

Appendix A

Site Plan



KEY						PROJECT		panter hudspith architects	
---	SITE BOUNDARY	C	UPDATED BUILDING HEIGHTS	HP	GH	28.09.17	Clarendon Gas Works - Wood Green	11 th Floor - Hannibal House Elephant & Castle, London SE1 6TE t: 020 7701 0575 e: info@panterhudspith.com	
A1	BLOCK REFERENCE	B	UPDATED BUILDING HEIGHTS	SM	GH	14.08.17			
XXfl	HEIGHT (incl. retail where appropriate)	A	INCLUDED GEA TABLE AND NUGGED BLOCK B2	SM	GH	11.08.17			
XXfl	HEIGHTS INCREASED	\	ISSUE FOR INFORMATION	SM	GH	10.08.17			
XXfl	MASSING CONSTANT (hidden floor now included in accommodation schedule)	REV	DESCRIPTION	DRWN	CHKD	DATE	DRAWING Proposed Site Layout Plan - September 17		
			1. Do not scale from this drawing, other than for Planning purposes. 2. All dimensions to be checked on site by the contractor and such dimensions to be his responsibility. 3. Report all drawing errors, omissions and discrepancies to the architect. 4. Where the drawing is in CAD format, it is uncontrolled - only figured dimensions in hard copies and PDFs to be relied upon for checking. 5. All information contained in this drawing is SOLE COPYRIGHT OF PANTER HUDSPITH ARCHITECTS and is not to be reproduced without their permission.				JOB No. 439		WORK STAGE C
							DRAWING No. SK402		SIZE A3
							SCALE 1:1250		

Appendix B

Summary CO₂ Emissions Rates & FEE Scores

– *Be Lean*

CO₂ Emissions at Be Lean Stage

Unit Type Description	Unit Floor Area	Individual		Number of Units	Total			Emissions Rate Improvement
		Dwelling Emissions Rate	Target Emissions Rate		Total Floor Area	Dwelling Emissions Rate	Target Emissions Rate	
Domestic	m ²	kg CO ₂ /m ² /year	kg CO ₂ /m ² /year		m ²	kg CO ₂ /year	kg CO ₂ /year	-
Flat Type T27 - MID 03rd Floor - 2B3P	73	13.4	14.6	95	6,897	92,282	100,558	8.2%
Flat Type T43 - MID 03rd Floor - 2B3P	63	15.5	15.9	95	6,012	92,879	95,464	2.7%
Flat Type T22 - TOP 13th Floor - 1B2P	50	18.7	19.7	25	1,258	23,490	24,748	5.1%
Flat Type T25 - MID 03rd Floor - 1B-MAN	39	15.9	17.4	20	784	12,475	13,635	8.5%
Flat Type T27 - HLF 02nd Floor - 2B3P	73	16.8	17.3	25	1,815	30,492	31,418	2.9%
Flat Type T33 - MID 03rd Floor - 1B2P	51	16.2	16.8	99	5,008	81,286	83,891	3.1%
Flat Type T39 - TOP 07th Floor - 2B3P	63	16.9	17.5	40	2,523	42,610	44,149	3.5%
Subtotal				399	24,296	375,515	393,862	4.7%
Non-Domestic								
Café	2,996	76.8	80.0	1	2,996	230,081	239,668	4.0%
Office	2,996	18.1	19.6	1	2,996	54,225	58,719	7.7%
Subtotal					5,992	284,306	298,386	4.7%
Total for All Units					30,288	659,820	692,248	4.7%

Fabric Energy Efficiency

Unit Type Description	Unit Floor Area	Individual		Number of Units	Total			Fabric Energy Efficiency Improvement
		Dwelling Fabric Energy Efficiency	Target Fabric Energy Efficiency		Total Floor Area	Dwelling Fabric Energy Efficiency	Target Fabric Energy Efficiency	
	m ²	kWh/m ² /year	kWh/m ² /year		m ²	kWh/year	kWh/year	-
Flat Type T27 - MID 03rd Floor - 2B3P	73	30.3	35.5	95	6,897	208,772	244,637	14.7%
Flat Type T43 - MID 03rd Floor - 2B3P	63	32.7	38.9	95	6,012	196,700	233,611	15.8%
Flat Type T22 - TOP 13th Floor - 1B2P	50	42.4	53.1	25	1,258	53,331	66,773	20.1%
Flat Type T25 - MID 03rd Floor - 1B-MAN	39	26.5	33.2	20	784	20,797	25,992	20.0%
Flat Type T27 - HLF 02nd Floor - 2B3P	73	40.6	49.3	25	1,815	73,762	89,516	17.6%
Flat Type T33 - MID 03rd Floor - 1B2P	51	32.6	37.8	99	5,008	163,224	189,468	13.9%
Flat Type T39 - TOP 07th Floor - 2B3P	63	37.4	47.2	40	2,523	94,277	119,026	20.8%
Floor Weighted Average				399	24,296	33.4	39.9	16.3%

CO₂ Emissions at Be Lean Stage

Unit Type Description	Unit Floor Area	Individual		Number of Units	Total			Emissions Rate Improvement
		Dwelling Emissions Rate	Target Emissions Rate		Total Floor Area	Dwelling Emissions Rate	Target Emissions Rate	
Domestic	m ²	kg CO ₂ /m ² /year	kg CO ₂ /m ² /year		m ²	kg CO ₂ /year	kg CO ₂ /year	-
Flat Type T27 - MID 03rd Floor - 2B3P	73	13.4	14.6	75	5,445	72,854	79,388	8.2%
Flat Type T43 - MID 03rd Floor - 2B3P	63	15.5	15.9	77	4,873	75,281	77,376	2.7%
Flat Type T22 - TOP 13th Floor - 1B2P	50	18.7	19.7	30	1,509	28,188	29,697	5.1%
Flat Type T25 - MID 03rd Floor - 1B-MAN	39	15.9	17.4	24	940	14,970	16,362	8.5%
Flat Type T27 - HLF 02nd Floor - 2B3P	73	16.8	17.3	42	3,049	51,227	52,782	2.9%
Flat Type T33 - MID 03rd Floor - 1B2P	51	16.2	16.8	89	4,503	73,076	75,417	3.1%
Flat Type T39 - TOP 07th Floor - 2B3P	63	16.9	17.5	38	2,397	40,480	41,942	3.5%
Subtotal				375	22,715	356,075	372,963	4.5%
Non-Domestic								
Café	1,050	76.8	80.0	1	1,050	80,625	83,984	4.0%
Office	1,050	18.1	19.6	1	1,050	19,001	20,576	7.7%
Subtotal					2,100	99,626	104,561	4.7%
Total for All Units					24,815	455,702	477,524	4.6%

Fabric Energy Efficiency

Unit Type Description	Unit Floor Area	Individual		Number of Units	Total			Fabric Energy Efficiency Improvement
		Dwelling Fabric Energy Efficiency	Target Fabric Energy Efficiency		Total Floor Area	Dwelling Fabric Energy Efficiency	Target Fabric Energy Efficiency	
	m ²	kWh/m ² /year	kWh/m ² /year		m ²	kWh/year	kWh/year	-
Flat Type T27 - MID 03rd Floor - 2B3P	73	30.3	35.5	75	5,445	164,820	193,134	14.7%
Flat Type T43 - MID 03rd Floor - 2B3P	63	32.7	38.9	77	4,873	159,430	189,348	15.8%
Flat Type T22 - TOP 13th Floor - 1B2P	50	42.4	53.1	30	1,509	63,997	80,128	20.1%
Flat Type T25 - MID 03rd Floor - 1B-MAN	39	26.5	33.2	24	940	24,956	31,190	20.0%
Flat Type T27 - HLF 02nd Floor - 2B3P	73	40.6	49.3	42	3,049	123,919	150,387	17.6%
Flat Type T33 - MID 03rd Floor - 1B2P	51	32.6	37.8	89	4,503	146,737	170,330	13.9%
Flat Type T39 - TOP 07th Floor - 2B3P	63	37.4	47.2	38	2,397	89,563	113,074	20.8%
Floor Weighted Average				375	22,715	34.0	40.8	16.6%

Appendix C

TER Worksheets

Including Be Lean
DER and TFEE/
DFEE calculations

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



Property Reference	Flat Type T27 - MID				Issued on Date	23/05/2022
Assessment Reference	BE LEAN		Prop Type Ref	03rd Floor - 2B3P		
Property	Flat Type T27, London , N8					
SAP Rating	86 B	DER	13.38	TER	14.58	
Environmental	90 B	% DER<TER	8.20			
CO ₂ Emissions (t/year)	0.81	DFEE	30.27	TFEE	35.47	
General Requirements Compliance	Pass	% DFEE<TFEE	14.65			
Assessor Details	Mr. Simon Gowing, Simon Gowing, Tel: 02036031616, Simon@hodkinsonconsultancy.com				Assessor ID	R572-0001
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

Mid-floor flat, total floor area 73 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:Mains gas (c)
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 14.58 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 13.38 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)35.5 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)30.3 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.24 (max. 0.30)	0.24 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	0.90 (max. 2.00)	0.90 (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:	4.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system:	Community heating scheme	-
Secondary heating system:	None	

5 Cylinder insulation

Hot water storage	Nominal cylinder loss: 0.22 kWh/day
Permitted by DBSCG 0.35	OK
Primary pipework insulated:	No primary pipework

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and TRVsOK

Hot water controls:

No cylinderstat

7 Low energy lights

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

8 Mechanical ventilation

Continuous supply and extract system	
Specific fan power:	0.64
Maximum	1.5
WWR efficiency:	90%
Minimum:	70% OK

9 Summertime temperature

Overheating risk (Thames Valley):	Slight	OK
Based on:		
Overshading:	Average	
Windows facing South West:	8.26 m ² , No overhang	
Windows facing North West:	7.44 m ² , No overhang	
Air change rate:	4.00 ach	
Blinds/curtains:	None	

10 Key features

Party wall U-value	0.00 W/m ² K
Party wall U-value	0.00 W/m ² K
Window U-value	0.90 W/m ² K

HODKINSON

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

			Air changes per hour	
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =	0.0000 / 5) =	0.0000 (8)	
Pressure test			Yes	
Measured/design AP50			4.0000	
Infiltration rate			0.2000 (18)	
Number of sides sheltered			2 (19)	
Shelter factor		(20) = 1 - [0.075 x (19)] =	0.8500 (20)	
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =	0.1700 (21)	

3. Heat losses and heat loss parameter

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)		7.4006	(36)
Total fabric heat loss	(33) + (36) =	29.5764	(37)

