

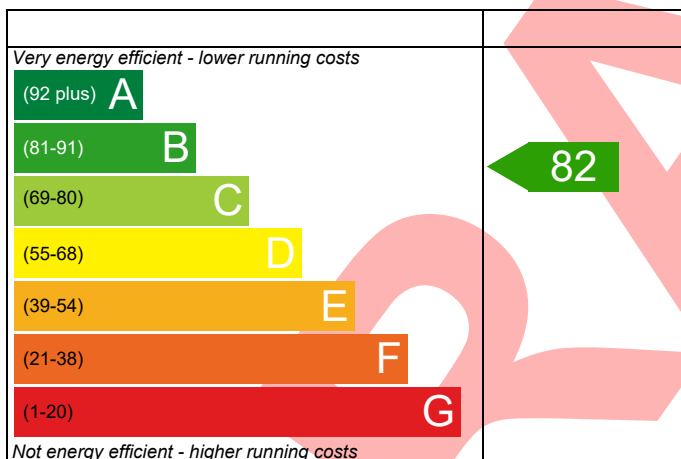
PREDICTED ENERGY ASSESSMENT

Dwelling type: House, Detached
Date of assessment: 09/11/2022
Produced by: S J Roberts Construction Limited
Total floor area: 124.74 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

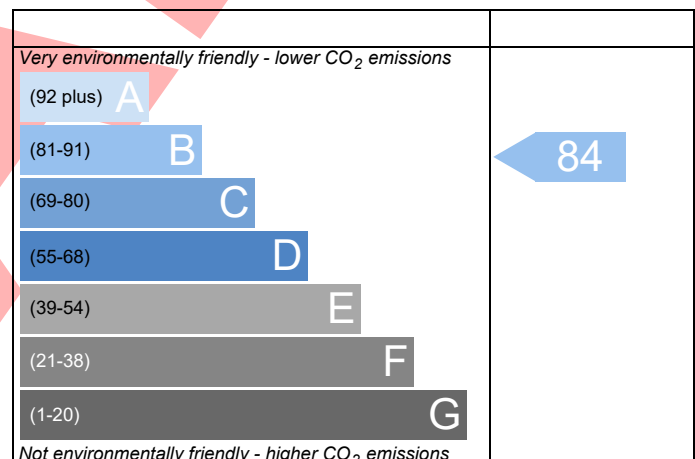


England

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 C1			Issued on Date	09/11/2022
Assessment Reference	GRANT ASHP	Prop Type Ref			
Property					
SAP Rating	82 B	DER	17.52	TER	26.05
Environmental	84 B	% DER<TER	32.74		
CO ₂ Emissions (t/year)	2.00	DFEE	53.22	TFEE	60.15
General Requirements Compliance	Pass	% DFEE<TFEE	11.51		
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)	26.05	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	17.52	kgCO ₂ /m ²	Pass
	-8.53 (-32.7%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	60.15	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	53.22	kWh/m ² /yr	
	-6.9 (-11.5%)	kWh/m ² /yr	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.23 (max. 0.30)	0.23 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Floor	0.17 (max. 0.25)	0.20 (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

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

8.51 m², No overhang

Windows facing East

4.05 m², No overhang

Windows facing South

6.02 m², No overhang

Air change rate

8.00 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

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FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	HOUSE TYPE C1				Issued on Date	09/11/2022
Assessment Reference	GRANT ASHP		Prop Type Ref			
Property						
SAP Rating	82 B	DER	17.52	TER	26.05	
Environmental	84 B	% DER<TER	32.74			
CO ₂ Emissions (t/year)	2.00	DFEE	53.22	TFEE	60.15	
General Requirements Compliance	Pass	% DFEE<TFEE	11.51			
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 125 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) 26.05 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 17.52 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)60.1 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)53.2 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.23 (max. 0.30)	0.23 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.17 (max. 0.25)	0.20 (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
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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
Maximum	0.7 OK

9 Summertime temperature

Overheating risk (Midlands):	Not significant	OK
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Based on:

Overshading:	Average
Windows facing North:	8.51 m ² , No overhang
Windows facing East:	4.05 m ² , No overhang
Windows facing South:	6.02 m ² , No overhang
Air change rate:	8.00 ach
Blinds/curtains:	None

10 Key features

Party wall U-value	0.00 W/m ² K
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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	63.5000 (1b)	x 2.4600 (2b)	= 156.2100 (1b) - (3b)
First floor	61.2400 (1c)	x 2.6500 (2c)	= 162.2860 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	124.7400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 318.4960 (5)

2. Ventilation rate

										main	secondary	other	total	m3 per hour			
										heating	heating						
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) =					Air changes per hour		
Pressure test															0.0000 / (5) =		0.0000 (8)
Measured/design AP50															Yes		
Infiltration rate															4.5000		
Number of sides sheltered															0.2250 (18)		
															1 (19)		
Shelter factor										(20) = 1 - [0.075 x (19)] =					0.9250 (20)		
Infiltration rate adjusted to include shelter factor										(21) = (18) x (20) =					0.2081 (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																	
	0.2654	0.2602	0.2550	0.2289	0.2237	0.1977	0.1977	0.1925	0.2081	0.2237	0.2341	0.2445 (22b)					
Mechanical extract ventilation - decentralised																	
If mechanical ventilation:																	0.5000 (23a)
Effective ac	0.5154	0.5102	0.5050	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)			15.2500	1.3258	20.2178		(27)
FRENCH DOOR (Uw = 1.40)			3.3300	1.3258	4.4148		(27)
external door			2.1600	1.2000	2.5920		(26)
REAR DOOR			2.1300	1.4000	2.9820		(26a)
Heat Loss Floor 1			63.5000	0.1600	10.1600		(28a)
FLOOR OVER GARAGE			8.8000	0.2038	1.7931		(28b)
BRICK TF	181.7300	22.8700	158.8600	0.2300	36.5378		(29a)
CEILING	63.5000		63.5000	0.1400	8.8900		(30)
Total net area of external elements Aum(A, m ²)			317.5300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	87.5874		(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K
Thermal bridges (Sum(L x Psi) calculated using Appendix K)
Total fabric heat loss

100.0000 (35)
15.3228 (36)
(33) + (36) = 102.9102 (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	54.1662	53.6193	53.0724	52.5518	52.5518	52.5518	52.5518	52.5518	52.5518	52.5518	52.5518	52.5518 (38)
Heat transfer coeff	157.0764	156.5295	155.9826	155.4620	155.4620	155.4620	155.4620	155.4620	155.4620	155.4620	155.4620	155.4620 (39)
Average = Sum(39)m / 12 =												155.7289 (39)
HLP	Jan 1.2592	Feb 1.2548	Mar 1.2505	Apr 1.2463	May 1.2463	Jun 1.2463	Jul 1.2463	Aug 1.2463	Sep 1.2463	Oct 1.2463	Nov 1.2463	Dec 1.2463 (40)
HLP (average)												1.2484 (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												2.8799 (42)
Average daily hot water use (litres/day)												102.5980 (43)
Daily hot water use	Jan 112.8578	Feb 108.7538	Mar 104.6499	Apr 100.5460	May 96.4421	Jun 92.3382	Jul 92.3382	Aug 96.4421	Sep 100.5460	Oct 104.6499	Nov 108.7538	Dec 112.8578 (44)
Energy conte	167.3648	146.3783	151.0493	131.6885	126.3582	109.0375	101.0393	115.9441	117.3288	136.7354	149.2574	162.0839 (45)
Energy content (annual)										Total = Sum(45)m =		1614.2655 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Distribution loss (46)m = 0.15 x (45)m	25.1047	21.9567	22.6574	19.7533	18.9537	16.3556	15.1559	17.3916	17.5993	20.5103	22.3886	24.3126 (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												
228.1248 201.2583 211.8093 190.4885 187.1182 167.8375 161.7993 176.7041 176.1288 197.4954 208.0574 222.8439 (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	228.1248	201.2583	211.8093	190.4885	187.1182	167.8375	161.7993	176.7041	176.1288	197.4954	208.0574	222.8439 (64)
Total per year (kWh/year) = Sum(64)m =												2329.6655 (64)
Heat gains from water heating, kWh/month												
104.2568 92.5748 98.8319 90.8264 90.6221 83.2950 82.2036 87.1594 86.0518 94.0725 96.6681 102.5009 (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	143.9957	143.9957	143.9957	143.9957	143.9957	143.9957	143.9957	143.9957	143.9957	143.9957	143.9957	143.9957 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
27.4894 24.4158 19.8563 15.0325 11.2369 9.4867 10.2507 13.3243 17.8838 22.7076 26.5031 28.2534 (67)												
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
291.2622 294.2846 286.6683 270.4540 249.9864 230.7498 217.8985 214.8761 222.4924 238.7067 259.1743 278.4109 (68)												
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
37.3996 37.3996 37.3996 37.3996 37.3996 37.3996 37.3996 37.3996 37.3996 37.3996 37.3996 37.3996 (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)												
-115.1966 -115.1966 -115.1966 -115.1966 -115.1966 -115.1966 -115.1966 -115.1966 -115.1966 -115.1966 -115.1966 -115.1966 (71)												
Water heating gains (Table 5)												
140.1301 137.7601 132.8386 126.1478 121.8039 115.6875 110.4887 117.1497 119.5164 126.4416 134.2612 137.7700 (72)												
Total internal gains	525.0804	522.6592	505.5618	477.8330	449.2260	422.1227	404.8366	411.5488	426.0914	454.0546	486.1374	510.6330 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data FF or Table 6c	Access factor Table 6d	Gains W
North	8.5100	10.6334	0.7200	0.7000	0.7700	31.6057 (74)
East	0.7200	19.6403	0.7200	0.7000	0.7700	4.9391 (76)
South	6.0200	46.7521	0.7200	0.7000	0.7700	98.3017 (78)
East	3.3300	19.6403	0.7200	0.7000	0.7700	22.8431 (76)

Solar gains	157.6896	275.7408	397.2139	527.1730	623.5833	633.9440	604.9787	530.5751	441.7222	310.0326	190.1518	134.1365 (83)
Total gains	682.7699	798.4000	902.7758	1005.0060	1072.8093	1056.0667	1009.8153	942.1240	867.8136	764.0872	676.2892	644.7695 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec												
tau	22.0593	22.1364	22.2140	22.2884	22.2884	22.2884	22.2884	22.2884	22.2884	22.2884	22.2884	22.2884
alpha	2.4706	2.4758	2.4809	2.4859	2.4859	2.4859	2.4859	2.4859	2.4859	2.4859	2.4859	2.4859
util living area	0.9732	0.9596	0.9358	0.8895	0.8100	0.6916	0.5657	0.6098	0.7841	0.9117	0.9611	0.9766 (86)
Tweekday	18.4949	18.5999	18.7711	18.9866	19.1839	19.3248	19.3839	19.3753	19.2731	19.0230	18.7285	18.4907
Tweekend	20.3529	20.3985	20.4737	20.5700	20.6618	20.7318	20.7658	20.7596	20.7032	20.5849	20.4526	20.3471
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	20.0014	20.0695	20.1878	20.3285	20.4781	20.5880	20.6385	20.6289	20.5366	20.3594	20.1453	19.9923 (87)
Th 2	19.8729	19.8764	19.8798	19.8831	19.8831	19.8831	19.8831	19.8831	19.8831	19.8831	19.8831	19.8831 (88)
util rest of house												
0.9688 0.9531 0.9250 0.8692 0.7710 0.6192 0.4549 0.5026 0.7256 0.8913 0.9537 0.9728 (89)												
Tweekday	18.4949	18.5999	18.7711	18.9866	19.1839	19.3248	19.3839	19.3753	19.2731	19.0230	18.7285	18.4907
Tweekend	18.4949	18.5999	18.7711	18.9866	19.1839	19.3248	19.3839	19.3753	19.2731	19.0230	18.7285	18.4907
MIT 2	18.4949	18.5999	18.7711	18.9866	19.1839	19.3248	19.3839	19.3753	19.2731	19.0230	18.7285	18.4907 (90)
Living area fraction												
fLA = Living area / (4) =												0.1708 (91)
MIT	18.7521	18.8508	19.0130	19.2157	19.4049	19.5405	19.5981	19.5893	19.4888	19.2512	18.9704	18.7471 (92)
Temperature adjustment												0.0000
adjusted MIT	18.7521	18.8508	19.0130	19.2157	19.4049	19.5405	19.5981	19.5893	19.4888	19.2512	18.9704	18.7471 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0.9635 0.9458 0.9148 0.8547 0.7513 0.5932 0.4226 0.4697 0.7005 0.8769 0.9461 0.9680 (94)												
Useful gains	657.8487	755.1405	825.8812	858.9445	805.9628	626.4981	426.7116	442.5081	607.8639	670.0646	639.8576	624.1467 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Heat loss rate W	2270.0867	2183.7147	1951.8051	1603.7010	1197.8200	768.0604	466.0928	495.8201	837.7567	1344.9311	1845.4036	2261.5266 (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	1199.5051	960.0018	837.6873	536.2247	291.5417	0.0000	0.0000	0.0000	0.0000	502.1006	867.9931	1218.2106 (98)
Space heating												6413.2650 (98)
Space heating per m2											(98) / (4) =	51.4131 (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 %)												264.0344 (206)
Efficiency of secondary/supplementary heating system, %												100.0000 (208)
Space heating requirement												2428.9501 (211)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	1199.5051	960.0018	837.6873	536.2247	291.5417	0.0000	0.0000	0.0000	0.0000	502.1006	867.9931	1218.2106 (98)
Space heating efficiency (main heating system 1)	264.0344	264.0344	264.0344	264.0344	264.0344	0.0000	0.0000	0.0000	0.0000	264.0344	264.0344	264.0344 (210)
Space heating fuel (main heating system)	454.2987	363.5896	317.2644	203.0889	110.4181	0.0000	0.0000	0.0000	0.0000	190.1648	328.7424	461.3832 (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	228.1248	201.2583	211.8093	190.4885	187.1182	167.8375	161.7993	176.7041	176.1288	197.4954	208.0574	222.8439 (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	120.3952	106.2161	111.7845	100.5322	98.7535	88.5780	85.3912	93.2574	92.9538	104.2302	109.8044	117.6081 (219)
Water heating fuel used												1229.5047 (219)
Annual totals kWh/year												
Space heating fuel - main system												2428.9501 (211)
Space heating fuel - secondary												0.0000 (215)
Electricity for pumps and fans:												
(MEV)Decentralised, Database: total watage = 7.8315, total flow = 45.0000, SFP = 0.1740)												
mechanical ventilation fans (SFP = 0.1740)												67.6233 (230a)
Total electricity for the above, kWh/year												67.6233 (231)
Electricity for lighting (calculated in Appendix L)												485.4707 (232)
Total delivered energy for all uses												4211.5488 (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	2428.9501	0.5190	1260.6251 (261)
Space heating - secondary	0.0000	0.5190	0.0000 (263)
Water heating (other fuel)	1229.5047	0.5190	638.1129 (264)
Space and water heating			1898.7381 (265)
Pumps and fans	67.6233	0.5190	35.0965 (267)
Energy for lighting	485.4707	0.5190	251.9593 (268)
Total CO2, kg/year			2185.7938 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			17.5200 (273)

