAP Code	901
Immersion Only Heating Hot Water	No
29.0 Hot Water Cylinder	Hot Water Cylinder
Cylinder Stat	Yes
Cylinder In Heated Space	Yes
Independent Time Control	Yes
Insulation Type	Measured Loss
Cylinder Volume	300.00
Loss	2.24
Pipes insulation	Fully insulated primary pipework
31.0 Thermal Store	None

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

	Typical Cost	Typical savings per year	Ratings after improvement	
			SAP rating	Environmental Impact
Solar water heating	£4,000 - £6,000	£94	B 84	
	Typical Cost	Typical savings per year	Ratings after improvement	
			SAP rating	Environmental Impact
Solar photovoltaic panels, 2.5 kWp	£3,500 - £5,500	£388	A 92	