4. Water heating energy requirements (kWh/year)



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

6. Solar gains

Solar gains	86.0123	152.6941	225.3469	306.7451	368.7077	377.0941	358.9593	311.0427	253.2693	173.1879	104.1490	72.8800 (83)
Total gains	465.6124	530.2111	590.0448	650.8329	692.0385	680.2582	648.9107	606.9957	559.7083	500.4511	455.3431	441.8595 (84)

7. Mean internal temperature (heating season)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)
Fraction of space heat from community system
Fraction of heat from community Boilers
Fraction of total space heat from community Boilers
Factor for control and charging method (Table 4c(3)) for community space heating
Factor for control and charging method (Table 4c(3)) for community water heating
Distribution loss factor (Table 12c) for community heating system
Space heating:
Annual space heating requirement
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)
Space heating fuel for secondary/supplementary system

0.0000 (301)
1.0000 (302)
1.0000 (303a)
1.0000 (304a)
1.0000 (305)
1.0000 (305a)
1.0500 (306)
926.8481 (98)
973.1905 (207a)
0.0000 (308)
0.0000 (309)

Water heating
Annual water heating requirement
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05
Electricity used for heat distribution
Annual totals kWh/year

1827.2899 (64)
1918.6544 (310a)
26.9184 (313)

Electricity for pumps and fans:
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.8000)
mechanical ventilation fans (SFP = 0.8000)
Total electricity for the above, kWh/year
Electricity for lighting (calculated in Appendix L)
Total delivered energy for all uses

177.1440 (330a)
177.1440 (331)
320.3886 (332)
3389.3774 (338)

Efficiency of heat source Boilers
Space heating from Boilers
Electrical energy for heat distribution
Total CO2 associated with community systems
(negative value allowed since DFEE <= TFEF)
Space and water heating
Pumps and fans
Energy for lighting
Total CO2, kg/year
Dwelling Carbon Dioxide Emission Rate (DER)

Energy
kWh/year
Emission factor
kg CO2/kWh
Emissions
kg CO2/year
83.5000 (367a)
697.9201 (367)
15.0087 (372)
712.9288 (373)
712.9288 (376)
91.9377 (378)
166.2817 (379)
971.1482 (383)
13.3800 (384)

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

DER
Total Floor Area
Assumed number of occupants
CO2 emission factor in Table 12 for electricity displaced from grid
CO2 emissions from appliances, equation (L14)
CO2 emissions from cooking, equation (L16)
Total CO2 emissions
Residual CO2 emissions offset from biofuel CHP
Additional allowable electricity generation, kWh/m²/year
Resulting CO2 emissions offset from additional allowable electricity generation
Net CO2 emissions

13.3800 C01
72.6000
2.3076
0.5190
16.5928 C02
2.4019 C03
32.3748 C04
0.0000 C05
0.0000 C06
0.0000 C07
32.3748 C08

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

Ground floor
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)
Dwelling volume
Storey height
Volume
(3a)+(3b)+(3c)+(3d)+(3e)...(3n)

2. Ventilation rate

Number of chimneys
Number of open flues
Number of intermittent fans
Number of passive vents
Number of fuelless gas fires
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =
Pressure test
Measured/design AP50
Infiltration rate
Number of sides sheltered
Shelter factor
Infiltration rate adjusted to include shelter factor
Air changes per hour
Yes
5.0000
0.4153 (18)
2 (19)
(20) = 1 - [(0.075 x (19))] = 0.8500 (20)
(21) = (18) x (20) = 0.3530 (21)

Wind speed
Wind factor
Adj infiltr rate
Effective ac
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
4.0000
4.3000
3.8000
3.7000
1.0000
1.0750
0.9500
0.9250
0.3530
0.3795
0.3971
0.4148 (22b)
0.5860 (25)

3. Heat losses and heat loss parameter

Element
Gross
m2
Openings
m2
NetArea
m2
U-value
W/m2K
A x U
W/K
K-value
kJ/m2K
A x K
kJ/K
TER Opening Type (Uw = 1.40)
External Wall
Total net area of external elements Aum(A, m2)
Fabric heat loss, W/K = Sum (A x U)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K
Thermal bridges (Sum(L x Psi) calculated using Appendix K)
Total fabric heat loss
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)
Heat transfer coeff
Average = Sum(39)m / 12 =
HLP
HLP (average)
Days in month

4. Water heating energy requirements (kWh/year)

Assumed occupancy
Average daily hot water use (litres/day)
Daily hot water use
Energy conte
Energy content (annual)
Distribution loss (46)m = 0.15 x (45)m
Water storage loss:
Store volume
a) If manufacturer declared loss factor is known (kWh/day):
Temperature factor from Table 2b
Enter (49) or (54) in (55)
Total storage loss
If cylinder contains dedicated solar storage

4.3553	3.9338	4.3553	4.2148	4.3553	4.2148	4.3553	4.2148	4.3553	4.2148	4.3553	57
23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month											
172.8078	151.9292	158.6540	140.9674	172.8078	151.9292	158.6540	140.9674	172.8078	151.9292	158.6540	(62)
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 =											
172.8078	151.9292	158.6540	140.9674	172.8078	151.9292	158.6540	140.9674	172.8078	151.9292	158.6540	(64)
Total per year (kWh/year) = Sum(64)m =											
70.3699	62.1783	65.6637	59.3664	58.5417	52.8329	51.2385	55.5378	55.2245	61.5349	64.4341	(65)
Heat gains from water heating, kWh/month											
70.3699	62.1783	65.6637	59.3664	58.5417	52.8329	51.2385	55.5378	55.2245	61.5349	64.4341	(66)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66m)	115.3778	115.3778	115.3778	115.3778	115.3778	115.3778	115.3778	115.3778	115.3778	115.3778	115.3778	115.3778 (66)
Lighting gains	(calculated in Appendix L, equation 15 or 16), also see Table 5											
	18.1417	16.1133	13.1042	9.2007	7.4159	6.2608	6.7650	8.7934	11.8025	14.9860	17.4909	18.6459 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	201.2876	205.3971	200.0813	188.7645	174.4790	161.0527	152.0832	149.9737	155.2895	166.6063	180.8918	194.3180 (68)
Cooking gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	34.5378	34.5378	34.5378	34.5378	34.5378	34.5378	34.5378	34.5378	34.5378	34.5378	34.5378	34.5378 (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)												
	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022 (71)
Water heating gains (Table 5)												
	94.5831	92.5272	88.2577	82.4534	78.6850	73.7390	68.8690	74.6475	76.7006	78.2082	89.4919	92.5357 (72)
Total internal gains												
	376.6258	374.6509	362.0565	341.7520	321.1933	301.3059	288.3305	294.0279	304.4060	324.9139	348.4878	366.1131 (73)

[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
Southwest	8.2600	36.7938	0.6300	0.7000	0.7700	92.8810 (79)
Northwest	7.4400	11.2829	0.6300	0.7000	0.7700	25.6547 (81)

Temperature during heating periods in the living area, see Table 9a, Th (°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	5.9495	5.9668	5.9838	6.0562	6.2802	6.1543	6.1543	6.1682	6.1257	6.2621	6.0807	6.0494	6.0171
util living area	0.9959	0.9885	0.9641	0.8786	0.7064	0.5044	0.3659	0.4129	0.6682	0.9289	0.9896	0.9971	0.9861
MIT	20.1372	20.3114	20.3560	20.8226	20.9603	20.9956	20.9995	20.9990	20.9786	20.7776	20.4078	20.1089	20.0878
Th 2	20.1375	20.1403	20.1430	20.1556	20.1580	20.1690	20.1690	20.1690	20.1911	20.1948	20.1980	20.1332	20.1482
util rest of house	0.9946	0.9850	0.9535	0.8483	0.6533	0.4407	0.3391	0.3391	0.5969	0.9031	0.9358	0.9961	0.991
MIT 2	18.9880	19.2425	19.5927	19.9608	20.1229	20.1664	20.1678	20.1678	20.1496	19.9137	19.8550	19.4773	19.4650
Living area fraction										Living area			
MIT	19.5081	19.7263	20.0287	20.3509	20.5019	20.5417	20.5448	20.5448	20.5248	20.3047	19.8527	19.4773	19.4773
Temperature adjustment													
adjusted MIT	19.7263	20.0287	20.3509	20.5019	20.5417	20.5448	20.5448	20.5448	20.5248	20.3047	19.8527	19.4773	19.4773

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilization	0.9934	0.9829	0.9519	0.8558	0.6756	0.4695	0.3283	0.3725	0.6285	0.9082	0.9841	0.9952 (94)
Unsup. fuel gms	481.8922	575.0850	640.2512	654.7274	560.2865	385.4322	257.0553	269.2183	410.6561	511.8408	484.2173	464.2941 (95)
Heat loss rate %	4.3190	4.9000	6.0000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.8000	7.1000	4.2000 (96)
Month factor	1032.5710	1003.3000	912.3921	759.8436	582.2788	387.4548	257.2382	269.6046	421.2953	642.0036	848.8761	1023.4804 (97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (97a)
Space heating kWh	402.3989	287.8086	202.4728	76.0113	16.3622	0.0000	0.0000	0.0000	0.0000	96.8411	262.5543	416.0346 (98)
Space heating per m2	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000 (98)
Space heating per m2	402.3989	287.8086	202.4728	76.0113	16.3622	0.0000	0.0000	0.0000	0.0000	96.8411	262.5543	416.0346 (98)
Space heating per m2	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000 (98)
Space heating per m2	402.3989	287.8086	202.4728	76.0113	16.3622	0.0000	0.0000	0.0000	0.0000	96.8411	262.5543	416.0346 (98)
Space heating per m2	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000 (98)
Space heating per m2	402.3989	287.8086	202.4728	76.0113	16.3622	0.0000	0.0000	0.0000	0.0000	96.8411	262.5543	416.0346 (98)
Space heating per m2	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000 (98)
Space heating per m2	402.3989	287.8086	202.4728	76.0113	16.3622	0.0000	0.0000	0.0000	0.0000	96.8411	262.5543	416.0346 (98)
Space heating per m2	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000 (98)
Space heating per m2	402.3989	287.8086	202.4728	76.0113	16.3622	0.0000	0.0000	0.0000	0.0000	96.8411	262.5543	416.0346 (98)
Space heating per m2	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000 (98)
Space heating per m2	402.3989	287.8086	202.4728	76.0113	16.3622	0.0000	0.0000	0.0000	0.0000	96.8411	262.5543	416.0346 (98)
Space heating per m2	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000 (98)
Space heating per m2	402.3989	287.8086	202.4728	76.0113	16.3622	0.0000	0.0000	0.0000	0.0000	96.8411	262.5543	416.0346 (98)
Space heating per m2	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000 (98)
Space heating per m2	402.3989	287.8086	202.4728	76.0113	16.3622	0.0000	0.0000	0.0000	0.0000	96.8411	262.5543	416.0346 (98)
Space heating per m2	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000 (98)
Space heating per m2	402.3989	287.8086	202.4728	76.0113	16.3622	0.0000	0.0000	0.0000	0.0000	96.8411	262.5543	416.0346 (98)
Space heating per m2	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000 (98)
Space heating per m2	402.3989	287.8086	202.									