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

DER		17.5200 ZC1
Total Floor Area	TFA	124.7400
Assumed number of occupants	N	2.8799
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190
CO2 emissions from appliances, equation (L14)		13.8364 ZC2
CO2 emissions from cooking, equation (L16)		1.5081 ZC3
Total CO2 emissions		32.8645 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		32.8645 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	63.5000 (1b)	x 2.4600 (2b)	= 156.2100 (1b) - (3b)
First floor	61.2400 (1c)	x 2.6500 (2c)	= 162.2860 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	124.7400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	318.4960 (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) = 0.1256 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3756 (18)
Number of sides sheltered					1 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3474 (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	0.4430	0.4343	0.4256	0.3822	0.3735	0.3300	0.3300	0.3214	0.3474	0.3735	0.3908	0.4082 (22b)
Effective ac	0.5981	0.5943	0.5906	0.5730	0.5697	0.5545	0.5545	0.5516	0.5604	0.5697	0.5764	0.5833 (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			2.1300	1.2000	2.5560		(26a)
TER Opening Type (Uw = 1.40)			18.5800	1.3258	24.6326		(27)
Heat Loss Floor 1			63.5000	0.1300	8.2550		(28a)
FLOOR OVER GARAGE			8.8000	0.1300	1.1440		(28b)
BRICK TF	181.7300	22.8700	158.8600	0.1800	28.5948		(29a)
CEILING	63.5000		63.5000	0.1300	8.2550		(30)
Total net area of external elements Aum(A, m ²)			317.5300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	75.5974		(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)							12.7078 (36)
Total fabric heat loss						(33) + (36) =	88.3052 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	62.8633	62.4629	62.0704	60.2270	59.8821	58.2765	58.2765	57.9791	58.8949	59.8821	60.5798	61.3093 (38)
Average = Sum(39)m / 12 =	151.1685	150.7681	150.3756	148.5321	148.1872	146.5816	146.5816	146.2843	147.2001	148.1872	148.8850	149.6144 (39)
												148.5305 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.2119	1.2087	1.2055	1.1907	1.1880	1.1751	1.1751	1.1727	1.1801	1.1880	1.1936	1.1994 (40)
Days in month												1.1907 (40)
	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.8799 (42)
Average daily hot water use (litres/day)												102.5980 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	112.8578	108.7538	104.6499	100.5460	96.4421	92.3382	92.3382	96.4421	100.5460	104.6499	108.7538	112.8578 (44)
Energy conte	167.3648	146.3783	151.0493	131.6885	126.3582	109.0375	101.0393	115.9441	117.3288	136.7354	149.2574	162.0839 (45)
Energy content (annual)											Total = Sum(45)m =	1614.2655 (45)
Distribution loss	(46)m = 0.15 x (45)m											
	25.1047	21.9567	22.6574	19.7533	18.9537	16.3556	15.1559	17.3916	17.5993	20.5103	22.3886	24.3126 (46)
Water storage loss:												
Store volume												300.0000 (47)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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 (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 (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	
225.9936 199.3334 209.6781 188.4260 184.9870 165.7751 159.6681 174.5729 174.0664 195.3642 205.9950 220.7127 (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	
225.9936 199.3334 209.6781 188.4260 184.9870 165.7751 159.6681 174.5729 174.0664 195.3642 205.9950 220.7127 (64)	
Heat gains from water heating, kWh/month	
102.5518 91.0348 97.1269 89.1765 88.9172 81.6450 80.4986 85.4545 84.4019 92.3676 95.0181 100.7959 (65)	
Total per year (kWh/year) = Sum(64)m =	2304.5725 (64)

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

Metabolic gains (Table 5), Watts	
(66)m	143.9957 143.9957 143.9957 143.9957 143.9957 143.9957 143.9957 143.9957 143.9957 143.9957 143.9957 143.9957 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	
27.4894 24.4158 19.8563 15.0325 11.2369 9.4867 10.2507 13.3243 17.8838 22.7076 26.5031 28.2534 (67)	
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	
291.2622 294.2846 286.6683 270.4540 249.9864 230.7498 217.8985 214.8761 222.4924 238.7067 259.1743 278.4109 (68)	
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	
37.3996 37.3996 37.3996 37.3996 37.3996 37.3996 37.3996 37.3996 37.3996 37.3996 37.3996 37.3996 (69)	
Pumps, fans	3.0000 3.0000 3.0000 3.0000 3.0000 3.0000 3.0000 3.0000 3.0000 3.0000 3.0000 3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	
-115.1966 -115.1966 -115.1966 -115.1966 -115.1966 -115.1966 -115.1966 -115.1966 -115.1966 -115.1966 -115.1966 -115.1966 (71)	
Water heating gains (Table 5)	
137.8385 135.4685 130.5470 123.8562 119.5123 113.3959 108.1971 114.8581 117.2248 124.1500 131.9696 135.4784 (72)	
Total internal gains	525.7888 523.3676 506.2702 478.5414 449.9344 422.8311 405.5450 412.2572 426.7998 454.7630 486.8458 511.3414 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
North				8.5100	10.6334	0.6300	0.7000	0.7700	27.6550 (74)			
East				4.0500	19.6403	0.6300	0.7000	0.7700	24.3094 (76)			
South				6.0200	46.7521	0.6300	0.7000	0.7700	86.0140 (78)			
Solar gains	137.9784	241.2732	347.5622	461.2764	545.6354	554.7010	529.3564	464.2532	386.5069	271.2785	166.3828	117.3694 (83)
Total gains	663.7671	764.6408	853.8324	939.8178	995.5698	977.5321	934.9014	876.5105	813.3067	726.0415	653.2286	628.7109 (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	57.3036 57.4558 57.6058 58.3207 58.4565 59.0968 59.0968 59.2169 58.8485 58.4565 58.1825 57.8988
alpha	4.8202 4.8304 4.8404 4.8880 4.8971 4.9398 4.9398 4.9478 4.9232 4.8971 4.8788 4.8599
util living area	0.9988 0.9974 0.9935 0.9795 0.9338 0.8141 0.6514 0.7069 0.9088 0.9866 0.9975 0.9991 (86)
MIT	19.6141 19.7599 20.0070 20.3448 20.6647 20.8933 20.9731 20.9600 20.7929 20.3832 19.9409 19.5932 (87)
Th 2	19.9105 19.9131 19.9156 19.9274 19.9296 19.9400 19.9400 19.9419 19.9360 19.9296 19.9252 19.9205 (88)
util rest of house	0.9984 0.9965 0.9910 0.9707 0.9026 0.7281 0.5132 0.5724 0.8531 0.9793 0.9965 0.9988 (89)
MIT 2	18.0599 18.2748 18.6369 19.1331 19.5781 19.8620 19.9293 19.9238 19.7548 19.1942 18.5483 18.0363 (90)
Living area fraction	fLA = Living area / (4) = 0.1708 (91)
MIT	18.3253 18.5284 18.8709 19.3400 19.7637 20.0381 20.1075 20.1008 19.9320 19.3972 18.7861 18.3021 (92)
Temperature adjustment	0.0000
adjusted MIT	18.3253 18.5284 18.8709 19.3400 19.7637 20.0381 20.1075 20.1008 19.9320 19.3972 18.7861 18.3021 (93)

8. Space heating requirement

Utilisation	0.9975	0.9947	0.9874	0.9640	0.8965	0.7372	0.5366	0.5946	0.8528	0.9740	0.9947	0.9980 (94)
Useful gains	662.0755	760.5762	843.0637	906.0264	892.4910	720.6727	501.7133	521.1342	693.6019	707.1356	649.7907	627.4812 (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	2120.1849	2054.7266	1860.2797	1550.6767	1194.9318	797.1302	514.1351	541.3649	858.4763	1303.6375	1739.8778	2109.8808 (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	1084.8334	869.6691	756.8087	464.1482	225.0160	0.0000	0.0000	0.0000	0.0000	443.7974	784.8627	1102.9053 (98)
Space heating												5732.0408 (98)
Space heating per m ²												(98) / (4) = 45.9519 (99)