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	1882.8405	(211)

[illegible][illegible]

Electricity for pumps and fans:	
central heating pump	30,000 (230)
main heating flow fan	45,000 (230)
Total electricity for the above, kWh/year	75,000 (231)
Electricity for lighting (calculated in Appendix L)	320,386 (232)
Total delivered energy for all uses	434,392 (238)

	Energy	Emission factor	Emissions
--	--------	-----------------	-----------

	kg CO ₂ e	kg CO ₂ e
Space heating - main system 1	1882.8405	406.6935 (261)
Space heating - secondary	0.0000	0.0000 (262)
Water heating (other fuel)	2066.1630	446.2932 (264)
Space and water heating		852.9848 (265)
Pumps and fans		38.9250 (267)
Energy for lighting	320.3886	166.2817 (268)
Total CO ₂ , kg/m ² /year		1058.1914 (272)
Emissions per m ² for space and water heating		11.7491 (272a)
Fuel factor (main gas)		1.0000 (272b)
Emissions per m ² for lighting		2.5964 (272c)
Emissions per m ² for pumps and fans		0.5362 (272d)
Target Carbon Dioxide Emission Rate (TER) = (11.7491 × 1.00) + 2.5964 + 0.5362, rounded to 2 d.p.		14.8800 (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 (m2)	Storey height (m)	Volume (m3)
Ground floor	72.6000 (1b)	2.5000 (2b)	181.5000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6000		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	181.5000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	0	0	0	0.0000 (6a)
Number of open flues	0	0	0	0	0.0000 (6b)
Number of intermittent fans	0	0	0	0	30.0000 (7a)
Number of passive vents	0	0	0	0	0.0000 (7b)
Number of fuelless gas fires	0	0	0	0	0.0000 (7c)

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =

Pressure test	30.0000 / (5) =	0.1633 (8)
Measured/design AP50		4.0000
Infiltration rate		0.3653 (8)
Number of sides sheltered	2	(19)

Shelter factor (20) = 1 - [0.075 x (19)] = 0.8500 (20)

Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.3105 (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 infiltr rate												
Effective ac	0.3959	0.3881	0.3804	0.3415	0.3338	0.2950	0.2950	0.2872	0.3105	0.3357	0.3493	0.3648 (22b)
	0.5784	0.5753	0.5723	0.5583	0.5557	0.5435	0.5412	0.5482	0.5588	0.5610	0.5610	0.5666 (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 k3/m2K	A x K kJ/K
Opening Type 1 (Uw = 0.90)			15.7000	0.8687	13.6390		(27)
External Wall	51.2700	15.7000	35.5700	0.2400	8.5368		(29a)
Total net area of external elements Aum(A, m2)	51.2700		51.2700				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		22.1758		(32)
Wall to Corridor			10.8000	0.0000	0.0000		(33)
Party Wall			33.8900	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.4006 (36)
Total fabric heat loss						(33) + (36) =	29.5764 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	34.6410	34.4587	34.2801	33.4410	33.2840	32.5532	32.5532	32.4178	32.8347	32.2840	33.6016	33.9336 (38)
Heat transfer coeff	64.2174	64.0351	63.8565	63.0174	62.8604	62.1296	62.1296	61.9942	62.4111	62.8604	63.1780	63.5100 (39)
Average = Sum(39)m / 12 =												63.0166 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.8845	0.8820	0.8796	0.8680	0.8658	0.8558	0.8558	0.8539	0.8597	0.8658	0.8702	0.8748 (40)
HLP (average)												0.8680 (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												2.3076 (42)
Average daily hot water use (litres/day)												93.6889 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	103.0578	99.3102	95.5627	91.8151	88.0676	84.3200	84.3200	88.0676	91.8151	95.5627	99.3102	103.0578 (44)
Energy conte	152.8317	133.6676	137.9330	120.2533	115.3859	99.5693	92.2656	105.8761	107.1406	124.8652	136.2967	148.0094 (45)
Energy content (annual)												Total = Sum(45)m = 1474.0912 (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	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Heat gains from water heating, kWh/month
32.4767 28.4044 29.3108 25.5538 24.5195 21.1585 19.6064 22.4987 22.7674 26.5332 28.9630 31.4520 (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	115.3778	115.3778	115.3778	115.3778	115.3778	115.3778	115.3778	115.3778	115.3778	115.3778	115.3778	115.3778 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.1417	16.1133	13.1042	9.9207	7.4159	6.2608	6.7650	8.7934	11.8025	14.9860	17.4909	18.6459 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	203.2876	205.3971	200.0813	188.7645	174.4790	161.0527	152.0832	149.9737	155.2895	166.6063	180.8918	194.3180 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5378	34.5378	34.5378	34.5378	34.5378	34.5378	34.5378	34.5378	34.5378	34.5378	34.5378	34.5378 (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)	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022 (71)
Water heating gains (Table 5)	43.6515	42.2684	39.3962	35.4914	32.9563	29.3868	26.3527	30.2401	31.6214	35.6629	40.2264	42.2742 (72)
Total internal gains	322.6942	321.3922	310.1950	291.7900	272.4646	254.3136	242.8142	246.6206	256.3267	274.8685	296.2224	312.8515 (73)

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	Access factor Table 6d	Gains W
Southwest	8.2600	36.7938	0.4000	0.8000	0.7700	67.3966 (79)
Northwest	7.4400	11.2829	0.4000	0.8000	0.7700	18.6157 (81)

Solar gains	86.0123	152.6941	225.3469	306.7451	368.7077	377.0941	358.9593	311.0427	253.2693	173.1879	104.1490	72.8800 (83)
Total gains	408.7065	474.0863	535.5420	598.5351	641.1722	631.4078	601.7736	557.6633	509.5960	448.0565	400.3714	385.7315 (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	78.5094	78.7329	78.9531	80.0044	80.2042	81.1476	81.1476	81.3248	80.7816	80.2042	79.8010	79.3838
alpha	6.2340	6.2489	6.2635	6.3336	6.3469	6.4098	6.4098	6.4217	6.3854	6.3469	6.3201	6.2923
util living area	0.9985	0.9958	0.9861	0.9441	0.8209	0.6173	0.4527	0.5080	0.7823	0.9695	0.9962	0.9989 (86)
MIT	20.0969	20.2399	20.4587	20.7308	20.9205	20.9893	20.9987	20.9974	20.9563	20.7007	20.3466	20.0717 (87)
Th 2	20.1807	20.1828	20.1849	20.1948	20.1966	20.2053	20.2053	20.2068	20.2019	20.1966	20.1929	20.1890 (88)
util rest of house	0.9980	0.9944	0.9814	0.9262	0.7740	0.5460	0.3718	0.4222	0.7140	0.9561	0.9947	0.9986 (89)
MIT 2	19.3488	19.4930	19.7110	19.9801	20.1450	20.2005	20.2049	20.2061	20.1788	19.9581	19.6082	19.3306 (90)
Living area fraction												fLA = Living area / (4) = 0.4526 (91)
MIT	19.6874	19.8311	20.0494	20.3199	20.4960	20.5575	20.5642	20.5643	20.5307	20.2942	19.9424	19.6660 (92)
Temperature adjustment												0.0000
adjusted MIT	19.6874	19.8311	20.0494	20.3199	20.4960	20.5575	20.5642	20.5643	20.5307	20.2942	19.9424	19.6660 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9976	0.9937	0.9805	0.9293	0.7924	0.5781	0.4085	0.4612	0.7436	0.9580	0.9941	0.9983 (94)
Useful gains	407.7289	471.0845	525.1095	556.2318	508.0823	365.0462	245.8187	257.1709	378.9499	429.2478	398.0224	385.0770 (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	988.1410	956.1133	865.2194	719.6519	552.9205	370.1369	246.2936	258.1604	401.3461	609.3828	811.3598	982.2483 (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 (98a)
Space heating kWh	431.8266	325.9393	253.0418	117.6625	33.3596	0.0000	0.0000	0.0000	0.0000	134.0204	297.6029	444.2955 (98)
Space heating												2037.7486 (98)
Space heating per m2										(98) / (4) =		28.0682 (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	584.0179	459.7588	471.1561	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9651	0.9865	0.9788	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	563.6502	453.5515	461.1842	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	823.4794	787.1219	736.9254	0.0000	0.0000	0.0000	0.0000 (103)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000 (103a)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	187.0770	248.1764	205.1515	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												640.4049 (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 (

[illegible]

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	Storey height		Volume
	(m ²)	(m)		(m ³)
Ground floor	72.6000 (1b)	x	2.5000 (2b)	= 181.5000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6000			(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	181.5000 (5)

	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					3	*	3 * 10 =	30.0000 (7a)				
Number of passive vents							0 * 10 =	0.0000 (7b)				
Number of flueless gas fires							0 * 40 =	0.0000 (7c)				
							Air changes per hour					
Infiltration due to chimneys, flues and fans	= (6a) + (6b) + (7a) + (7b) + (7c) =						30.0000 / (5) =	0.1653 (8)				
Pressure test							tes					
Measured/design AP50								5.0000				
Infiltration rate								0.4153 (18)				
Number of sides sheltered								2 (19)				
Shelter factor					(20) = 1 - [0.075 x (19)] =		0.8500 (20)					
Infiltration rate adjusted to include shelter factor					(21) = (18) x (20) =		0.3530 (21)					
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1200	5.0000	4.9000	4.8000	4.8000	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 infiltrate ac	0.4501	0.4412	0.4324	0.3883	0.3795	0.3353	0.3353	0.3265	0.3530	0.3795	0.3971	0.4148 (22b)
Effective ac	0.4603	0.4593	0.5935	0.5794	0.5720	0.5562	0.5562	0.5533	0.5623	0.5795	0.5789	0.5866 (22b)