8c. Space cooling requirement

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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													6130.5249 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	1084.8334	869.6691	756.8087	464.1482	225.0160	0.0000	0.0000	0.0000	0.0000	443.7974	784.8627	1102.9053	(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)	1160.2496	930.1274	809.4211	496.4152	240.6588	0.0000	0.0000	0.0000	0.0000	474.6497	839.4254	1179.5779	(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	225.9936	199.3334	209.6781	188.4260	184.9870	165.7751	159.6681	174.5729	174.0664	195.3642	205.9950	220.7127	(64)
Efficiency of water heater (217)m	88.4552	88.2925	87.9418	87.1268	85.3373	79.8000	79.8000	79.8000	79.8000	86.9370	88.0457	79.8000	(216)
Fuel for water heating, kWh/month	255.4894	225.7649	238.4283	216.2665	216.7715	207.7382	200.0854	218.7630	218.1283	224.7194	233.9638	249.3343	(219)
Water heating fuel used												2705.4528	(219)
Annual totals kWh/year													
Space heating fuel - main system												6130.5249	(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)												485.4707	(232)
Total delivered energy for all uses												9396.4484	(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	6130.5249	0.2160	1324.1934	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2705.4528	0.2160	584.3778	(264)
Space and water heating			1908.5712	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	485.4707	0.5190	251.9593	(268)
Total CO2, kg/m2/year			2199.4555	(272)
Emissions per m2 for space and water heating			15.3004	(272a)
Fuel factor (electricity)			1.5500	
Emissions per m2 for lighting			2.0199	(272b)
Emissions per m2 for pumps and fans			0.3120	(272c)
Target Carbon Dioxide Emission Rate (TER) = (15.3004 * 1.55) + 2.0199 + 0.3120, rounded to 2 d.p.			26.0500	(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	63.5000 (1b)	x 2.4600 (2b)	= 156.2100 (1b) - (3b)
First floor	61.2400 (1c)	x 2.6500 (2c)	= 162.2860 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	124.7400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 318.4960 (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) = 0.1256 (8)
Pressure test					Yes
Measured/design AP50					4.5000
Infiltration rate					0.3506 (18)
Number of sides sheltered					1 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3243 (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	0.4135	0.4054	0.3973	0.3567	0.3486	0.3081	0.3081	0.3000	0.3243	0.3486	0.3648	0.3810 (22b)
Effective ac	0.5855	0.5822	0.5789	0.5636	0.5608	0.5475	0.5475	0.5450	0.5526	0.5608	0.5666	0.5726 (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)			15.2500	1.3258	20.2178		(27)
FRENCH DOOR (Uw = 1.40)			3.3300	1.3258	4.4148		(27)
external door			2.1600	1.2000	2.5920		(26)
REAR DOOR			2.1300	1.4000	2.9820		(26a)
Heat Loss Floor 1			63.5000	0.1600	10.1600		(28a)
FLOOR OVER GARAGE			8.8000	0.2038	1.7931		(28b)
BRICK TF	181.7300	22.8700	158.8600	0.2300	36.5378		(29a)
CEILING	63.5000		63.5000	0.1400	8.8900		(30)
Total net area of external elements Aum(A, m ²)			317.5300				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		87.5874		(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)							15.3228 (36)
Total fabric heat loss						(33) + (36) =	102.9102 (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	61.5363	61.1874	60.8454	59.2392	58.9387	57.5397	57.5397	57.2807	58.0786	58.9387	59.5467	60.1822 (38)
Heat transfer coeff	164.4465	164.0976	163.7556	162.1494	161.8489	160.4499	160.4499	160.1909	160.9888	161.8489	162.4569	163.0924 (39)
Average = Sum(39)m / 12 =												162.1480 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.3183	1.3155	1.3128	1.2999	1.2975	1.2863	1.2863	1.2842	1.2906	1.2975	1.3024	1.3075 (40)
HLP (average)												1.2999 (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												2.8799 (42)
Average daily hot water use (litres/day)												102.5980 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	112.8578	108.7538	104.6499	100.5460	96.4421	92.3382	92.3382	96.4421	100.5460	104.6499	108.7538	112.8578 (44)
Energy conte	167.3648	146.3783	151.0493	131.6885	126.3582	109.0375	101.0393	115.9441	117.3288	136.7354	149.2574	162.0839 (45)
Energy content (annual)												Total = Sum(45)m = 1614.2655 (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	35.5650	31.1054	32.0980	27.9838	26.8511	23.1705	21.4709	24.6381	24.9324	29.0563	31.7172	34.4428 (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	143.9957	143.9957	143.9957	143.9957	143.9957	143.9957	143.9957	143.9957	143.9957	143.9957	143.9957	143.9957	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	27.4894	24.4158	19.8563	15.0325	11.2369	9.4867	10.2507	13.3243	17.8838	22.7076	26.5031	28.2534	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	291.2622	294.2846	286.6683	270.4540	249.9864	230.7498	217.8985	214.8761	222.4924	238.7067	259.1743	278.4109	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.3996	37.3996	37.3996	37.3996	37.3996	37.3996	37.3996	37.3996	37.3996	37.3996	37.3996	37.3996	(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)	-115.1966	-115.1966	-115.1966	-115.1966	-115.1966	-115.1966	-115.1966	-115.1966	-115.1966	-115.1966	-115.1966	-115.1966	(71)
Water heating gains (Table 5)	47.8024	46.2878	43.1424	38.8664	36.0902	32.1812	28.8587	33.1157	34.6283	39.0541	44.0517	46.2941	(72)
Total internal gains	432.7527	431.1869	415.8657	390.5516	363.5123	338.6164	323.2066	327.5149	341.2033	366.6672	395.9278	419.1571	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
North	8.5100	10.6334	0.7200	0.7000	0.7700	31.6057 (74)
East	0.7200	19.6403	0.7200	0.7000	0.7700	4.9391 (76)
South	6.0200	46.7521	0.7200	0.7000	0.7700	98.3017 (78)
East	3.3300	19.6403	0.7200	0.7000	0.7700	22.8431 (76)

Solar gains	157.6896	275.7408	397.2139	527.1730	623.5833	633.9440	604.9787	530.5751	441.7222	310.0326	190.1518	134.1365	(83)
Total gains	590.4423	706.9276	813.0796	917.7246	987.0956	972.5604	928.1853	858.0900	782.9255	676.6997	586.0796	553.2936	(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	21.0707	21.1155	21.1596	21.3692	21.4089	21.5955	21.5955	21.6304	21.5232	21.4089	21.3287	21.2456	
alpha	2.4047	2.4077	2.4106	2.4246	2.4273	2.4397	2.4397	2.4420	2.4349	2.4273	2.4219	2.4164	
util living area	0.9804	0.9690	0.9490	0.9089	0.8383	0.7283	0.6075	0.6537	0.8199	0.9315	0.9715	0.9832	(86)
MIT	18.0669	18.3492	18.8269	19.4644	20.0766	20.5643	20.8056	20.7593	20.3596	19.5653	18.7025	18.0176	(87)
Th 2	19.8265	19.8287	19.8308	19.8409	19.8428	19.8516	19.8516	19.8532	19.8482	19.8428	19.8390	19.8350	(88)
util rest of house	0.9771	0.9638	0.9399	0.8910	0.8020	0.6569	0.4921	0.5441	0.7654	0.9145	0.9658	0.9804	(89)
MIT 2	17.1519	17.4333	17.9073	18.5387	19.1258	19.5729	19.7627	19.7351	19.4028	18.6477	17.7936	17.1085	(90)
Living area fraction									fLA = Living area / (4) =			0.1708	(91)
MIT	17.3081	17.5897	18.0643	18.6968	19.2881	19.7422	19.9408	19.9100	19.5662	18.8044	17.9488	17.2637	(92)
Temperature adjustment												0.0000	
adjusted MIT	17.3081	17.5897	18.0643	18.6968	19.2881	19.7422	19.9408	19.9100	19.5662	18.8044	17.9488	17.2637	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9668	0.9497	0.9213	0.8682	0.7809	0.6490	0.5022	0.5503	0.7490	0.8940	0.9525	0.9712	(94)
Ext temp.	570.8547	671.3892	749.0545	796.7901	770.8124	631.1792	466.1235	472.2052	586.4340	604.9668	558.2525	537.3777	(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	2139.1406	2082.3422	1893.7227	1588.5439	1228.1277	825.0678	536.0303	562.2643	879.9985	1327.8691	1762.4606	2130.5975	(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	1166.8047	948.1604	851.6331	570.0627	340.2426	0.0000	0.0000	0.0000	0.0000	537.8393	867.0299	1185.3555	(98)
												6467.1282	(98)
												51.8449	(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	1508.2295	1187.3296	1217.4507	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.6414	0.7129	0.6793	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	967.3812	846.4581	827.0668	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1254.0318	1199.5828	1120.0475	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	206.3884	262.7247	217.9776	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												687.0908 (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	51.5971	65.6812	54.4944	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												171.7727 (107)
Space cooling per m2												1.3770 (108)
Energy for space heating												51.8449 (99)
Energy for space cooling												1.3770 (108)
Total												53.2219 (109)
Dwelling Fabric Energy Efficiency (DFEE)												53.2 (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	63.5000 (1b)	x 2.4600 (2b)	= 156.2100 (1b) - (3b)
First floor	61.2400 (1c)	x 2.6500 (2c)	= 162.2860 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	124.7400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 318.4960 (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) = 0.1256 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3756 (18)
Number of sides sheltered					1 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3474 (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	0.4430	0.4343	0.4256	0.3822	0.3735	0.3300	0.3300	0.3214	0.3474	0.3735	0.3908	0.4082 (22b)
Effective ac	0.5981	0.5943	0.5906	0.5730	0.5697	0.5545	0.5545	0.5516	0.5604	0.5697	0.5764	0.5833 (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			2.1300	1.2000	2.5560		(26a)
TER Opening Type (Uw = 1.40)			18.5800	1.3258	24.6326		(27)
Heat Loss Floor 1			63.5000	0.1300	8.2550		(28a)
FLOOR OVER GARAGE			8.8000	0.1300	1.1440		(28b)
BRICK TF	181.7300	22.8700	158.8600	0.1800	28.5948		(29a)
CEILING	63.5000		63.5000	0.1300	8.2550		(30)
Total net area of external elements Aum(A, m ²)			317.5300				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		75.5974		(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)							12.7078 (36)
Total fabric heat loss						(33) + (36) =	88.3052 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	62.8633	62.4629	62.0704	60.2270	59.8821	58.2765	58.2765	57.9791	58.8949	59.8821	60.5798	61.3093 (38)
Heat transfer coeff	151.1685	150.7681	150.3756	148.5321	148.1872	146.5816	146.5816	146.2843	147.2001	148.1872	148.8850	149.6144 (39)
Average = Sum(39)m / 12 =												148.5305 (39)
HLP	1.2119	1.2087	1.2055	1.1907	1.1880	1.1751	1.1751	1.1727	1.1801	1.1880	1.1936	1.1994 (40)
HLP (average)												1.1907 (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												2.8799 (42)
Average daily hot water use (litres/day)												102.5980 (43)
Daily hot water use	112.8578	108.7538	104.6499	100.5460	96.4421	92.3382	92.3382	96.4421	100.5460	104.6499	108.7538	112.8578 (44)
Energy conte	167.3648	146.3783	151.0493	131.6885	126.3582	109.0375	101.0393	115.9441	117.3288	136.7354	149.2574	162.0839 (45)
Energy content (annual)												Total = Sum(45)m = 1614.2655 (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:												
Total storage loss												

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Calculation Type: New Build (As Designed)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

	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	35.5650	31.1054	32.0980	27.9838	26.8511	23.1705	21.4709	24.6381	24.9324	29.0563	31.7172	34.4428 (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	143.9957	143.9957	143.9957	143.9957	143.9957	143.9957	143.9957	143.9957	143.9957	143.9957	143.9957	143.9957	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	27.4894	24.4158	19.8563	15.0325	11.2369	9.4867	10.2507	13.3243	17.8838	22.7076	26.5031	28.2534	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	291.2622	294.2846	286.6683	270.4540	249.9864	230.7498	217.8985	214.8761	222.4924	238.7067	259.1743	278.4109	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.3996	37.3996	37.3996	37.3996	37.3996	37.3996	37.3996	37.3996	37.3996	37.3996	37.3996	37.3996	(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)	-115.1966	-115.1966	-115.1966	-115.1966	-115.1966	-115.1966	-115.1966	-115.1966	-115.1966	-115.1966	-115.1966	-115.1966	(71)
Water heating gains (Table 5)	47.8024	46.2878	43.1424	38.8664	36.0902	32.1812	28.8587	33.1157	34.6283	39.0541	44.0517	46.2941	(72)
Total internal gains	432.7527	431.1869	415.8657	390.5516	363.5123	338.6164	323.2066	327.5149	341.2033	366.6672	395.9278	419.1571	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	FF	Access factor Table 6d	Gains W	
North	8.5100	10.6334	0.6300		0.7000	0.7700	27.6550	(74)
East	4.0500	19.6403	0.6300		0.7000	0.7700	24.3094	(76)
South	6.0200	46.7521	0.6300		0.7000	0.7700	86.0140	(78)

Solar gains	137.9784	241.2732	347.5622	461.2764	545.6354	554.7010	529.3564	464.2532	386.5069	271.2785	166.3828	117.3694	(83)
Total gains	570.7311	672.4600	763.4279	851.8280	909.1477	893.3174	852.5630	791.7681	727.7102	637.9457	562.3106	536.5266	(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	57.3036	57.4558	57.6058	58.3207	58.4565	59.0968	59.0968	59.2169	58.8485	58.4565	58.1825	57.8988	
alpha	4.8202	4.8304	4.8404	4.8880	4.8971	4.9398	4.9398	4.9478	4.9232	4.8971	4.8788	4.8599	
util living area	0.9994	0.9985	0.9959	0.9862	0.9514	0.8513	0.6992	0.7579	0.9362	0.9922	0.9987	0.9996	(86)
MIT	19.5451	19.6920	19.9415	20.2846	20.6163	20.8669	20.9634	20.9454	20.7496	20.3209	19.8736	19.5246	(87)
Th 2	19.9105	19.9131	19.9156	19.9274	19.9296	19.9400	19.9400	19.9419	19.9360	19.9296	19.9252	19.9205	(88)
util rest of house	0.9992	0.9980	0.9943	0.9799	0.9266	0.7724	0.5579	0.6242	0.8921	0.9877	0.9982	0.9994	(89)
MIT 2	18.5782	18.7269	18.9777	19.3272	19.6477	19.8705	19.9295	19.9240	19.7788	19.3670	18.9181	18.5656	(90)
Living area fraction									fLA = Living area / (4) =			0.1708	(91)
MIT	18.7433	18.8917	19.1423	19.4906	19.8131	20.0406	20.1060	20.0984	19.9446	19.5299	19.0813	18.7293	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.7433	18.8917	19.1423	19.4906	19.8131	20.0406	20.1060	20.0984	19.9446	19.5299	19.0813	18.7293	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9989	0.9973	0.9927	0.9765	0.9232	0.7812	0.5821	0.6466	0.8925	0.9853	0.9975	0.9992	(94)
Ext temp.	570.0760	670.6270	757.8822	831.8092	839.2965	697.8864	496.2998	511.9652	649.4952	628.5442	560.9306	536.0762	(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	2183.3721	2109.4955	1901.0941	1573.0513	1202.2540	797.4923	513.9206	541.0161	860.3237	1323.2964	1783.8310	2173.7972	(97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000	(97a)
Space heating per m2	1200.2923	966.9196	850.5497	533.6943	270.0403	0.0000	0.0000	0.0000	0.0000	516.8957	880.4883	1218.4645	(98)
										(98) / (4) =		51.6061	(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	1377.8675	1084.7042	1111.7608	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7536	0.8415	0.8040	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1038.4020	912.7948	893.9061	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1161.4101	1111.1930	1042.5284	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													