Element	Gross m ²	Openings m ²	NetArea W/m ²	U-value m ²	A x U W/m ² K	R-value kJ/m ² K	A x R kJ/K					
TER Opening Type (Uw = 1.40)			15.7000	1.3258	20.8144		(29)					
External Wall	51.2700	15.7000	35.5700	0.1800	6.4026		(31)					
Total net area of external elements Aum(A, m ²)			51.2700				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	27.2170		(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)							4.6770 (36)					
Total fabric heat loss						(33) + (36) =	31.8940 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 36.0137	Feb 35.7782	Mar 35.5473	Apr 34.4628	May 34.2599	Jun 33.3153	Jul 33.3153	Aug 33.1404	Sep 33.6791	Oct 34.2599	Nov 34.6704	Dec 35.0995 (38)
Heat transfer coeff	67.9077	67.6722	67.4413	66.3568	66.1539	65.2093	65.2093	65.0344	65.5731	66.1539	66.5644	66.9935 (39)
Average = Sum(39)m / 12 =												66.3558 (39)
HLP	Jan 0.9354	Feb 0.9321	Mar 0.9289	Apr 0.9140	May 0.9112	Jun 0.8982	Jul 0.8982	Aug 0.8958	Sep 0.9032	Oct 0.9112	Nov 0.9169	Dec 0.9228 (40)
HLP (average)												0.9140 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

Assumed occupancy												2.3876	(42)
Average daily hot water use (litres/day)												89.0045	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Usily hot water use	97.9049	94.3447	90.7845	87.2244	83.6642	80.1040	80.1040	83.6642	87.2244	90.7845	94.3447	97.9049	(44)
Energy cost	145.1901	126.9842	131.0363	114.2407	109.6166	94.5908	87.6523	100.5823	101.7836	118.6189	129.4818	140.6089	(45)
Energy cost (annual)												Total = Sum(45)m = 1400.3867	(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	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	(58)
Heat gains from water heating, 380/month	30.8529	26.9841	27.8452	24.2761	23.2935	20.1005	18.6261	21.3737	21.6290	25.2065	27.5149	29.8794	(59)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

5. Internal gains (see Table 5 and 5a)											
Metabolic gains (Table 5), Watts											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
(66)m	115.3778	115.3778	115.3778	115.3778	115.3778	115.3778	115.3778	115.3778	115.3778	115.3778	115.3778
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5											
	18.1417	16.1133	13.1042	9.9207	7.4159	6.2608	6.7650	8.7934	11.8025	14.9860	18.6459
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5											
	201.2876	205.3971	200.0813	188.7645	174.4790	161.0527	152.0832	149.9737	155.2895	166.6063	180.8918
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5											
	34.5378	34.5378	34.5378	34.5378	34.5378	34.5378	34.5378	34.5378	34.5378	34.5378	34.5378
Pumps, fans											
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Losses e.g. evaporation (negative values) (Table 5)											
	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022
Water heating gains (Table 5)											
	41.4690	40.1550	37.4264	33.7169	31.3085	27.9174	25.0351	28.7281	30.0403	33.8797	38.2151
Total internal gains											
	320.5117	319.2788	308.2252	290.0154	270.8168	252.8443	241.4966	245.1086	254.7456	273.0854	294.2111

6. Solar gains											
[Jan]	Area	Solar flux	g	FP	Access	Gains					
	m ²	Table 6a	Specific data	Specific data	factor	W					
		W/m ²	or Table 6b	or Table 6c	Table 6d						
Southwest	8.2600	36.7938	0.6300	0.7000	0.7700	92.8810 (79)					
Northwest	7.4400	11.2829	0.6300	0.7000	0.7700	25.6547 (81)					
Solar gains	118.5357	210.4316	310.5563	422.7332	508.1252	519.6828	494.6908	428.6558	349.0367	238.6746	143.5303
Total gains	439.0474	529.7104	618.7815	712.7486	778.9420	772.5271	736.1874	673.7643	603.7823	511.7600	437.7414

7. Mean internal temperature (heating season)											
Temperature during heating periods in the living area from Table 9, Thl (C)											
Utilisation factor for gains for living area, nil,m (see Table 9a)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
tau	74.2429	74.5013	74.7564	75.9782	76.2112	77.3151	77.3151	76.8862	76.2112	75.7412	75.2561
alpha	5.9495	5.9668	5.9838	6.0652	6.0807	6.1543	6.1543	6.1682	6.1257	6.0807	6.0494
util living area											
	0.9978	0.9930	0.9752	0.9042	0.7411	0.5345	0.3890	0.4424	0.7126	0.9517	0.9943
MIT											
	20.0631	20.2409	20.4953	20.7858	20.9487	20.9940	20.9993	20.9985	20.7282	20.3380	20.0352
Th 2											
	20.1375	20.1403	20.1430	20.1556	20.1580	20.1690	20.1690	20.1711	20.1648	20.1580	20.1532
util rest of house											
	0.9971	0.9908	0.9675	0.8777	0.6884	0.4677	0.3160	0.3635	0.9321	0.9921	0.9980
MIT 2											
	19.2790	19.4580	19.7097	19.9917	20.1264	20.1665	20.1689	20.1707	20.1498	19.9480	19.5661
Living area fraction											
	19.6339	19.8123	20.0653	20.3511	20.4986	20.5411	20.5447	20.5454	20.5210	20.3011	19.9155
MIT											
	19.6339	19.8123	20.0653	20.3511	20.4986	20.5411	20.5447	20.5454	20.5210	20.3011	19.9155
Temperature adjustment											
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
adjusted MIT											
	19.6339	19.8123	20.0653	20.3511	20.4986	20.5411	20.5447	20.5454	20.5210	20.3011	19.9155

8. Space heating requirement											
Utilisation											
	0.9966	0.9897	0.9666	0.8844	0.7105	0.4979	0.3491	0.3993	0.6722	0.9360	0.9913
Useful gains											
	437.5534	524.2714	598.1414	630.3544	553.4036	384.6315	256.9732	269.0206	405.8767	478.9901	433.9421
Ext temp											
	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000
Heat loss rate W											
	1041.2908	1009.1506	914.8596	759.8583	582.0619	387.4130	257.2322	269.5903	421.0437	641.7677	853.0526
Month fracti											
	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Space heating kWh											
	449.1806	325.8388	235.6383	93.2428	21.3218	0.0000	0.0000	0.0000	0.0000	121.1066	301.7596
Space heating											
	449.1806	325.8388	235.6383	93.2428	21.3218	0.0000	0.0000	0.0000	0.0000	121.1066	301.7596
Space heating per m2											
	(98) / (4) =	27.7001 (99)									

8c. Space cooling requirement											
Calculated for June, July and August. See Table 10b											
Ext. temp.											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
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
Utilisation											
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Useful gains											
	0.0000	0.0000	0.0000	0.0000	0.0000	0.9793	0.9921	0.9868	0.0000	0.0000	0.0000
Useful loss											
	0.0000	0.0000	0.0000	0.0000	0.0000	600.2434	478.7325	487.7286	0.0000	0.0000	0.0000
Total gains											
	0.0000	0.0000	0.0000	0.0000	0.0000	988.6722	944.4515	872.8832	0.0000	0.0000	0.0000
Month fracti											
	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000
Space cooling kWh											
	0.0000	0.0000	0.0000	0.0000	0.0000	279.6543	346.4949	286.5550	0.0000	0.0000	0.0000
Space cooling											
	0.0000	0.0000	0.0000	0.0000	0.0000	279.6543	346.4949	286.5550	0.0000	0.0000	0.0000
Cooled fraction											
	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000
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
Space cooling kWh											
	0.0000	0.0000	0.0000	0.0000	0.0000	69.9136	86.6237	71.6388	0.0000	0.0000	0.0000

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



Property Reference	Flat Type T43 - MID				Issued on Date	23/05/2022
Assessment Reference	BE LEAN	Prop Type Ref	03rd Floor - 2B3P			
Property	Flat Type T43, London , N8					
SAP Rating	85 B	DER	15.45	TER	15.88	
Environmental	89 B	% DER<TER	2.71			
CO ₂ Emissions (t/year)	0.80	DFEE	32.72	TFEE	38.86	
General Requirements Compliance	Pass	% DFEE<TFEE	15.80			
Assessor Details	Mr. Simon Gowing, Simon Gowing, Tel: 02036031616, Simon@hodkinsonconsultancy.com				Assessor ID	R572-0001
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

Mid-floor flat, total floor area 63 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:Mains gas (c)
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 15.88 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 15.45 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)38.9 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)32.7 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.24 (max. 0.30)	0.24 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor (no floor)			
Roof (no roof)			
Openings	0.90 (max. 2.00)	0.90 (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:	4.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system: None

5 Cylinder insulation

Hot water storage: Nominal cylinder loss: 0.22 kWh/day

Permitted by DBSCG 0.35 OK

Primary pipework insulated: No primary pipework

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and TRVsOK

Hot water controls: No cylinderstat

7 Low energy lights

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

Minimum 75% OK

8 Mechanical ventilation

Continuous supply and extract system

Specific fan power: 0.64

Maximum 1.5 OK

WWR efficiency: 90% OK

Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): Slight OK

Based on:

Overshading: Average

Windows facing North East: 8.26 m², No overhang

Windows facing North West: 4.96 m², No overhang

Air change rate: 4.00 ach

Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K

Party wall U-value 0.00 W/m²K

Window U-value 0.90 W/m²K

HODKINSON

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

	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 infiltr rate		0.2168	0.2125	0.2083	0.1870	0.1828	0.1615	0.1615	0.1573	0.1700	0.1828	0.1933
Adjusted mechanical ventilation with heat recovery												0.1998 (22b)
If mechanical ventilation:												0.5000 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												63.0000 (23c)
Effective ac	0.4018	0.3975	0.3933	0.3720	0.3678	0.3465	0.3465	0.3423	0.3550	0.3678	0.3763	0.3848 (25)

3. Heat losses and heat loss parameter

[illegible]

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)	103.6346	103.6346	103.6346	103.6346	103.6346	103.6346	103.6346	103.6346	103.6346	103.6346	103.6346	103.6346 (66)
Lighting gains (calculated in Appendix L, equation L19 or L19a), also see Table 5	16.1988	14.3877	11.7008	8.8583	6.6217	5.5903	6.0405	7.8517	10.5385	13.3811	15.6177	16.6491 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5								135.5118	133.6322	138.3688	148.4525	173.1447 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.3635	33.3635	33.3635	33.3635	33.3635	33.3635	33.3635	33.3635	33.3635	33.3635	33.3635	33.3635 (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. evaporative (negative values) (Table 5)	-82.9077	-82.9077	-82.9077	-82.9077	-82.9077	-82.9077	-82.9077	-82.9077	-82.9077	-82.9077	-82.9077	-82.9077 (71)
Water heating gains (Table 5)	96.2769	94.2483	90.0358	84.3089	80.5908	75.3555	76.6071	78.6329	84.5603	91.2535	94.2568 (72)	
Total internal gains	347.7030	345.7428	334.1070	315.4538	296.7703	278.5403	266.5484	272.1814	281.6306	300.4843	322.1429	338.1409 (73)