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

	0.0000	0.0000	0.0000	0.0000	0.0000	88.5659	147.6083	110.5750	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												346.7492 (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	22.1415	36.9021	27.6438	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling												86.6873 (107)
Space cooling per m2												0.6949 (108)
Energy for space heating												51.6061 (99)
Energy for space cooling												0.6949 (108)
Total												52.3010 (109)
Target Fabric Energy Efficiency (TFEE)												60.1 (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	63.5000 (1b)	x 2.4600 (2b)	= 156.2100 (1b) - (3b)
First floor	61.2400 (1c)	x 2.6500 (2c)	= 162.2860 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	124.7400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 318.4960 (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) =																		Air changes per hour	
Pressure test																		0.0000 / (5) =	0.0000 (8)
Measured/design AP50																		Yes	
Infiltration rate																		4.5000	
Number of sides sheltered																		0.2250 (18)	
																		1 (19)	
Shelter factor																	(20) = 1 - [0.075 x (19)] =	0.9250 (20)	
Infiltration rate adjusted to include shelter factor																	(21) = (18) x (20) =	0.2081 (21)	
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec							
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																			
0.2341	0.2341	0.2289	0.2029	0.1977	0.1769	0.1717	0.1717	0.1821	0.1977	0.2029	0.2133 (22b)								
Mechanical extract ventilation - decentralised																			
If mechanical ventilation:																		0.5000 (23a)	
Effective ac	0.5000	0.5000	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 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)			15.2500	1.3258	20.2178		(27)					
FRENCH DOOR (Uw = 1.40)			3.3300	1.3258	4.4148		(27)					
external door			2.1600	1.2000	2.5920		(26)					
REAR DOOR			2.1300	1.4000	2.9820		(26a)					
Heat Loss Floor 1			63.5000	0.1600	10.1600		(28a)					
FLOOR OVER GARAGE			8.8000	0.2038	1.7931		(28b)					
BRICK TF	181.7300	22.8700	158.8600	0.2300	36.5378		(29a)					
CEILING	63.5000		63.5000	0.1400	8.8900		(30)					
Total net area of external elements Aum(A, m2)			317.5300				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	87.5874		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							100.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							15.3228 (36)					
Total fabric heat loss						(33) + (36) =	102.9102 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 52.5518	Feb 52.5518	Mar 52.5518	Apr 52.5518	May 52.5518	Jun 52.5518	Jul 52.5518	Aug 52.5518	Sep 52.5518	Oct 52.5518	Nov 52.5518	Dec 52.5518 (38)
Heat transfer coeff	155.4620	155.4620	155.4620	155.4620	155.4620	155.4620	155.4620	155.4620	155.4620	155.4620	155.4620	155.4620 (39)
Average = Sum(39)m / 12 =												155.4620 (39)
HLP	Jan 1.2463	Feb 1.2463	Mar 1.2463	Apr 1.2463	May 1.2463	Jun 1.2463	Jul 1.2463	Aug 1.2463	Sep 1.2463	Oct 1.2463	Nov 1.2463	Dec 1.2463 (40)
HLP (average)												1.2463 (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												2.8799 (42)
Average daily hot water use (litres/day)												102.5980 (43)
Daily hot water use	Jan 112.8578	Feb 108.7538	Mar 104.6499	Apr 100.5460	May 96.4421	Jun 92.3382	Jul 92.3382	Aug 96.4421	Sep 100.5460	Oct 104.6499	Nov 108.7538	Dec 112.8578 (44)
Energy conte	167.3648	146.3783	151.0493	131.6885	126.3582	109.0375	101.0393	115.9441	117.3288	136.7354	149.2574	162.0839 (45)
Energy content (annual)										Total = Sum(45)m =		1614.2655 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF HEAT DEMAND 09 Jan 2014

Distribution loss (46)m = 0.15 x (45)m	25.1047	21.9567	22.6574	19.7533	18.9537	16.3556	15.1559	17.3916	17.5993	20.5103	22.3886	24.3126 (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												
228.1248 201.2583 211.8093 190.4885 187.1182 167.8375 161.7993 176.7041 176.1288 197.4954 208.0574 222.8439 (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	228.1248	201.2583	211.8093	190.4885	187.1182	167.8375	161.7993	176.7041	176.1288	197.4954	208.0574	222.8439 (64)
RHI water heating demand												2329.6655 (64)
Heat gains from water heating, kWh/month	104.2568	92.5748	98.8319	90.8264	90.6221	83.2950	82.2036	87.1594	86.0518	94.0725	96.6681	102.5009 (65)
												2330 (64)

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

Metabolic gains (Table 5), Watts												
(66)m	172.7949	172.7949	172.7949	172.7949	172.7949	172.7949	172.7949	172.7949	172.7949	172.7949	172.7949	172.7949 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	68.7234	61.0395	49.6407	37.5812	28.0924	23.7168	25.6268	33.3107	44.7095	56.7690	66.2578	70.6334 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	434.7197	439.2307	427.8631	403.6627	373.1140	344.4026	325.2217	320.7106	332.0783	356.2787	386.8273	415.5387 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.1594	55.1594	55.1594	55.1594	55.1594	55.1594	55.1594	55.1594	55.1594	55.1594	55.1594	55.1594 (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)	-115.1966	-115.1966	-115.1966	-115.1966	-115.1966	-115.1966	-115.1966	-115.1966	-115.1966	-115.1966	-115.1966	-115.1966 (71)
Water heating gains (Table 5)	140.1301	137.7601	132.8386	126.1478	121.8039	115.6875	110.4887	117.1497	119.5164	126.4416	134.2612	137.7700 (72)
Total internal gains	756.3309	750.7880	723.1000	680.1493	635.7680	596.5646	574.0948	583.9287	609.0619	652.2469	700.1040	736.6998 (73)

6. Solar gains

[Jan]												
Area	8.5100											
Solar flux	11.3201											
Specific data	0.7200											
Specific data	0.7200											
Access factor	0.7700											
Gains	33.6469 (74)											
North												
East												
South												
East												
Solar gains	166.4363	295.6780	427.9587	581.2283	649.0730	713.3892	656.2215	586.7325	492.8907	341.5487	225.9609	156.4731 (83)
Total gains	922.7672	1046.4660	1151.0587	1261.3776	1284.8410	1309.9537	1230.3163	1170.6612	1101.9526	993.7956	926.0649	893.1729 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec												
tau	22.2884	22.2884	22.2884	22.2884	22.2884	22.2884	22.2884	22.2884	22.2884	22.2884	22.2884	22.2884
alpha	2.4859	2.4859	2.4859	2.4859	2.4859	2.4859	2.4859	2.4859	2.4859	2.4859	2.4859	2.4859
util living area	0.9494	0.9309	0.8969	0.8356	0.7503	0.5978	0.4901	0.5174	0.7086	0.8615	0.9266	0.9532 (86)
Tweekday	18.6213	18.7087	18.8764	19.0687	19.2318	19.3551	19.3919	19.3883	19.3058	19.0899	18.8308	18.6013
Tweekend	20.4057	20.4451	20.5209	20.6093	20.6866	20.7506	20.7729	20.7700	20.7222	20.6172	20.4992	20.3967
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	20.0829	20.1417	20.2605	20.3899	20.5163	20.6169	20.6495	20.6451	20.5663	20.4092	20.2181	20.0689 (87)
Th 2	19.8831	19.8831	19.8831	19.8831	19.8831	19.8831	19.8831	19.8831	19.8831	19.8831	19.8831	19.8831 (88)
util rest of house												
0.9418 0.9207 0.8810 0.8086 0.7052 0.5210 0.3863 0.4132 0.6441 0.8336 0.9140 0.9462 (89)												
Tweekday	18.6213	18.7087	18.8764	19.0687	19.2318	19.3551	19.3919	19.3883	19.3058	19.0899	18.8308	18.6013
Tweekend	18.6213	18.7087	18.8764	19.0687	19.2318	19.3551	19.3919	19.3883	19.3058	19.0899	18.8308	18.6013
MIT 2	18.6213	18.7087	18.8764	19.0687	19.2318	19.3551	19.3919	19.3883	19.3058	19.0899	18.8308	18.6013 (90)
Living area fraction												
MIT	18.8709	18.9534	19.1127	19.2943	19.4512	19.5705	19.6067	19.6029	19.5211	19.3152	19.0677	0.1708 (91)
Temperature adjustment												18.8519 (92)
adjusted MIT	18.8709	18.9534	19.1127	19.2943	19.4512	19.5705	19.6067	19.6029	19.5211	19.3152	19.0677	0.0000 (93)

8. Space heating requirement

Utilisation	0.9335	0.9106	0.8680	0.7921	0.6851	0.4969	0.3579	0.3841	0.6198	0.8165	0.9028	0.9383 (94)
Useful gains	861.4278	952.9500	999.1523	999.1523	880.2926	650.9254	440.3538	449.5945	682.9509	811.4418	836.0533	838.0956 (95)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF HEAT DEMAND 09 Jan 2014

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	2265.2233	2200.3190	1945.2557	1600.3788	1189.4672	741.6373	467.4220	482.3878	858.3138	1370.4218	1860.5162	2277.8157 (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	1044.4238	838.2320	703.9009	432.8831	230.0259	0.0000	0.0000	0.0000	0.0000	415.8811	737.6133	1071.1518 (98)
Space heating												5474.1119 (98)
RHI space heating demand												5474 (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	63.5000 (1b)	x 2.4600 (2b)	= 156.2100 (1b) - (3b)
First floor	61.2400 (1c)	x 2.6500 (2c)	= 162.2860 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	124.7400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 318.4960 (5)

2. Ventilation rate

										main	secondary	other	total	m3 per hour							
										heating	heating										
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														1 (19)							
Shelter factor										(20) = 1 - [0.075 x (19)] =				0.9250 (20)							
Infiltration rate adjusted to include shelter factor										(21) = (18) x (20) =				0.2081 (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	0.2654	0.2602	0.2550	0.2289	0.2237	0.1977	0.1977	0.1925	0.2081	0.2237	0.2341	0.2445 (22b)									
Mechanical extract ventilation - decentralised																					
If mechanical ventilation:										0.5000 (23a)											
Effective ac	0.5154	0.5102	0.5050	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)			15.2500	1.3258	20.2178		(27)
FRENCH DOOR (Uw = 1.40)			3.3300	1.3258	4.4148		(27)
external door			2.1600	1.2000	2.5920		(26)
REAR DOOR			2.1300	1.4000	2.9820		(26a)
Heat Loss Floor 1			63.5000	0.1600	10.1600		(28a)
FLOOR OVER GARAGE			8.8000	0.2038	1.7931		(28b)
BRICK TF	181.7300	22.8700	158.8600	0.2300	36.5378		(29a)
CEILING	63.5000		63.5000	0.1400	8.8900		(30)
Total net area of external elements Aum(A, m ²)			317.5300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	87.5874		(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K
Thermal bridges (Sum(L x Psi) calculated using Appendix K)
Total fabric heat loss