Solar gains	33.0778	67.3309	121.3088	199.2239	267.7961	285.4990	267.0784	212.9180	147.8167	82.2837	41.6205	27.0130 (83)
Total gains	380.7809	413.0738	455.4158	514.6778	564.5663	564.0392	533.6268	485.0994	429.4473	382.7680	363.7634	365.1539 (84)

7. Mean internal temperature (heating season)													21,000 m ² (85)
Temperature during heating periods in the living area from Table 9, Th1 (C)													
Thilisation factor for gains for living area, nillm (see Table 9, Th1 (C))													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	93.4119	93.8546	94.3015	96.6012	97.0747	99.5134	99.5134	100.0159	98.5233	97.0747	96.1323	95.2081	
alpha	7.2275	7.2570	7.2868	7.4401	7.4716	7.6342	7.6342	7.6677	7.5682	7.4716	7.4088	7.3472	
util living area	0.9972	0.9942	0.9809	0.9089	0.7226	0.4998	0.3640	0.4163	0.6993	0.9518	0.9931	0.9979 (86)	
MIT	20.3494	20.4496	20.6325	20.8669	20.9790	20.9998	20.9998	20.9998	20.9880	20.8284	20.5587	20.3394 (87)	
Th 2	20.3026	20.3057	20.3088	20.3242	20.3273	20.3427	20.3427	20.3458	20.3365	20.3273	20.3211	20.3149 (88)	
util rest of house	0.9964	0.9924	0.9750	0.8857	0.6776	0.4491	0.3097	0.3573	0.6390	0.9340	0.9806	0.9973 (89)	
MIT 2	19.4260	19.5472	19.8399	20.1736	20.3083	20.3420	20.3427	20.3457	20.3277	20.1317	19.7459	19.4212 (90)	
Living area fraction									fLA = Living area	/ (4) =			
MIT	19.8304	19.9576	20.1870	20.4772	20.6020	20.6296	20.6305	20.6321	20.6168	20.4368	20.1018	19.8233 (92)	
temperature adjustment											0.0000		
adjusted MIT	19.8304	19.9576	20.1870	20.4772	20.6020	20.6296	20.6305	20.6321	20.6168	20.4368	20.1018	19.8233 (93)	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9957	0.9913	0.9738	0.8914	0.6963	0.4713	0.3335	0.3832	0.6650	0.9373	0.9896	0.9967 (94)
Useful gas	379.1310	409.467	443.495	458.785	393.1285	265.8073	177.9577	185.8758	285.934	358.7497	359.9881	363.9438 (95)
Heat loss rate W	4.3300	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.7000	14.1000	10.6000	7.1000	4.2000 (96)
Month factor	730.660	705.0226	637.8125	526.6545	402.9825	266.2642	177.9839	185.9493	290.6704	445.2985	594.3452	721.1077 (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 (98)
Space heating m ²	261.496	198.5934	144.5718	48.8657	7.3314	0.0000	0.0000	0.0000	0.0000	64.3923	168.7371	265.7389 (99)
Space heating per m ²										(98) / (4) =		18.3269 (99)



FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)
Fraction of space heat from community system
Fraction of heat from community Boilers
Fraction of total space heat from community Boilers
Factor for control and charging method (Table 4c(3)) for community space heating
Factor for control and charging method (Table 4c(3)) for community water heating
Distribution loss factor (Table 12c) for community heating system
Space heating:
Annual space heating requirement
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)
Space heating fuel for secondary/supplementary system

0.0000 (301)
1.0000 (302)
1.0000 (303a)
1.0000 (304a)
1.0000 (305)
1.0000 (305a)
1.0500 (306)
1159.7282 (98)
1217.7147 (207a)
0.0000 (308)
0.0000 (309)

Water heating
Annual water heating requirement
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05
Electricity used for heat distribution
Annual totals kWh/year

1734.9070 (64)
1821.6524 (310a)
30.3937 (313)

Electricity for pumps and fans:
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.8000)
mechanical ventilation fans (SFP = 0.8000)
Total electricity for the above, kWh/year
Electricity for lighting (calculated in Appendix L)
Total delivered energy for all uses

154.4032 (330a)
154.4032 (331)
286.0767 (332)
3479.8469 (338)

Efficiency of heat source Boilers
Space heating from Boilers
Electrical energy for heat distribution
Total CO2 associated with community systems
(negative value allowed since DFEE <= TFEF)
Space and water heating
Pumps and fans
Energy for lighting
Total CO2, kg/year
Dwelling Carbon Dioxide Emission Rate (DER)

Emission factor
kg CO2/kWh
Emissions
kg CO2/year
83.5000 (367a)
733.5232 (367)
15.7743 (372)
749.2975 (373)
749.2975 (376)
80.1353 (378)
148.4738 (379)
977.9066 (383)
15.4500 (384)

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

DER
Total Floor Area
Assumed number of occupants
CO2 emission factor in Table 12 for electricity displaced from grid
CO2 emissions from appliances, equation (L14)
CO2 emissions from cooking, equation (L16)
Total CO2 emissions
Residual CO2 emissions offset from biofuel CHP
Additional allowable electricity generation, kWh/m²/year
Resulting CO2 emissions offset from additional allowable electricity generation
Net CO2 emissions

15.4500 ZC1
63.2800
2.0727
0.5190
16.9624 ZC2
2.6666 ZC3
35.0790 ZC4
0.0000 ZC5
0.0000 ZC6
0.0000 ZC7
35.0790 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

Ground floor
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)
Dwelling volume
Storey height
Volume
(3a)+(3b)+(3c)+(3d)+(3e)...(3n)

2. Ventilation rate

Number of chimneys
Number of open flues
Number of intermittent fans
Number of passive vents
Number of flueless gas fires
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =
Pressure test
Measured/design AP50
Infiltration rate
Number of sides sheltered
Shelter factor
Infiltration rate adjusted to include shelter factor
Wind speed
Wind factor
Adj infiltr rate
Effective ac

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
THER Opening Type (Uw = 1.40)
External Wall
Total net area of external elements Aum(A, m2)
Fabric heat loss, W/K = Sum (A x U)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K
Thermal bridges (Sum(L x Psi) calculated using Appendix K)
Total fabric heat loss
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)
Heat transfer coeff
Average = Sum(39)m / 12 =
HLP
HLP (average)
Days in month

4. Water heating energy requirements (kWh/year)

Assumed occupancy
Average daily hot water use (litres/day)
Daily hot water use
Energy conte
Energy content (annual)
Distribution loss (46)m = 0.15 x (45)m
Water storage loss:
Store volume
a) If manufacturer declared loss factor is known (kWh/day):
Temperature factor from Table 2b
Enter (49) or (54) in (55)
Total storage loss
If cylinder contains dedicated solar storage

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Primary loss	4.3553	3.9338	4.3553	4.2148	4.3553	4.2148	4.3553	4.2148	4.3553	4.2148	4.3553	(57)
Total heat required for water heating	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Solar input	163.7086	143.9710	150.4418	133.8079	130.3645	115.3895	109.7767	121.8964	122.1315	138.8026	148.0939	(62)
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Heat gains from water heating, kWh/month	163.7086	143.9710	150.4418	133.8079	130.3645	115.3895	109.7767	121.8964	122.1315	138.8026	148.0939	(64)
	67.3444	59.5321	62.9332	56.9859	56.2575	50.8618	49.4120	53.4418	53.1035	59.0631	61.7360	(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	103.6346	103.6346	103.6346	103.6346	103.6346	103.6346	103.6346	103.6346	103.6346	103.6346	103.6346	103.6346
Lighting gains (calculated in Appendix L9 or L9a), also see Table 5	16.1988	14.3877	11.7008	8.8583	6.6217	5.5903	6.0405	7.8517	10.5385	13.3811	15.6177	16.6491 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	181.1369	183.0166	178.2800	168.1963	155.4674	143.5041	135.5118	133.6322	138.3688	148.4525	161.1814	173.1447 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.3635	33.3635	33.3635	33.3635	33.3635	33.3635	33.3635	33.3635	33.3635	33.3635	33.3635	33.3635 (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)	-82.9077	-82.9077	-82.9077	-82.9077	-82.9077	-82.9077	-82.9077	-82.9077	-82.9077	-82.9077	-82.9077	-82.9077 (71)
Water heating gains (Table 5)	90.5166	88.5895	84.5876	79.1471	75.6149	70.6414	66.4140	71.8304	73.7548	79.3859	85.7444	88.5975 (72)
Total internal gains	344.9428	343.0841	331.6588	313.2920	294.7943	276.8261	265.0567	270.4047	279.7526	298.3099	319.6339	335.4817 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g or Table 6b	FF or Table 6c	Access factor Table 6d	Gains W						
Northeast	8.2600	11.2829	0.6300	0.7000	0.7700	28.4822 (75)						
Northwest	4.9600	11.2829	0.6300	0.7000	0.7700	17.1031 (81)						
Solar gains	45.5854	92.7904	167.1787	274.5555	369.0565	393.4532	368.0674	293.4276	203.7099	113.3972	57.3582	37.2273 (83)
Total gains	390.5282	435.8745	498.8375	587.8475	663.8508	670.2794	633.1242	563.8323	483.4624	411.7071	376.9921	372.7090 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)													
tau	75.6889	75.8894	76.1067	77.1443	77.3416	78.2734	78.2734	78.4485	77.9118	77.3416	76.9435	76.5317	
alpha	0.0446	0.0593	0.0738	0.1430	0.1561	0.2182	0.2182	0.2299	0.1941	0.1561	0.1296	0.1021	
util living area													
	0.9976	0.9947	0.9821	0.9185	0.7464	0.5309	0.3895	0.4551	0.7531	0.9645	0.9945	0.9981	(86)
MIT	20.1008	20.2267	20.4612	20.7678	20.9488	20.9946	20.9993	20.9983	20.9610	20.6985	20.3489	20.0798	(87)
Th 2	20.1524	20.1547	20.1569	20.1673	20.1693	20.1784	20.1784	20.1801	20.1749	20.1693	20.1653	20.1612	(88)
util rest of house													
	0.9968	0.9929	0.9763	0.8948	0.6943	0.4650	0.3171	0.3750	0.6820	0.9492	0.9924	0.9975	(89)
MIT 2	19.9464	19.1316	19.4718	19.9036	20.1230	20.1750	20.1781	20.1794	20.1454	19.8209	19.3184	18.9225	(90)
Living area fraction									fLA = Living area /				(4)
	19.4519	19.6111	19.9051	20.2820	20.4847	20.5339	20.5377	20.5380	20.5025	20.2052	19.7696	19.4292	(92)
Temperature adjustment													(0.0000)
adjusted MIT	19.4519	19.6111	19.9051	20.2820	20.4847	20.5339	20.5377	20.5380	20.5025	20.2052	19.7696	19.4292	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9959	0.9915	0.9742	0.8984	0.7148	0.4938	0.3489	0.4102	0.7116	0.9500	0.9911	0.9968
Useful gains	388.9221	432.1709	485.9591	528.1405	474.2364	330.9594	220.8658	231.2405	344.0289	545.7555	373.6411	371.5312
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.4000	16.4000	14.1000	10.6000	7.1000	4.2000
Heat loss rate W	879.9395	851.8616	774.0168	648.3652	499.1326	333.1419	221.0732	231.7986	361.1213	545.7555	723.5962	874.4618
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
Space heating kWh	365.3169	282.0321	214.3150	86.5618	18.2995	0.0000	0.0000	0.0000	0.0000	115.0381	251.9677	374.1804
Space heating	365.3169	282.0321	214.3150	86.5618	18.2995	0.0000	0.0000	0.0000	0.0000	115.0381	251.9677	374.1804
Space heating per m2										(98) / (4) =		
											(26.986)	(99)

8c. Space cooling requirement

Not applicable

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

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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	1826.4295	(211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	365.3169	282.0321	214.3150	86.5618	18.2995	0.0000	0.0000	0.0000	0.0000	115.0381	251.9677	374.1804	(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)	390.7133	301.6386	229.2139	92.5794	19.5717	0.0000	0.0000	0.0000	0.0000	123.0354	269.4842	400.1929	(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	163.7086	143.9710	150.4418	133.8079	130.3645	115.3895	109.7767	121.8964	122.1315	138.8026	148.0939	159.4145	(64)
Water heating requirement	163.7086	143.9710	150.4418	133.8079	130.3645	115.3895	109.7767	121.8964	122.1315	138.8026	148.0939	159.4145	(64)
Equation of water heater	86.8945	86.5768	85.7574	83.6866	80.9785	79.8000	79.8000	79.8000	79.8000	84.3179	86.2204	87.0143	(216)
Fuel for water heating, kWh/month	188.3993	166.2929	175.4273	159.8917	160.9865	144.5984	137.5648	152.7523	153.0469	164.6183	171.7619	183.2049	(219)
Water heating fuel used	188.3993	166.2929	175.4273	159.8917	160.9865	144.5984	137.5648	152.7523	153.0469	164.6183	171.7619	183.2049	(219)
Annual totals kWh/year	33.3635	33.3635	33.3635	33.3635	33.3635	33.3635	33.3635	33.3635	33.3635	33.3635	33.3635	33.3635	(69)
Space heating fuel - main system	390.7133	301.6386	229.2139	92.5794	19.5717	0.0000	0.0000	0.0000	0.0000	123.0354	269.4842	400.1929	(211)
Space heating fuel - secondary	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Electricity for pumps and fans:													
central heating pump													
main heating flue fan													
Total electricity for the above, kWh/year													
Electricity for lighting (calculated in Appendix L)													
Total delivered energy for all uses													

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	1826.4293	0.2160	394.5088 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1958.5451	0.2160	423.0458 (264)
Space and water heating			817.5545 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	286.0767	0.5190	148.4738 (268)
Total CO2, kg/m2/year			1004.9533 (272)
Emissions per m2 for space and water heating			12.9196 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.3463 (272b)
Emissions per m2 for pumps and fans			0.6151 (272c)
Target Carbon Dioxide Emission Rate (TER) = (12.9196 * 1.00) + 2.3463 + 0.6151, rounded to 2 d.p.			15.8800 (273)

FULL SAP CALCULATION PRINTOUT

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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 (m2)	Storey height (m)	Volume (m3)
Ground floor	63.2800 (1b)	2.5000 (2b)	158.2000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	63.2800		158.2000 (4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+... (3n)	158.2000 (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 * 20 = 0.0000 (6b)
Number of intermittent fans	+	0	+	=	2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of fuelless gas fires					0 * 40 = 0.0000 (7c)

Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1264 (8)
Pressure test			Yes
Measured/design AP50			4.0000
Infiltration rate			0.3264 (18)
Number of sides sheltered			2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =		0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =		0.2775 (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	1.0000	1.0750	1.1250	1.1750 (22a)	
Adj infiltr rate												
Effective ac	0.3538	0.3468	0.3399	0.3052	0.2983	0.2636	0.2636	0.2566	0.2775	0.2983	0.3121	0.3260 (22b)
	0.5626	0.5601	0.5578	0.5466	0.5445	0.5347	0.5347	0.5329	0.5385	0.5445	0.5487	0.5531 (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 k3/m2K	A x K k3/K
Opening Type 1 (Uw = 0.90)			13.2200	0.8687	11.4846		(27)
External Wall	46.3100	13.2200	33.0900	0.2400	7.9416		(29a)
Total net area of external elements Aum(A, m2)			46.3100				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)... (30) + (32) =		19.4262		(33)
Wall to Corridor			11.0700	0.0000	0.0000		(32)
Party Wall			12.7900	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							6.6438 (36)
Total fabric heat loss					(33) + (36) =		26.0700 (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	29.3697	29.2428	29.1185	28.5345	28.4252	27.9166	27.9166	27.8224	28.1125	28.4252	28.6463	28.8774 (38)
Average = Sum(39)m / 12 =	55.4396	55.3128	55.1885	54.6044	54.4952	53.9865	53.9865	53.8923	54.1825	54.4952	54.7162	54.9473 (39)
												54.6039 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.8761	0.8741	0.8721	0.8629	0.8612	0.8531	0.8531	0.8516	0.8562	0.8612	0.8647	0.8683 (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												2.0727 (42)
Average daily hot water use (litres/day)												87.8173 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	96.5990	93.0864	89.5737	86.0610	82.5483	79.0356	79.0356	82.5483	86.0610	89.5737	93.0864	96.5990 (44)
Energy content (annual)	143.2536	125.2905	129.2886	112.7169	108.1546	93.3292	96.4832	100.4260	100.4260	117.0368	127.7548	138.7335 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 1381.7084 (45)
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)



FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Heat gains from water heating, kWh/month
30.4414 26.6242 27.4738 23.9523 22.9828 19.8324 18.3777 21.0887 21.3405 24.8703 27.1479 29.4809 (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
(66m)	103.6346	103.6346	103.6346	103.6346	103.6346	103.6346	103.6346	103.6346	103.6346	103.6346	103.6346	103.6346 (66)
Lighting gains (calculated in Appendix L, equation L19 or L9a), also see Table 5	16.1988	14.3877	11.7008	8.8583	6.6217	5.5903	6.0405	7.8517	10.5385	13.3811	15.6177	16.6491 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	181.1369	183.0166	178.2800	168.1963	155.4674	143.5041	135.5118	133.6322	138.3688	148.4525	161.1814	173.1447 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.3635	33.3635	33.3635	33.3635	33.3635	33.3635	33.3635	33.3635	33.3635	33.3635	33.3635	33.3635 (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)	-82.9077	-82.9077	-82.9077	-82.9077	-82.9077	-82.9077	-82.9077	-82.9077	-82.9077	-82.9077	-82.9077	-82.9077 (71)
Water heating gains (Table 5)	40.9158	39.6194	36.9272	33.2671	30.8909	27.5451	24.7012	28.3450	29.6396	33.4278	37.7054	39.6248 (72)
Total internal gains	292.3420	291.1140	280.9984	264.4121	247.0704	230.7298	220.3439	223.9192	232.6373	249.3518	268.5949	283.5090 (73)

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	Access factor Table 6d	Gains W
Northeast	8.2600	11.2829	0.4000	0.8000	0.7700	20.6674 (75)
Northwest	4.9600	11.2829	0.4000	0.8000	0.7700	12.4104 (81)

Solar gains	33.0778	67.3309	121.3088	199.2239	267.7961	285.4990	267.0784	212.9180	147.8167	82.2837	41.6205	27.0130 (83)
Total gains	325.4199	358.4449	402.3072	463.6360	514.8665	516.2288	487.4223	436.8372	380.4540	331.6355	310.2153	310.5220 (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	79.2654	79.4472	79.6261	80.4778	80.6391	81.3989	81.3989	81.5412	81.1046	80.6391	80.3134	79.9756
alpha	6.2844	6.2965	6.3084	6.3652	6.3759	6.4266	6.4266	6.4361	6.4070	6.3759	6.3542	6.3317
util living area	0.9991	0.9981	0.9935	0.9662	0.8575	0.6516	0.4849	0.5610	0.8573	0.9861	0.9980	0.9993 (86)
MIT	20.0616	20.1674	20.3738	20.6668	20.8977	20.9857	20.9981	20.9955	20.9252	20.6245	20.2940	20.0413 (87)
Th 2	20.1879	20.1896	20.1913	20.1991	20.2006	20.2075	20.2075	20.2088	20.2049	20.2006	20.1976	20.1945 (88)
util rest of house	0.9988	0.9974	0.9911	0.9541	0.8148	0.5784	0.3989	0.4680	0.7976	0.9793	0.9972	0.9991 (89)
MIT 2	19.3197	19.4267	19.6334	19.9257	20.1321	20.2010	20.2070	20.2070	20.2075	20.1620	19.8898	19.3050 (90)
Living area fraction	F _{LA} = Living area / (4) = 0.4379 (91)											
MIT	19.6446	19.7511	19.9576	20.2502	20.4673	20.5446	20.5534	20.5526	20.4962	20.2115	19.8814	19.6274 (92)
adjusted MIT	19.6446	19.7511	19.9576	20.2502	20.4673	20.5446	20.5534	20.5526	20.4962	20.2115	19.8814	19.6274 (93)

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[illegible]

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	Storey height		Volume
	(m ²)	(m)		(m ³)
Ground floor	63.2800 (1b)	x	2.5000 (2b)	= 158.2000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	63.2800			(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		158.2000 (5)

[illegible]