100.0000 (35)
15.3228 (36)
(33) + (36) = 102.9102 (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	54.1662	53.6193	53.0724	52.5518	52.5518	52.5518	52.5518	52.5518	52.5518	52.5518	52.5518	52.5518 (38)
Heat transfer coeff	157.0764	156.5295	155.9826	155.4620	155.4620	155.4620	155.4620	155.4620	155.4620	155.4620	155.4620	155.4620 (39)
Average = Sum(39)m / 12 =												155.7289 (39)
HLP	Jan 1.2592	Feb 1.2548	Mar 1.2505	Apr 1.2463	May 1.2463	Jun 1.2463	Jul 1.2463	Aug 1.2463	Sep 1.2463	Oct 1.2463	Nov 1.2463	Dec 1.2463 (40)
HLP (average)												1.2484 (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												2.8799 (42)
Average daily hot water use (litres/day)												102.5980 (43)
Daily hot water use	Jan 112.8578	Feb 108.7538	Mar 104.6499	Apr 100.5460	May 96.4421	Jun 92.3382	Jul 92.3382	Aug 96.4421	Sep 100.5460	Oct 104.6499	Nov 108.7538	Dec 112.8578 (44)
Energy conte	167.3648	146.3783	151.0493	131.6885	126.3582	109.0375	101.0393	115.9441	117.3288	136.7354	149.2574	162.0839 (45)
Energy content (annual)										Total = Sum(45)m =		1614.2655 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Distribution loss (46)m = 0.15 x (45)m	25.1047	21.9567	22.6574	19.7533	18.9537	16.3556	15.1559	17.3916	17.5993	20.5103	22.3886	24.3126 (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												
228.1248 201.2583 211.8093 190.4885 187.1182 167.8375 161.7993 176.7041 176.1288 197.4954 208.0574 222.8439 (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	228.1248	201.2583	211.8093	190.4885	187.1182	167.8375	161.7993	176.7041	176.1288	197.4954	208.0574	222.8439 (64)
Total per year (kWh/year) = Sum(64)m =												2329.6655 (64)
Heat gains from water heating, kWh/month												
104.2568 92.5748 98.8319 90.8264 90.6221 83.2950 82.2036 87.1594 86.0518 94.0725 96.6681 102.5009 (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	172.7949	172.7949	172.7949	172.7949	172.7949	172.7949	172.7949	172.7949	172.7949	172.7949	172.7949	172.7949 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
68.7234 61.0395 49.6407 37.5812 28.0924 23.7168 25.6268 33.3107 44.7095 56.7690 66.2578 70.6334 (67)												
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
434.7197 439.2307 427.8631 403.6627 373.1140 344.4026 325.2217 320.7106 332.0783 356.2787 386.8273 415.5387 (68)												
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
55.1594 55.1594 55.1594 55.1594 55.1594 55.1594 55.1594 55.1594 55.1594 55.1594 55.1594 55.1594 (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)												
-115.1966 -115.1966 -115.1966 -115.1966 -115.1966 -115.1966 -115.1966 -115.1966 -115.1966 -115.1966 -115.1966 -115.1966 (71)												
Water heating gains (Table 5)												
140.1301 137.7601 132.8386 126.1478 121.8039 115.6875 110.4887 117.1497 119.5164 126.4416 134.2612 137.7700 (72)												
Total internal gains	756.3309	750.7880	723.1000	680.1493	635.7680	596.5646	574.0948	583.9287	609.0619	652.2469	700.1040	736.6998 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data FF or Table 6c	Access factor Table 6d	Gains W
North	8.5100	10.6334	0.7200	0.7000	0.7700	31.6057 (74)
East	0.7200	19.6403	0.7200	0.7000	0.7700	4.9391 (76)
South	6.0200	46.7521	0.7200	0.7000	0.7700	98.3017 (78)
East	3.3300	19.6403	0.7200	0.7000	0.7700	22.8431 (76)

Solar gains	157.6896	275.7408	397.2139	527.1730	623.5833	633.9440	604.9787	530.5751	441.7222	310.0326	190.1518	134.1365 (83)
Total gains	914.0204	1026.5288	1120.3139	1207.3224	1259.3513	1230.5086	1179.0735	1114.5039	1050.7841	962.2795	890.2559	870.8363 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec												
tau	22.0593	22.1364	22.2140	22.2884	22.2884	22.2884	22.2884	22.2884	22.2884	22.2884	22.2884	22.2884
alpha	2.4706	2.4758	2.4809	2.4859	2.4859	2.4859	2.4859	2.4859	2.4859	2.4859	2.4859	2.4859
util living area	0.9506	0.9329	0.9033	0.8488	0.7605	0.6341	0.5061	0.5447	0.7204	0.8667	0.9320	0.9556 (86)
Tweekday	18.5962	18.6942	18.8522	19.0478	19.2222	19.3426	19.3904	19.3842	19.3031	19.0872	18.8169	18.5918
Tweekend	20.3985	20.4412	20.5111	20.5993	20.6817	20.7430	20.7715	20.7669	20.7204	20.6157	20.4929	20.3924
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	20.0717	20.1357	20.2455	20.3743	20.5088	20.6052	20.6474	20.6402	20.5633	20.4069	20.2082	20.0623 (87)
Th 2	19.8729	19.8764	19.8798	19.8831	19.8831	19.8831	19.8831	19.8831	19.8831	19.8831	19.8831	19.8831 (88)
util rest of house	0.9431	0.9229	0.8882	0.8235	0.7167	0.5600	0.4005	0.4407	0.6557	0.8392	0.9201	0.9489 (89)
Tweekday	18.5962	18.6942	18.8522	19.0478	19.2222	19.3426	19.3904	19.3842	19.3031	19.0872	18.8169	18.5918
Tweekend	18.5962	18.6942	18.8522	19.0478	19.2222	19.3426	19.3904	19.3842	19.3031	19.0872	18.8169	18.5918
MIT 2	18.5962	18.6942	18.8522	19.0478	19.2222	19.3426	19.3904	19.3842	19.3031	19.0872	18.8169	18.5918 (90)
Living area fraction									fLA = Living area / (4) =			0.1708 (91)
MIT	18.8482	18.9403	19.0901	19.2743	19.4419	19.5582	19.6050	19.5987	19.5183	19.3125	19.0545	18.8429 (92)
Temperature adjustment												0.0000
adjusted MIT	18.8482	18.9403	19.0901	19.2743	19.4419	19.5582	19.6050	19.5987	19.5183	19.3125	19.0545	18.8429 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0.9349 0.9129 0.8757 0.8074 0.6968 0.5354 0.3713 0.4108 0.6308 0.8222 0.9094 0.9413 (94)												
Useful gains	854.5437	937.0970	981.0164	974.8200	877.5187	658.8662	437.7618	457.8667	662.8669	791.2139	809.6298	819.7083 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS 09 Jan 2014

Heat loss rate W	2285.1728	2197.7279	1963.8324	1612.8127	1203.5731	770.8148	467.1677	497.2730	842.3450	1354.4674	1858.4710	2276.4097 (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	1064.3881	847.1440	731.2151	459.3547	242.5845	0.0000	0.0000	0.0000	0.0000	419.0606	755.1657	1083.7859 (98)
Space heating												5602.6985 (98)
Space heating per m2											(98) / (4) =	44.9150 (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 %)												264.0344 (206)
Efficiency of secondary/supplementary heating system, %												100.0000 (208)
Space heating requirement												2121.9574 (211)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	1064.3881	847.1440	731.2151	459.3547	242.5845	0.0000	0.0000	0.0000	0.0000	419.0606	755.1657	1083.7859 (98)
Space heating efficiency (main heating system 1)	264.0344	264.0344	264.0344	264.0344	264.0344	0.0000	0.0000	0.0000	0.0000	264.0344	264.0344	264.0344 (210)
Space heating fuel (main heating system)	403.1247	320.8460	276.9393	173.9753	91.8761	0.0000	0.0000	0.0000	0.0000	158.7144	286.0103	410.4714 (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	228.1248	201.2583	211.8093	190.4885	187.1182	167.8375	161.7993	176.7041	176.1288	197.4954	208.0574	222.8439 (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	120.3952	106.2161	111.7845	100.5322	98.7535	88.5780	85.3912	93.2574	92.9538	104.2302	109.8044	117.6081 (219)
Water heating fuel used												1229.5047 (219)
Annual totals kWh/year												
Space heating fuel - main system												2121.9574 (211)
Space heating fuel - secondary												0.0000 (215)
Electricity for pumps and fans:												
(MEV)Decentralised, Database: total watage = 7.8315, total flow = 45.0000, SFP = 0.1740)												
mechanical ventilation fans (SFP = 0.1740)												67.6233 (230a)
Total electricity for the above, kWh/year												67.6233 (231)
Electricity for lighting (calculated in Appendix L)												485.4707 (232)
Total delivered energy for all uses												3904.5560 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2121.9574	13.1900	279.8862 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1229.5047	13.1900	162.1717 (247)
Mechanical ventilation fans	67.6233	13.1900	8.9195 (249)
Pumps and fans for heating	0.0000	0.0000	0.0000 (249)
Energy for lighting	485.4707	13.1900	64.0336 (250)
Additional standing charges			0.0000 (251)
Total energy cost			515.0109 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] =	0.4200 (256)
SAP value		1.2743 (257)
SAP rating (Section 12)		82.2231
SAP band		B (258)

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	2121.9574	0.5190	1101.2959 (261)
Space heating - secondary	0.0000	0.5190	0.0000 (263)
Water heating (other fuel)	1229.5047	0.5190	638.1129 (264)
Space and water heating			1739.4088 (265)
Pumps and fans	67.6233	0.5190	35.0965 (267)
Energy for lighting	485.4707	0.5190	251.9593 (268)
Total kg/year			2026.4646 (272)
CO2 emissions per m2			16.2500 (273)
EI value			84.0022
EI rating			B (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	$13.19 \times (1 + 0.29 \times 0.75) / 2.6403 = 6.082$, stars = 3
Main heating environmental impact	$0.519 \times (1 + 0.29 \times 0.75) / 2.6403 = 0.2393$, 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	63.5000 (1b)	x 2.4600 (2b)	= 156.2100 (1b) - (3b)
First floor	61.2400 (1c)	x 2.6500 (2c)	= 162.2860 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	124.7400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 318.4960 (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											1 (19)	
Shelter factor											(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor											(21) = (18) x (20) =	0.2081 (21)
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	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	0.2341	0.2341	0.2289	0.2029	0.1977	0.1769	0.1717	0.1717	0.1821	0.1977	0.2029	0.2133 (22b)
Mechanical extract ventilation - decentralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5000	0.5000	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)			15.2500	1.3258	20.2178		(27)
FRENCH DOOR (Uw = 1.40)			3.3300	1.3258	4.4148		(27)
external door			2.1600	1.2000	2.5920		(26)
REAR DOOR			2.1300	1.4000	2.9820		(26a)
Heat Loss Floor 1			63.5000	0.1600	10.1600		(28a)
FLOOR OVER GARAGE			8.8000	0.2038	1.7931		(28b)
BRICK TF	181.7300	22.8700	158.8600	0.2300	36.5378		(29a)
CEILING	63.5000		63.5000	0.1400	8.8900		(30)
Total net area of external elements Aum(A, m ²)			317.5300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	87.5874		(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 100.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 15.3228 (36)
Total fabric heat loss (33) + (36) = 102.9102 (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	52.5518	52.5518	52.5518	52.5518	52.5518	52.5518	52.5518	52.5518	52.5518	52.5518	52.5518	52.5518 (38)
Heat transfer coeff	155.4620	155.4620	155.4620	155.4620	155.4620	155.4620	155.4620	155.4620	155.4620	155.4620	155.4620	155.4620 (39)
Average = Sum(39)m / 12 =												155.4620 (39)
HLP	1.2463	1.2463	1.2463	1.2463	1.2463	1.2463	1.2463	1.2463	1.2463	1.2463	1.2463	1.2463 (40)
HLP (average)												1.2463 (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												2.8799 (42)
Average daily hot water use (litres/day)												102.5980 (43)
Daily hot water use	Jan 112.8578	Feb 108.7538	Mar 104.6499	Apr 100.5460	May 96.4421	Jun 92.3382	Jul 92.3382	Aug 96.4421	Sep 100.5460	Oct 104.6499	Nov 108.7538	Dec 112.8578 (44)
Energy conte	167.3648	146.3783	151.0493	131.6885	126.3582	109.0375	101.0393	115.9441	117.3288	136.7354	149.2574	162.0839 (45)
Energy content (annual)										Total = Sum(45)m =		1614.2655 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