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	R-value kJ/m ² K	A x R kJ/K
TER Opening Type (Uw = 1.40)			13.2200	1.3258	17.5265		(29)
External Wall	46.3100	13.2200	33.0900	0.1800	5.9562		(276)
Total net area of external elements Aum(A, m ²)			46.3100				(31)
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	23.4827		(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)							4.1448 (36)
Total fabric heat loss						(33) + (36) =	27.6275 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)							
(38m)	Jan	Feb	Mar	Apr	May	Jun	Jul
Heat transfer coeff	30.4471	30.2784	30.1131	29.3364	29.1911	28.5147	28.5147
	Aug	Sep	Oct	Nov	Dec		
	28.3895	28.7753	29.1911	29.4851	29.7924	(38)	
Average = Sum(39m) / 12 =	58.0746	57.9059	57.7406	56.9640	56.8186	56.1422	56.1422
	56.0170	56.4028	56.8186	57.1126	57.4139	(39)	
					56.9633	(39)	
HLP (average)	Jan	Feb	Mar	Apr	May	Jun	Jul
Days in month	0.9177	0.9151	0.9125	0.9002	0.8979	0.8872	0.8872
	Aug	Sep	Oct	Nov	Dec		
	0.8852	0.8913	0.8979	0.9025	0.9074	(40)	
					0.9002	(40)	
	31	28	31	30	31	30	31
							31 (41)

Assumed occupancy												2.0727 (42)
Average daily hot water use (litres/day)												83.4265 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Usily hot water use	91.7691	88.4320	85.0950	81.7579	78.4209	75.0838	75.0838	78.4209	81.7579	85.0950	88.4320	91.7691 (44)
Energy cost	136.0909	119.0260	122.8242	107.0811	102.7468	88.6627	82.1590	94.2787	111.1850	121.3671	131.7968 (45)	
Energy content (annual)										Total = Sum(45)m		1312.6229 (45)
Distribution loss (46) = 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	0.0000 (46)
Water storage loss:												
Total storage loss												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Heat gains from water heating, kWh/month												
28.9193	25.2930	26.1001	22.7547	21.8337	18.8408	17.4588	20.0342	20.2735	23.6268	25.7905	28.0068 (65)	

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5. Internal gains (see Table 5 and 5a)												
Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66) m	103.6346	103.6346	103.6346	103.6346	103.6346	103.6346	103.6346	103.6346	103.6346	103.6346	103.6346	103.6346
Lighting gains (calculated in Appendix L, equation L9 or L18), also see Table 5	16.1988	14.3877	11.7008	8.8583	6.6217	5.5903	6.0405	7.8517	10.5385	13.3811	15.6177	16.6491 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	181.1369	183.0616	178.2860	168.1963	155.4674	143.5041	135.5118	133.6322	138.3688	148.4525	161.1814	173.1447 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.3635	33.3635	33.3635	33.3635	33.3635	33.3635	33.3635	33.3635	33.3635	33.3635	33.3635	33.3635 (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. evaporators (negative values) (Table 5)	-82.9077	-82.9077	-82.9077	-82.9077	-82.9077	-82.9077	-82.9077	-82.9077	-82.9077	-82.9077	-82.9077	-82.9077 (71)
Water heating gains (Table 5)	38.8701	37.6384	35.0808	31.6038	29.3464	26.1678	23.4661	26.9277	28.1576	31.7565	35.8201	37.6436 (72)
Total internal gains	290.2962	289.1331	279.1520	262.7487	245.5258	229.5326	219.1089	222.5020	231.5514	247.6804	266.7096	281.2757 (73)

[Jan]			Area m ²	Solar flux Table 6a W/m ²	g Table 6b	PF Specific data or Table 6c	Access factor Table 6d	Gains W				
Northeast			8.2600	11.2829	0.6300	0.7000	0.7700	28.4822 (75)				
Northwest				4.9600	0.6300	0.7000	0.7700	17.1031 (81)				
Solar gains	45.5854	92.7904	167.1787	274.5555	369.0565	393.4532	368.0674	293.4276	203.7099	113.3972	97.3582	37.2273 (83)

Temperature during heating periods in the living area from Table 9, Th (C)												21.0000 (85)
Utilization factor for gains for living area, nL,m (see Table 9)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	0.0889	0.0889	0.0889	0.0889	0.0889	0.0889	0.0889	0.0889	0.0889	0.0889	0.0889	0.0889
alpha	0.0446	0.0593	0.0738	0.1430	0.1561	0.2182	0.2182	0.2299	0.1941	0.1561	0.1296	0.1021
util living area	0.9889	0.9973	0.9896	0.9426	0.7878	0.5688	0.4196	0.4961	0.8090	0.9807	0.9976	0.9992 (86)
MIT	0.01070	0.02148	0.03864	0.07157	0.09312	0.09921	0.09990	0.09973	0.09418	0.06316	0.02686	0.01967 (87)
Th 2	0.01524	0.02148	0.03569	0.06793	0.09312	0.09921	0.09990	0.09973	0.09418	0.06316	0.02686	0.01967 (87)
util rest of house	0.9889	0.9973	0.9896	0.9426	0.7878	0.5688	0.4196	0.4961	0.8090	0.9807	0.9976	0.9992 (86)
MIT	0.01070	0.02148	0.03864	0.07157	0.09312	0.09921	0.09990	0.09973	0.09418	0.06316	0.02686	0.01967 (87)
Th 2	0.01524	0.02148	0.03569	0.06793	0.09312	0.09921	0.09990	0.09973	0.09418	0.06316	0.02686	0.01967 (87)
util living area	0.9889	0.9973	0.9896	0.9426	0.7878	0.5688	0.4196	0.4961	0.8090	0.9807	0.9976	0.9992 (86)
MIT	0.01070	0.02148	0.03864	0.07157	0.09312	0.09921	0.09990	0.09973	0.09418	0.06316	0.02686	0.01967 (87)
Th 2	0.01524	0.02148	0.03569	0.06793	0.09312	0.09921	0.09990	0.09973	0.09418	0.06316	0.02686	0.01967 (87)
util rest of house	0.9889	0.9973	0.9896	0.9426	0.7878	0.5688	0.4196	0.4961	0.8090	0.9807	0.9976	0.9992 (86)
MIT	0.01070	0.02148	0.03864	0.07157	0.09312	0.09921	0.09990	0.09973	0.09418	0.06316	0.02686	0.01967 (87)
Th 2	0.01524	0.02148	0.03569	0.06793	0.09312	0.09921	0.09990	0.09973	0.09418	0.06316	0.02686	0.01967 (87)
util living area	0.9889	0.9973	0.9896	0.9426	0.7878	0.5688	0.4196	0.4961	0.8090	0.9807	0.9976	0.9992 (86)
MIT	0.01070	0.02148	0.03864	0.07157	0.09312	0.09921	0.09990	0.09973	0.09418	0.06316	0.02686	0.01967 (87)
Th 2	0.01524	0.02148	0.03569	0.06793	0.09312	0.09921	0.09990	0.09973	0.09418	0.06316	0.02686	0.01967 (87)
util rest of house	0.9889	0.9973	0.9896	0.9426	0.7878	0.5688	0.4196	0.4961	0.8090	0.9807	0.9976	0.9992 (86)
MIT	0.01070	0.02148	0.03864	0.07157	0.09312	0.09921	0.09990	0.09973	0.09418	0.06316	0.02686	0.01967 (87)
Th 2	0.01524	0.02148	0.03569	0.06793	0.09312	0.09921	0.09990	0.09973	0.09418	0.06316	0.02686	0.01967 (87)
util living area	0.9889	0.9973	0.9896	0.9426	0.7878	0.5688	0.4196	0.4961	0.8090	0.9807	0.9976	0.9992 (86)
MIT	0.01070	0.02148	0.03864	0.07157	0.09312	0.09921	0.09990	0.09973	0.09418	0.06316	0.02686	0.01967 (87)
Th 2	0.01524	0.02148	0.03569	0.06793	0.09312	0.09921	0.09990	0.09973	0.09418	0.06316	0.02686	0.01967 (87)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilization	0.9983	0.9959	0.9850	0.9268	0.7570	0.5297	0.3759	0.4475	0.7692	0.9719	0.9961	0.9987 (94)
Useful gains	335.2938	380.3442	439.6401	497.9377	465.2613	329.8830	220.7467	230.8596	334.5052	350.9319	322.8089	318.3470 (95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.8000	14.1000	10.6000	7.1000	4.2000 (96)
Month factor	887.5475	857.7214	776.8182	648.2745	498.7774	333.0806	221.0641	231.7712	360.5818	545.6314	727.6614	882.3819 (97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000 (97a)
Space heating m2	410.8968	320.7975	250.8605	108.1993	24.9360	0.0000	0.0000	0.0000	0.0000	144.8564	291.4996	419.6240 (98)
Space heating per m2												1971.6880 (98)
											(98) / (4) =	31.1582 (99)

Calculated for June, July and August. See Table 10b												
Ext. temp.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	527.7370	415.4525	425.7290	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9738	0.9894	0.9791	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss W	0.0000	0.0000	0.0000	0.0000	0.0000	513.9360	411.0496	416.8152	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	805.1718	761.9553	679.9380	0.0000	0.0000	0.0000	0.0000 (103)
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	209.6898	261.1035	195.7634	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												666.5567 (104)
Cooled fraction												1.5987 (105)
Intermittency factor (Table 10b)												$fc = \text{cooled area} / (4) =$
Useful loss W	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	52.4224	65.2759	48.9408	0.0000	0.0000	0.0000	0.0000 (107)

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166.6392 (107
  2.6334 (108
  31.1582 (99)
  2.6334 (108
  33.7915 (109
    38.9 (109

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FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



Property Reference	Flat Type T22 - TOP				Issued on Date	23/05/2022
Assessment Reference	BE LEAN	Prop Type Ref	13th Floor - 1B2P			
Property	Flat Type T22, London , N8					
SAP Rating	83 B	DER	18.68	TER	19.68	
Environmental	88 B	% DER<TER	5.07			
CO ₂ Emissions (t/year)	0.78	DFEE	42.41	TFEE	53.10	
General Requirements Compliance	Pass	% DFEE<TFEE	20.13			
Assessor Details	Mr. Simon Gowing, Simon Gowing, Tel: 02036031616, Simon@hodkinsonconsultancy.com				Assessor ID	R572-0001
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

Top-floor flat, total floor area 50 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:Mains gas (c)
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 19.68 kgCO₂/m²/yr
Dwelling Carbon Dioxide Emission Rate (DER) 18.68 kgCO₂/m²/yrOK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)53.1 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)42.4 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.24 (max. 0.30)	0.24 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor (no floor)			
Roof	0.14 (max. 0.20)	0.14 (max. 0.35)	OK
Openings	0.90 (max. 2.00)	0.90 (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:	4.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system:	Community heating scheme	-
Secondary heating system:	None	