Distribution loss (46)m = 0.15 x (45)m	25.1047	21.9567	22.6574	19.7533	18.9537	16.3556	15.1559	17.3916	17.5993	20.5103	22.3886	24.3126 (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												
228.1248 201.2583 211.8093 190.4885 187.1182 167.8375 161.7993 176.7041 176.1288 197.4954 208.0574 222.8439 (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	228.1248	201.2583	211.8093	190.4885	187.1182	167.8375	161.7993	176.7041	176.1288	197.4954	208.0574	222.8439 (64)
Total per year (kWh/year) = Sum(64)m =												2329.6655 (64)
Heat gains from water heating, kWh/month												
104.2568 92.5748 98.8319 90.8264 90.6221 83.2950 82.2036 87.1594 86.0518 94.0725 96.6681 102.5009 (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	172.7949	172.7949	172.7949	172.7949	172.7949	172.7949	172.7949	172.7949	172.7949	172.7949	172.7949	172.7949 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
68.7234 61.0395 49.6407 37.5812 28.0924 23.7168 25.6268 33.3107 44.7095 56.7690 66.2578 70.6334 (67)												
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
434.7197 439.2307 427.8631 403.6627 373.1140 344.4026 325.2217 320.7106 332.0783 356.2787 386.8273 415.5387 (68)												
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
55.1594 55.1594 55.1594 55.1594 55.1594 55.1594 55.1594 55.1594 55.1594 55.1594 55.1594 55.1594 (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)												
-115.1966 -115.1966 -115.1966 -115.1966 -115.1966 -115.1966 -115.1966 -115.1966 -115.1966 -115.1966 -115.1966 -115.1966 (71)												
Water heating gains (Table 5)												
140.1301 137.7601 132.8386 126.1478 121.8039 115.6875 110.4887 117.1497 119.5164 126.4416 134.2612 137.7700 (72)												
Total internal gains	756.3309	750.7880	723.1000	680.1493	635.7680	596.5646	574.0948	583.9287	609.0619	652.2469	700.1040	736.6998 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data FF or Table 6c	Access factor Table 6d	Gains W
North	8.5100	11.3201	0.7200	0.7000	0.7700	33.6469 (74)
East	0.7200	21.0039	0.7200	0.7000	0.7700	5.2820 (76)
South	6.0200	49.0238	0.7200	0.7000	0.7700	103.0783 (78)
East	3.3300	21.0039	0.7200	0.7000	0.7700	24.4292 (76)

Solar gains	166.4363	295.6780	427.9587	581.2283	649.0730	713.3892	656.2215	586.7325	492.8907	341.5487	225.9609	156.4731 (83)
Total gains	922.7672	1046.4660	1151.0587	1261.3776	1284.8410	1309.9537	1230.3163	1170.6612	1101.9526	993.7956	926.0649	893.1729 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec												
tau	22.2884	22.2884	22.2884	22.2884	22.2884	22.2884	22.2884	22.2884	22.2884	22.2884	22.2884	22.2884
alpha	2.4859	2.4859	2.4859	2.4859	2.4859	2.4859	2.4859	2.4859	2.4859	2.4859	2.4859	2.4859
util living area	0.9494	0.9309	0.8969	0.8356	0.7503	0.5978	0.4901	0.5174	0.7086	0.8615	0.9266	0.9532 (86)
Tweekday	18.6213	18.7087	18.8764	19.0687	19.2318	19.3551	19.3919	19.3883	19.3058	19.0899	18.8308	18.6013
Tweekend	20.4057	20.4451	20.5209	20.6093	20.6866	20.7506	20.7729	20.7700	20.7222	20.6172	20.4992	20.3967
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	20.0829	20.1417	20.2605	20.3899	20.5163	20.6169	20.6495	20.6451	20.5663	20.4092	20.2181	20.0689 (87)
Th 2	19.8831	19.8831	19.8831	19.8831	19.8831	19.8831	19.8831	19.8831	19.8831	19.8831	19.8831	19.8831 (88)
util rest of house	0.9418	0.9207	0.8810	0.8086	0.7052	0.5210	0.3863	0.4132	0.6441	0.8336	0.9140	0.9462 (89)
Tweekday	18.6213	18.7087	18.8764	19.0687	19.2318	19.3551	19.3919	19.3883	19.3058	19.0899	18.8308	18.6013
Tweekend	18.6213	18.7087	18.8764	19.0687	19.2318	19.3551	19.3919	19.3883	19.3058	19.0899	18.8308	18.6013
MIT 2	18.6213	18.7087	18.8764	19.0687	19.2318	19.3551	19.3919	19.3883	19.3058	19.0899	18.8308	18.6013 (90)
Living area fraction									fLA = Living area / (4) =			0.1708 (91)
MIT	18.8709	18.9534	19.1127	19.2943	19.4512	19.5705	19.6067	19.6029	19.5211	19.3152	19.0677	18.8519 (92)
Temperature adjustment												0.0000
adjusted MIT	18.8709	18.9534	19.1127	19.2943	19.4512	19.5705	19.6067	19.6029	19.5211	19.3152	19.0677	18.8519 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0.9335 0.9106 0.8680 0.7921 0.6851 0.4969 0.3579 0.3841 0.6198 0.8165 0.9028 0.9383 (94)												
Useful gains	861.4278	952.9500	999.1523	999.1523	880.2926	650.9254	440.3538	449.5945	682.9509	811.4418	836.0533	838.0956 (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)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

Heat loss rate W	2265.2233	2200.3190	1945.2557	1600.3788	1189.4672	741.6373	467.4220	482.3878	858.3138	1370.4218	1860.5162	2277.8157 (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	1044.4238	838.2320	703.9009	432.8831	230.0259	0.0000	0.0000	0.0000	0.0000	415.8811	737.6133	1071.1518 (98)
Space heating												5474.1119 (98)
Space heating per m2											(98) / (4) =	43.8842 (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 %)												263.6950 (206)
Efficiency of secondary/supplementary heating system, %												100.0000 (208)
Space heating requirement												2075.9259 (211)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	1044.4238	838.2320	703.9009	432.8831	230.0259	0.0000	0.0000	0.0000	0.0000	415.8811	737.6133	1071.1518 (98)
Space heating efficiency (main heating system 1)	263.6950	263.6950	263.6950	263.6950	263.6950	0.0000	0.0000	0.0000	0.0000	263.6950	263.6950	263.6950 (210)
Space heating fuel (main heating system)	396.0727	317.8794	266.9376	164.1605	87.2318	0.0000	0.0000	0.0000	0.0000	157.7130	279.7222	406.2087 (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	228.1248	201.2583	211.8093	190.4885	187.1182	167.8375	161.7993	176.7041	176.1288	197.4954	208.0574	222.8439 (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	120.3952	106.2161	111.7845	100.5322	98.7535	88.5780	85.3912	93.2574	92.9538	104.2302	109.8044	117.6081 (219)
Water heating fuel used												1229.5047 (219)
Annual totals kWh/year												
Space heating fuel - main system												2075.9259 (211)
Space heating fuel - secondary												0.0000 (215)
Electricity for pumps and fans:												
(MEV)Decentralised, Database: total watage = 7.8315, total flow = 45.0000, SFP = 0.1740)												
mechanical ventilation fans (SFP = 0.1740)												67.6233 (230a)
Total electricity for the above, kWh/year												67.6233 (231)
Electricity for lighting (calculated in Appendix L)												485.4707 (232)
Total delivered energy for all uses												3858.5246 (238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2075.9259	20.4300	424.1117 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	1229.5047	20.4300	251.1878 (247)
Mechanical ventilation fans	67.6233	20.4300	13.8154 (249)
Pumps and fans for heating	0.0000	0.0000	0.0000 (249)
Energy for lighting	485.4707	20.4300	99.1817 (250)
Additional standing charges			0.0000 (251)
Total energy cost			788.2966 (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	2075.9259	0.5190	1077.4056 (261)
Space heating - secondary	0.0000	0.5190	0.0000 (263)
Water heating (other fuel)	1229.5047	0.5190	638.1129 (264)
Space and water heating			1715.5185 (265)
Pumps and fans	67.6233	0.5190	35.0965 (267)
Energy for lighting	485.4707	0.5190	251.9593 (268)
Total kg/year			2002.5743 (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	2075.9259	3.0700	6373.0926 (261)
Space heating - secondary	0.0000	3.0700	0.0000 (263)
Water heating (other fuel)	1229.5047	3.0700	3774.5794 (264)
Space and water heating			10147.6720 (265)
Pumps and fans	67.6233	3.0700	207.6035 (267)
Energy for lighting	485.4707	3.0700	1490.3949 (268)
Primary energy kWh/year			11845.6705 (272)
Primary energy kWh/m2/year			94.9629 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating: B 82
Current environmental impact rating: B 84

(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	+ 2.0	-£ 95	-240 kg (12.0%)
U Solar photovoltaic panels	+ 7.9	-£ 388	-985 kg (55.9%)

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
Solar water heating	£95	1.93 kg/m²	B 84 B 86
Solar photovoltaic panels	£388	7.89 kg/m²	A 92 A 93
Total Savings	£482	9.82 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	£788	£694	£95
Space heating	£438	£438	-£1
Water heating	£251	£156	£95
Lighting	£99	£99	£0
Generated (PV)	-£0	-£388	£388
Total cost of fuels	£788	£306	£483
Total cost of uses	£788	£305	£482
Delivered energy	31 kWh/m²	12 kWh/m²	19 kWh/m²
Carbon dioxide emissions	2.0 tonnes	0.8 tonnes	1.2 tonnes
CO2 emissions per m²	16 kg/m²	6 kg/m²	10 kg/m²
Primary energy	95 kWh/m²	37 kWh/m²	58 kWh/m²

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	63.5000 (1b)	x 2.4600 (2b)	= 156.2100 (1b) - (3b)
First floor	61.2400 (1c)	x 2.6500 (2c)	= 162.2860 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	124.7400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	318.4960 (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											1 (19)	
Shelter factor											(20) = 1 - [0.075 x (19)] =	0.9250 (20)
Infiltration rate adjusted to include shelter factor											(21) = (18) x (20) =	0.2081 (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	0.2654	0.2602	0.2550	0.2289	0.2237	0.1977	0.1977	0.1925	0.2081	0.2237	0.2341	0.2445 (22b)
Mechanical extract ventilation - decentralised												
If mechanical ventilation:												0.5000 (23a)
Effective ac	0.5154	0.5102	0.5050	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)			15.2500	1.3258	20.2178		(27)
FRENCH DOOR (Uw = 1.40)			3.3300	1.3258	4.4148		(27)
external door			2.1600	1.2000	2.5920		(26)
REAR DOOR			2.1300	1.4000	2.9820		(26a)
Heat Loss Floor 1			63.5000	0.1600	10.1600		(28a)
FLOOR OVER GARAGE			8.8000	0.2038	1.7931		(28b)
BRICK TF	181.7300	22.8700	158.8600	0.2300	36.5378		(29a)
CEILING	63.5000		63.5000	0.1400	8.8900		(30)
Total net area of external elements Aum(A, m ²)			317.5300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	87.5874		(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K
Thermal bridges (Sum(L x Psi) calculated using Appendix K)
Total fabric heat loss

100.0000 (35)
15.3228 (36)
(33) + (36) = 102.9102 (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	54.1662	53.6193	53.0724	52.5518	52.5518	52.5518	52.5518	52.5518	52.5518	52.5518	52.5518	52.5518 (38)
Heat transfer coeff	157.0764	156.5295	155.9826	155.4620	155.4620	155.4620	155.4620	155.4620	155.4620	155.4620	155.4620	155.4620 (39)
Average = Sum(39)m / 12 =												155.7289 (39)
HLP	Jan 1.2592	Feb 1.2548	Mar 1.2505	Apr 1.2463	May 1.2463	Jun 1.2463	Jul 1.2463	Aug 1.2463	Sep 1.2463	Oct 1.2463	Nov 1.2463	Dec 1.2463 (40)
HLP (average)												1.2484 (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												2.8799 (42)
Average daily hot water use (litres/day)												102.5980 (43)
Daily hot water use	Jan 112.8578	Feb 108.7538	Mar 104.6499	Apr 100.5460	May 96.4421	Jun 92.3382	Jul 92.3382	Aug 96.4421	Sep 100.5460	Oct 104.6499	Nov 108.7538	Dec 112.8578 (44)
Energy conte	167.3648	146.3783	151.0493	131.6885	126.3582	109.0375	101.0393	115.9441	117.3288	136.7354	149.2574	162.0839 (45)
Energy content (annual)										Total = Sum(45)m =		1614.2655 (45)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

Distribution loss (46)m = 0.15 x (45)m	25.1047	21.9567	22.6574	19.7533	18.9537	16.3556	15.1559	17.3916	17.5993	20.5103	22.3886	24.3126 (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												
228.1248 201.2583 210.4136 183.7349 174.3239 155.2308 148.7724 164.6076 170.7259 196.0997 208.0574 222.8439 (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												1.1235 (H8)
Utilisation factor												0.5894 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												75.0000 (H13)
Daily hot water demand												102.5980 (H14)
Volume ratio Veff/V												0.7310 (H15)
Solar storage volume factor												0.9373 (H16)
Solar input												-880.9796 (H17)
Solar input	-25.5467	-42.6300	-72.6038	-97.3034	-120.2102	-118.1857	-116.6239	-101.8948	-79.8041	-54.4968	-30.3020	-21.3782 (63)
Solar input (sum of months) = Sum (63)m =												-880.9796 (63)
Output from w/h												
202.5781 158.6283 137.8098 86.4315 54.1137 37.0451 32.1485 62.7128 90.9218 141.6029 177.7554 201.4657 (64)												
Total per year (kWh/year) = Sum (64)m =												1383.2136 (64)
Heat gains from water heating, kWh/month												
104.2568 92.5748 97.7153 85.4235 80.3866 73.2096 71.7820 77.4822 81.7295 92.9559 96.6681 102.5009 (65)												

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

Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	172.7949	172.7949	172.7949	172.7949	172.7949	172.7949	172.7949	172.7949	172.7949	172.7949	172.7949	172.7949 (66)
68.7234 61.0395 49.6407 37.5812 28.0924 23.7168 25.6268 33.3107 44.7095 56.7690 66.2578 70.6334 (67)												
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	434.7197	439.2307	427.8631	403.6627	373.1140	344.4026	325.2217	320.7106	332.0783	356.2787	386.8273	415.5387 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.1594	55.1594	55.1594	55.1594	55.1594	55.1594	55.1594	55.1594	55.1594	55.1594	55.1594	55.1594 (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)	-115.1966	-115.1966	-115.1966	-115.1966	-115.1966	-115.1966	-115.1966	-115.1966	-115.1966	-115.1966	-115.1966	-115.1966 (71)
Water heating gains (Table 5)	140.1301	137.7601	131.3378	118.6438	108.0466	101.6800	96.4812	104.1428	113.5132	124.9408	134.2612	137.7700 (72)
Total internal gains	756.3309	750.7880	721.5992	672.6453	622.0107	582.5571	560.0873	570.9218	603.0587	650.7461	700.1040	736.6998 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
North				8.5100	10.6334	0.7200	0.7000	0.7700	31.6057 (74)			
East				0.7200	19.6403	0.7200	0.7000	0.7700	4.9391 (76)			
South				6.0200	46.7521	0.7200	0.7000	0.7700	98.3017 (78)			
East				3.3300	19.6403	0.7200	0.7000	0.7700	22.8431 (76)			
Solar gains	157.6896	275.7408	397.2139	527.1730	623.5833	633.9440	604.9787	530.5751	441.7222	310.0326	190.1518	134.1365 (83)
Total gains	914.0204	1026.5288	1118.8131	1199.8184	1245.5940	1216.5011	1165.0660	1101.4969	1044.7809	960.7787	890.2559	870.8363 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
tau	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
alpha	22.0593	22.1364	22.2140	22.2884	22.2884	22.2884	22.2884	22.2884	22.2884	22.2884	22.2884	22.2884
util living area	2.4706	2.4758	2.4809	2.4859	2.4859	2.4859	2.4859	2.4859	2.4859	2.4859	2.4859	2.4859
	0.9506	0.9329	0.9035	0.8504	0.7641	0.6385	0.5107	0.5492	0.7225	0.8671	0.9320	0.9556 (86)
Tweekday	18.5962	18.6942	18.8516	19.0457	19.2197	19.3414	19.3899	19.3837	19.3023	19.0867	18.8169	18.5918
Tweekend	20.3985	20.4412	20.5109	20.5982	20.6804	20.7422	20.7711	20.7664	20.7199	20.6155	20.4929	20.3924
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	20.0717	20.1357	20.2451	20.3727	20.5067	20.6040	20.6467	20.6395	20.5626	20.4066	20.2082	20.0623 (87)
Th 2	19.8729	19.8764	19.8798	19.8831	19.8831	19.8831	19.8831	19.8831	19.8831	19.8831	19.8831	19.8831 (88)
util rest of house												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

	0.9431	0.9229	0.8885	0.8252	0.7206	0.5644	0.4046	0.4449	0.6578	0.8396	0.9201	0.9489 (89)
Tweekday	18.5962	18.6942	18.8516	19.0457	19.2197	19.3414	19.3899	19.3837	19.3023	19.0867	18.8169	18.5918
Tweekend	18.5962	18.6942	18.8516	19.0457	19.2197	19.3414	19.3899	19.3837	19.3023	19.0867	18.8169	18.5918
MIT 2	18.5962	18.6942	18.8516	19.0457	19.2197	19.3414	19.3899	19.3837	19.3023	19.0867	18.8169	18.5918 (90)
Living area fraction									fLA = Living area / (4) =			0.1708 (91)
MIT	18.8482	18.9403	19.0896	19.2723	19.4394	19.5570	19.6045	19.5981	19.5175	19.3121	19.0545	18.8429 (92)
Temperature adjustment												0.0000
adjusted MIT	18.8482	18.9403	19.0896	19.2723	19.4394	19.5570	19.6045	19.5981	19.5175	19.3121	19.0545	18.8429 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9349	0.9129	0.8759	0.8092	0.7007	0.5398	0.3751	0.4148	0.6330	0.8226	0.9094	0.9413 (94)	
Useful gains	854.5437	937.0970	980.0146	970.8591	872.7585	656.6098	437.0009	456.9084	661.3144	790.3807	809.6298	819.7083 (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	2285.1728	2197.7279	1963.7544	1612.5004	1203.1897	770.6223	467.0932	497.1818	842.2149	1354.4015	1858.4710	2276.4097 (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	1064.3881	847.1440	731.9024	461.9817	245.8408	0.0000	0.0000	0.0000	0.0000	419.6315	755.1657	1083.7859 (98)	
Space heating												5609.8401 (98)	
Space heating per m2												44.9723 (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 %)													264.0344 (206)
Efficiency of secondary/supplementary heating system, %													100.0000 (208)
Space heating requirement													2124.6622 (211)
Space heating requirement	1064.3881	847.1440	731.9024	461.9817	245.8408	0.0000	0.0000	0.0000	0.0000	419.6315	755.1657	1083.7859 (98)	
Space heating efficiency (main heating system 1)	264.0344	264.0344	264.0344	264.0344	264.0344	0.0000	0.0000	0.0000	0.0000	264.0344	264.0344	264.0344 (210)	
Space heating fuel (main heating system)	403.1247	320.8460	277.1996	174.9703	93.1094	0.0000	0.0000	0.0000	0.0000	158.9306	286.0103	410.4714 (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	202.5781	158.6283	137.8098	86.4315	54.1137	37.0451	32.1485	62.7128	90.9218	141.6029	177.7554	201.4657 (64)	
Efficiency of water heater (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	106.9127	83.7177	72.7305	45.6151	28.5591	19.5509	16.9667	33.0973	47.9849	74.7324	93.8122	106.3256 (219)	
Water heating fuel used												730.0050 (219)	
Annual totals kWh/year													
Space heating fuel - main system												2124.6622 (211)	
Space heating fuel - secondary												0.0000 (215)	
Electricity for pumps and fans:													
(MEV)Decentralised, Database: total watage = 7.8315, total flow = 45.0000, SFP = 0.1740)													
mechanical ventilation fans (SFP = 0.1740)													67.6233 (230a)
pump for solar water heating													50.0000 (230g)
Total electricity for the above, kWh/year													117.6233 (231)
Electricity for lighting (calculated in Appendix L)													485.4707 (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													1730.5218 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2124.6622	13.1900	280.2429 (240)
Space heating - secondary	0.0000	0.0000	0.0000 (242)
Water heating (other fuel)	730.0050	13.1900	96.2877 (247)
Mechanical ventilation fans	67.6233	13.1900	8.9195 (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	485.4707	13.1900	64.0336 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit	-1727.2394	13.1900	-227.8229 (252)
Total energy cost			228.2558 (255)

11a. SAP rating - Individual heating systems

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

Energy cost deflator (Table 12):		0.4200 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	0.5648 (257)
SAP value		92.1212
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	2124.6622	0.5190	1102.6997 (261)
Space heating - secondary	0.0000	0.5190	0.0000 (263)
Water heating (other fuel)	730.0050	0.5190	378.8726 (264)
Space and water heating			1481.5723 (265)
Pumps and fans	117.6233	0.5190	61.0465 (267)
Energy for lighting	485.4707	0.5190	251.9593 (268)
Energy saving/generation technologies			
PV Unit	-1727.2394	0.5190	-896.4372 (269)
Total kg/year			898.1408 (272)
CO2 emissions per m2			7.2000 (273)
EI value			92.9097
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	63.5000 (1b)	x 2.4600 (2b)	= 156.2100 (1b) - (3b)
First floor	61.2400 (1c)	x 2.6500 (2c)	= 162.2860 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	124.7400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 318.4960 (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) =											Air changes per hour		
Pressure test											0.0000 / (5) =		0.0000 (8)
Measured/design AP50											Yes		
Infiltration rate											4.5000		
Number of sides sheltered											0.2250 (18)		
											1 (19)		
Shelter factor											(20) = 1 - [0.075 x (19)] =		0.9250 (20)
Infiltration rate adjusted to include shelter factor											(21) = (18) x (20) =		0.2081 (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)	
	0.2341	0.2341	0.2289	0.2029	0.1977	0.1769	0.1717	0.1717	0.1821	0.1977	0.2029	0.2133 (22b)	
Mechanical extract ventilation - decentralised													
If mechanical ventilation:												0.5000 (23a)	
Effective ac	0.5000	0.5000	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)			15.2500	1.3258	20.2178		(27)
FRENCH DOOR (Uw = 1.40)			3.3300	1.3258	4.4148		(27)
external door			2.1600	1.2000	2.5920		(26)
REAR DOOR			2.1300	1.4000	2.9820		(26a)
Heat Loss Floor 1			63.5000	0.1600	10.1600		(28a)
FLOOR OVER GARAGE			8.8000	0.2038	1.7931		(28b)
BRICK TF	181.7300	22.8700	158.8600	0.2300	36.5378		(29a)
CEILING	63.5000		63.5000	0.1400	8.8900		(30)
Total net area of external elements Aum(A, m ²)			317.5300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	87.5874		(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 100.0000 (35)
 Thermal bridges (Sum(L x Psi) calculated using Appendix K) 15.3228 (36)
 Total fabric heat loss (33) + (36) = 102.9102 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 52.5518	Feb 52.5518	Mar 52.5518	Apr 52.5518	May 52.5518	Jun 52.5518	Jul 52.5518	Aug 52.5518	Sep 52.5518	Oct 52.5518	Nov 52.5518	Dec 52.5518 (38)
Heat transfer coeff	155.4620	155.4620	155.4620	155.4620	155.4620	155.4620	155.4620	155.4620	155.4620	155.4620	155.4620	155.4620 (39)
Average = Sum(39)m / 12 =												155.4620 (39)
HLP	Jan 1.2463	Feb 1.2463	Mar 1.2463	Apr 1.2463	May 1.2463	Jun 1.2463	Jul 1.2463	Aug 1.2463	Sep 1.2463	Oct 1.2463	Nov 1.2463	Dec 1.2463 (40)
HLP (average)												1.2463 (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												2.8799 (42)
Average daily hot water use (litres/day)												102.5980 (43)
Daily hot water use	Jan 112.8578	Feb 108.7538	Mar 104.6499	Apr 100.5460	May 96.4421	Jun 92.3382	Jul 92.3382	Aug 96.4421	Sep 100.5460	Oct 104.6499	Nov 108.7538	Dec 112.8578 (44)
Energy conte	167.3648	146.3783	151.0493	131.6885	126.3582	109.0375	101.0393	115.9441	117.3288	136.7354	149.2574	162.0839 (45)
Energy content (annual)										Total = Sum(45)m =		1614.2655 (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

Distribution loss (46)m = 0.15 x (45)m	25.1047	21.9567	22.6574	19.7533	18.9537	16.3556	15.1559	17.3916	17.5993	20.5103	22.3886	24.3126 (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	228.1248	201.2583	210.4136	183.7349	174.3239	155.2308	148.7724	164.6076	170.7259	196.0997	208.0574	222.8439 (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												1.2339 (H8)
Utilisation factor												0.5553 (H9)
Collector performance factor												0.8793 (H10)
Dedicated solar storage volume												75.0000 (H11)
Effective solar volume												75.0000 (H13)
Daily hot water demand												102.5980 (H14)
Volume ratio Veff/V												0.7310 (H15)
Solar storage volume factor												0.9373 (H16)
Solar input												-911.6818 (H17)
Solar input	-25.5688	-43.3303	-74.0312	-101.2764	-117.9089	-125.2497	-119.1635	-106.2839	-84.1946	-56.8827	-34.1437	-23.6482 (63)
Solar input (sum of months) = Sum (63)m =												-911.6818 (63)
Output from w/h	202.5560	157.9280	136.3824	82.4585	56.4150	29.9811	29.6089	58.3237	86.5314	139.2170	173.9137	199.1956 (64)
Total per year (kWh/year) = Sum (64)m =												1352.5113 (64)
Heat gains from water heating, kWh/month	104.2568	92.5748	97.7153	85.4235	80.3866	73.2096	71.7820	77.4822	81.7295	92.9559	96.6681	102.5009 (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)
(66)m	172.7949	172.7949	172.7949	172.7949	172.7949	172.7949	172.7949	172.7949	172.7949	172.7949	172.7949	172.7949	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	68.7234	61.0395	49.6407	37.5812	28.0924	23.7168	25.6268	33.3107	44.7095	56.7690	66.2578	70.6334	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	434.7197	439.2307	427.8631	403.6627	373.1140	344.4026	325.2217	320.7106	332.0783	356.2787	386.8273	415.5387	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.1594	55.1594	55.1594	55.1594	55.1594	55.1594	55.1594	55.1594	55.1594	55.1594	55.1594	55.1594	(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)	-115.1966	-115.1966	-115.1966	-115.1966	-115.1966	-115.1966	-115.1966	-115.1966	-115.1966	-115.1966	-115.1966	-115.1966	(71)
Water heating gains (Table 5)	140.1301	137.7601	131.3378	118.6438	108.0466	101.6800	96.4812	104.1428	113.5132	124.9408	134.2612	137.7700	(72)
Total internal gains	756.3309	750.7880	721.5992	672.6453	622.0107	582.5571	560.0873	570.9218	603.0587	650.7461	700.1040	736.6998	(73)

6. Solar gains

[Jan]														
	Area m2				Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W	
North	8.5100				11.3201		0.7200		0.7000		0.7700		33.6469 (74)	
East	0.7200				21.0039		0.7200		0.7000		0.7700		5.2820 (76)	
South	6.0200				49.0238		0.7200		0.7000		0.7700		103.0783 (78)	
East	3.3300				21.0039		0.7200		0.7000		0.7700		24.4292 (76)	
Solar gains	166.4363	295.6780	427.9587	581.2283	649.0730	713.3892	656.2215	586.7325	492.8907	341.5487	225.9609	156.4731 (83)		
Total gains	922.7672	1046.4660	1149.5579	1253.8736	1271.0837	1295.9463	1216.3089	1157.6543	1095.9494	992.2948	926.0649	893.1729 (84)		

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	22.2884	22.2884	22.2884	22.2884	22.2884	22.2884	22.2884	22.2884	22.2884	22.2884	22.2884	22.2884	
alpha	2.4859	2.4859	2.4859	2.4859	2.4859	2.4859	2.4859	2.4859	2.4859	2.4859	2.4859	2.4859	
util living area													
	0.9494	0.9309	0.8971	0.8371	0.7539	0.6019	0.4944	0.5217	0.7106	0.8619	0.9266	0.9532 (86)	
Tweekday	18.6213	18.7087	18.8759	19.0668	19.2294	19.3541	19.3915	19.3879	19.3050	19.0894	18.8308	18.6013	
Tweekend	20.4057	20.4451	20.5206	20.6083	20.6853	20.7499	20.7725	20.7696	20.7217	20.6170	20.4992	20.3967	
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	20.0829	20.1417	20.2601	20.3884	20.5143	20.6158	20.6489	20.6445	20.5655	20.4089	20.2181	20.0689 (87)	
Th 2	19.8831	19.8831	19.8831	19.8831	19.8831	19.8831	19.8831	19.8831	19.8831	19.8831	19.8831	19.8831 (88)	
util rest of house													

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

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

	0.9418	0.9207	0.8812	0.8103	0.7090	0.5251	0.3901	0.4171	0.6462	0.8340	0.9140	0.9462 (89)
Tweekday	18.6213	18.7087	18.8759	19.0668	19.2294	19.3541	19.3915	19.3879	19.3050	19.0894	18.8308	18.6013
Tweekend	18.6213	18.7087	18.8759	19.0668	19.2294	19.3541	19.3915	19.3879	19.3050	19.0894	18.8308	18.6013
MIT 2	18.6213	18.7087	18.8759	19.0668	19.2294	19.3541	19.3915	19.3879	19.3050	19.0894	18.8308	18.6013 (90)
Living area fraction									fLA = Living area / (4) =			0.1708 (91)
MIT	18.8709	18.9534	19.1122	19.2924	19.4488	19.5695	19.6062	19.6024	19.5203	19.3147	19.0677	18.8519 (92)
Temperature adjustment												0.0000
adjusted MIT	18.8709	18.9534	19.1122	19.2924	19.4488	19.5695	19.6062	19.6024	19.5203	19.3147	19.0677	18.8519 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9335	0.9106	0.8683	0.7939	0.6890	0.5009	0.3615	0.3877	0.6218	0.8169	0.9028	0.9383	(94)
Useful gains	861.4278	952.9500	998.1764	995.4055	875.7596	649.1164	439.6738	448.8129	681.4767	810.6253	836.0533	838.0956	(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	2265.2233	2200.3190	1945.1799	1600.0829	1189.1015	741.4813	467.3552	482.3123	858.1904	1370.3572	1860.5162	2277.8157	(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	1044.4238	838.2320	704.5706	435.3677	233.1264	0.0000	0.0000	0.0000	0.0000	416.4405	737.6133	1071.1518	(98)
Space heating												5480.9261	(98)
Space heating per m2											(98) / (4) =	43.9388	(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 %)													263.6950 (206)
Efficiency of secondary/supplementary heating system, %													100.0000 (208)
Space heating requirement													2078.5100 (211)
Space heating requirement	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	1044.4238	838.2320	704.5706	435.3677	233.1264	0.0000	0.0000	0.0000	0.0000	416.4405	737.6133	1071.1518	(98)
Space heating efficiency (main heating system 1)	263.6950	263.6950	263.6950	263.6950	263.6950	0.0000	0.0000	0.0000	0.0000	263.6950	263.6950	263.6950	(210)
Space heating fuel (main heating system)	396.0727	317.8794	267.1915	165.1028	88.4076	0.0000	0.0000	0.0000	0.0000	157.9251	279.7222	406.2087	(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	202.5560	157.9280	136.3824	82.4585	56.4150	29.9811	29.6089	58.3237	86.5314	139.2170	173.9137	199.1956	(64)
Efficiency of water heater (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	106.9010	83.3481	71.9772	43.5183	29.7736	15.8229	15.6264	30.7810	45.6678	73.4732	91.7847	105.1275	(219)
Water heating fuel used												713.8016	(219)
Annual totals kWh/year													
Space heating fuel - main system												2078.5100	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
(MEV)Decentralised, Database: total watage = 7.8315, total flow = 45.0000, SFP = 0.1740)													
mechanical ventilation fans (SFP = 0.1740)													67.6233 (230a)
pump for solar water heating													50.0000 (230g)
Total electricity for the above, kWh/year													117.6233 (231)
Electricity for lighting (calculated in Appendix L)													485.4707 (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												1498.3682	(238)

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

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	2078.5100	20.4300	424.6396 (240)	
Space heating - secondary	0.0000	0.0000	0.0000 (242)	
Water heating (other fuel)	713.8016	20.4300	145.8297 (247)	
Mechanical ventilation fans	67.6233	20.4300	13.8154 (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	485.4707	20.4300	99.1817 (250)	
Additional standing charges			0.0000 (251)	
Energy saving/generation technologies				
PV Unit	-1897.0374	20.4300	-387.5647 (252)	
Total energy cost			306.1166 (255)	

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

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 kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2078.5100	0.5190	1078.7467 (261)
Space heating - secondary	0.0000	0.5190	0.0000 (263)
Water heating (other fuel)	713.8016	0.5190	370.4630 (264)
Space and water heating			1449.2097 (265)
Pumps and fans	117.6233	0.5190	61.0465 (267)
Energy for lighting	485.4707	0.5190	251.9593 (268)
Energy saving/generation technologies			
PV Unit	-1897.0374	0.5190	-984.5624 (269)
Total kg/year			777.6531 (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	2078.5100	3.0700	6381.0258 (261)
Space heating - secondary	0.0000	3.0700	0.0000 (263)
Water heating (other fuel)	713.8016	3.0700	2191.3709 (264)
Space and water heating			8572.3968 (265)
Pumps and fans	117.6233	3.0700	361.1035 (267)
Energy for lighting	485.4707	3.0700	1490.3949 (268)
Energy saving/generation technologies			
PV Unit	-1897.0374	3.0700	-5823.9049 (269)
Primary energy kWh/year			4599.9903 (272)
Primary energy kWh/m2/year			36.8766 (273)

BASIC COMPLIANCE REPORT

Calculation Type: New Build (As Designed)

Property Reference	HOUSE TYPE C1			Issued on Date	09/11/2022
Assessment Reference	GRANT ASHP	Prop Type Ref			
Property					
SAP Rating	82 B	DER	17.52	TER	26.05
Environmental	84 B	% DER<TER	32.74		
CO ₂ Emissions (t/year)	2.00	DFEE	53.22	TFEE	60.15
General Requirements Compliance	Pass	% DFEE<TFEE	11.51		
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)	26.05	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	17.52	kgCO ₂ /m ²	Pass
	-8.53 (-32.7%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	60.15	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	53.22	kWh/m ² /yr	
	-6.9 (-11.5%)	kWh/m ² /yr	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.23 (max. 0.30)	0.23 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Floor	0.17 (max. 0.25)	0.20 (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	
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	8.51 m ² , No overhang	
Windows facing East	4.05 m ² , No overhang	
Windows facing South	6.02 m ² , No overhang	
Air change rate	8.00 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 C1			Issued on Date	09/11/2022
Assessment Reference	GRANT ASHP	Prop Type Ref			
Property					
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Environmental	84 B	% DER<TER	32.74		
CO ₂ Emissions (t/year)	2.00	DFEE	53.22	TFEE	60.15
General Requirements Compliance	Pass	% DFEE<TFEE	11.51		
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)

Orientation	North
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	1
5.0 Sunlight/Shade	Average or unknown

6.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground Floor:	36.60 m	63.50 m ²	2.46 m
1st Storey:	34.60 m	61.24 m ²	2.65 m

7.0 Living Area	21.30	m ²
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8.0 Thermal Mass Parameter	Simple calculation - Low	
Thermal Mass	100.00	kJ/m²K

9.0 External Walls

Description	Type	U-Value (W/m ² K)	Gross Area (m ²)	Nett Area (m ²)
BRICK TF	Timber Frame	0.23	181.73	158.86

9.1 Party Walls

Description	Type	Construction	U-Value (W/m ² K)	Area (m ²)
-------------	------	--------------	------------------------------	------------------------

10.0 External Roofs

Description	Type	U-Value (W/m ² K)	Gross Area (m ²)	Nett Area (m ²)
CEILING	External Plane Roof	0.14	63.50	63.50

11.0 Heat Loss Floors

Description	Type	Construction	U-Value (W/m ² K)	Area (m ²)
Heat Loss Floor 1	Ground Floor - Solid		0.16	63.50
FLOOR OVER GARAGE	Exposed Floor - Timber		0.23	8.80

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	Manufacture r	Window	Double Low-E Hard 0.15			0.72		0.70	1.40
FRENCH DOOR	Manufacture r	Window	Double Low-E Hard 0.15			0.72		0.70	1.40
external door	Manufacture r	Solid Door							1.20
REAR DOOR	Manufacture r	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	North	None	0.00					8.51	
REAR WINDOW	Window	[1] BRICK TF	South	None	0.00					6.02	
GABLE WINDOW	Window	[1] BRICK TF	East	None	0.00					0.72	
FRONT DOOR	Solid Door	[1] BRICK TF	North							2.16	
FRENCH DOOR	Window	[1] BRICK TF	East	None	0.00					3.33	
REAR DOOR	Half Glazed Door	[1] BRICK TF	South							2.13	

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)	15.60	0.141	Yes	TRADA
Independently assessed	E3 Sill	13.56	0.027	Yes	TRADA
Independently assessed	E4 Jamb	34.67	0.038	Yes	TRADA
Independently assessed	E5 Ground floor (normal)	36.60	0.131	Yes	TRADA
Independently assessed	E6 Intermediate floor within a dwelling	34.60	0.094	Yes	TRADA
Independently assessed	E10 Eaves (insulation at ceiling level)	18.84	0.060	No	TRADA
Independently assessed	E12 Gable (insulation at ceiling level)	22.86	0.062	No	TRADA
Independently assessed	E16 Corner (normal)	20.44	0.058	Yes	TRADA
Independently assessed	E17 Corner (inverted – internal area greater than external area)	7.57	-0.045	No	TRADA

Y-value 0.048 W/m²K

18.0 Pressure Testing

Designed AP₅₀ 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 Yes
 Night Ventilation No
 Air change rate 8.00

Mechanical Ventilation

Mechanical Ventilation System Present Yes
 Approved Installation Yes
 Mechanical Ventilation data Type Database

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

Type	Mechanical extract ventilation - 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	4

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	26	
Total number of L.E.L. fittings	26	
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	277.9	
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	£95	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	