5 Cylinder insulation

Hot water storage	Nominal cylinder loss: 0.22 kWh/day
Permitted by DBSCG 0.35	OK
Primary pipework insulated:	No primary pipework

6 Controls

Space heating controls:	Charging system linked to use of community heating, programmer and TRVsOK
-------------------------	---

Hot water controls:

No cylinderstat

7 Low energy lights

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

8 Mechanical ventilation

Continuous supply and extract system	
Specific fan power:	0.64
Maximum	1.5
WWR efficiency:	90%
Minimum:	70%OK

9 Summertime temperature

Overheating risk (Thames Valley):	Slight	OK
Based on:		
Overshading:	Average	
Windows facing South East:	2.48 m ² , No overhang	
Windows facing South West:	11.56 m ² , No overhang	
Air change rate:	4.00 ach	
Blinds/curtains:	None	

10 Key features

Party wall U-value	0.00 W/m ² K
Party wall U-value	0.00 W/m ² K
Party wall U-value	0.00 W/m ² K
Window U-value	0.90 W/m ² K

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													

Ground floor	Area (m2)			Storey height (m)			Volume (m3)						
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.3000 (1b)			x 2.5000 (2b)			= 125.7500 (1b) - (3b)						
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)			= 125.7500 (5)						

2. Ventilation rate													

	main heating			secondary heating			other			total			m3 per hour
Number of chimneys	0 + 0			0 + 0			0 = 0			0 * 40 = 0.0000 (6a)			
Number of open flues	0 + 0			0 + 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 fuelless gas fires										0 * 40 = 0.0000 (7c)			
										Air changes per hour			
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =										0.0000 / (5) = 0.0000 (8)			
Pressure test										Yes			
Measured/design AP50										4.0000			
Infiltration rate										0.2000 (18)			
Number of sides sheltered										3 (19)			
Shelter factor							(20) = 1 - [0.075 x (19)] =			0.7750 (20)			
Infiltration rate adjusted to include shelter factor							(21) = (18) x (20) =			0.1550 (21)			
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)	
Adj infiltr rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)	
Balanced mechanical ventilation with heat recovery	0.1976	0.1938	0.1899	0.1705	0.1666	0.1473	0.1473	0.1434	0.1550	0.1666	0.1744	0.1821 (22b)	
If mechanical ventilation:													0.5000 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =													63.0000 (23c)
Effective ac	0.3826	0.3788	0.3749	0.3555	0.3516	0.3323	0.3323	0.3284	0.3400	0.3516	0.3594	0.3671 (25)	

3. Heat losses and heat loss parameter													

Element	Gross m2			Openings m2			NetArea m2			U-value W/m2K			A x U W/K
Opening Type 1 (Uw = 0.90)							14.0400			0.8687			12.1969
External Wall	43.5100			14.0400			29.4700			0.2400			7.0728
Roof	50.3000						50.3000			0.1400			7.0420
Total net area of external elements Aum(A, m2)							93.8100						
Fabric heat loss, W/K = Sum (A x U)							(26)...(30) + (32) =			26.3117 (33)			
Wall to Corridor							4.0900			0.0000			0.0000 (32)
Party Wall							13.2900			0.0000			0.0000 (32)
Wall to stairs/lift							28.2200			0.0000			0.0000 (32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K													250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)													11.2423 (36)
Total fabric heat loss										(33) + (36) =			37.5540 (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	15.8780	15.7172	15.5564	14.7524	14.5916	13.7875	13.7875	13.6267	14.1092	14.5916	14.9132	15.2348 (38)	
Average = Sum(39)m / 12 =	53.4320	53.2712	53.1104	52.3064	52.1456	51.3416	51.3416	51.1808	51.6632	52.1456	52.4672	52.7888 (39)	
	52.2662 (39)												
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.0623	1.0591	1.0559	1.0399	1.0367	1.0207	1.0207	1.0175	1.0271	1.0367	1.0431	1.0495 (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													1.6989 (42)
Average daily hot water use (litres/day)													78.4734 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy content	86.3208	83.1818	80.0429	76.9039	73.7650	70.6261	70.6261	73.7650	76.9039	80.0429	83.1818	86.3208 (44)	
Energy content (annual)	128.0112	111.9594	115.5321	100.7237	96.6467	83.3988	77.2812	88.6814	89.7405	104.5839	114.1615	123.9720 (45)	
Distribution loss (46)m = 0.15 x (45)m													Total = Sum(45)m = 1234.6923 (45)
	19.2017	16.7939	17.3298	15.1085	14.4970	12.5098	11.5922	13.3022	13.611	15.6876	17.1242	18.5958 (46)	



FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Water storage loss:													3.0000 (47)
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)													
Volume factor from Table 2a													
Temperature factor from Table 2b													
Enter (49) or (54) in (55)													
Total storage loss													
6.7353	6.0835	6.7353	6.5180	6.7353	6.5180	6.7353	6.7353	6.5180	6.7353	6.5180	6.7353 (56)		
If cylinder contains dedicated solar storage													
6.7353	6.0835	6.7353	6.5180	6.7353	6.5180	6.7353	6.7353	6.5180	6.7353	6.5180	6.7353 (57)		
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)		
Total heat required for water heating calculated for each month													
Solar input	158.0089	139.0541	145.5298	129.7537	126.6444	112.4288	127.2789	118.6790	118.7705	134.5816	143.1915	153.9697 (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 =													
158.0089	139.0541	145.5298	129.7537	126.6444	112.4288	127.2789	118.6790	118.7705	134.5816	143.1915	153.9697 (64)		
Heat gains from water heating, kWh/month													
66.5619	58.9023	62.4126	56.7146	56.1332	50.9541	49.6942	53.4847	53.0627	58.7723	61.1827	65.2188 (65)		
Total per year (kWh/year) = Sum(64)m =													
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		
84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468 (66)	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
13.1955	11.7201	9.5314	7.2159	4.5538	4.9206	6.3959	8.5846	10.9001	12.7221	13.5622 (67)			
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
148.0131	149.5490	145.6785	137.4388	127.0376	117.2620	110.7313	109.1954	113.0658	121.3055	131.7067	141.4824 (68)		
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
31.4947	31.4947	31.4947	31.4947	31.4947	31.4947	31.4947	31.4947	31.4947	31.4947	31.4947	31.4947 (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)													
-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575 (71)	
Water heating gains (Table 5)													
89.4649	87.6522	83.8879	78.7703	75.4478	70.7696	66.7932	71.8880	73.6982	78.9950	84.9760	87.6597 (72)		
299.1575	297.4053	287.5819	271.9091	256.3635	241.0695	230.9291	235.9634	243.8327	259.6847	279.7888	291.1884 (73)		
6. Solar gains													
[Jan]													
			Area m ²	Solar flux Table 6a W/m ²	g Table 6b	Specific data or Table 6c	FF Table 6c	Access factor Table 6d				Gains W	
Southeast			2.4800	36.7938	0.4000		0.8000		0.7700			20.2353 (77)	
Southwest			11.5600	36.7938	0.4000		0.8000		0.7700			94.3227 (79)	
Solar gains													
114.5580	195.1346	266.9917	330.8157	370.5411	367.8616	354.6578	325.0208	289.0955	215.6653	137.2141	98.0378 (83)		
Total gains	413.7155	492.5399	554.5736	602.7248	626.9046	608.9310	585.5869	560.9842	532.9282	475.3501	415.1029	389.2261 (84)	
7. Mean internal temperature (heating season)													
Temperature during heating periods in the living area from Table 9, Th1 (C)													
Utilisation factor for gains for living area, nil/m (see Table 9a)													
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
tau	65.3739	65.5712	65.7697	66.7807	66.9866	68.0356	68.0356	68.2494	67.6121	66.9866	66.5760	66.1704	
alpha	5.3383	5.3714	5.3846	5.4520	5.4658	5.5357	5.5357	5.5500	5.5075	5.4658	5.4384	5.4114	
util living area	0.9912	0.9777	0.9455	0.8649	0.7204	0.5313	0.3846	0.4177	0.6428	0.8952	0.9793	0.9935 (86)	
MIT	20.0850	20.2859	20.5332	20.7873	20.9365	20.9903	20.9986	20.9979	20.9734	20.7774	20.3854	20.0487 (87)	
Th 2	20.0318	20.0344	20.0370	20.0502	20.0529	20.0661	20.0661	20.0688	20.0608	20.0529	20.0476	20.0423 (88)	
util rest of house	0.9885	0.9712	0.9302	0.8308	0.6628	0.4574	0.3306	0.3342	0.5656	0.8203	0.9721	0.9914 (89)	
MIT 2	18.8323	19.1226	19.4719	19.8200	19.9968	20.0603	20.0656	20.0680	20.0426	19.8183	19.2874	18.7876 (90)	
Living area fraction	0.4300	0.4300	0.4300	0.4300	0.4300	0.4300	0.4300	0.4300	0.4300	0.4300	0.4300	0.4300 (91)	
MIT 1	19.5328	19.7732	20.0654	20.3610	20.5223	20.5804	20.5874	20.5880	20.5632	20.3547	19.8975	19.4929 (93)	
Temperature adjustment												0.0000	
adjusted MIT	19.5328	19.7732	20.0654	20.3610	20.5223	20.5804	20.5874	20.5880	20.5632	20.3547	19.8975	19.4929 (93)	
8. Space heating requirement													
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation	0.9867	0.9691	0.9307	0.8427	0.6922	0.4985	0.3489	0.3810	0.6078	0.8725	0.9708	0.9899 (94)	
Useful gains	408.2247	477.3025	516.1432	507.9296	433.9573	303.5647	204.3236	213.7091	323.9337	414.7298	402.9629	385.2996 (95)	
Ext temp	4.3000	4.3000	4.3000	4.3000	4.3000	4.3000	4.3000	4.3000	4.3000	4.3000	4.3000	4.3000 (96)	
Heat loss rate W	813.9209	792.3138	720.4655	599.4842	460.4464	307.0425	204.7200	214.3457	333.9669	508.6632	671.4480	807.2918 (97)	
Month factor	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	301.8379	211.6876	152.0158	65.9180	19.4089	0.0000	0.0000	0.0000	0.0000	69.8864	193.3093	313.9622 (98)	
Space heating												328.0261 (98)	
Space heating per m ²												26.4021 (99)	
(98) / (4) =													

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8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)
Fraction of space heat from community system
Fraction of heat from community boilers
Fraction of total space heat from community boilers
Factor for control and charging method (Table 4c3) for community space heating
Factor for control and charging method (Table 4c3) for community water heating
Distribution loss factor (Table 12c) for community heating system
Space heating:
Annual space heating requirement
Space heat from Boilers = $(98) \times 1.00 \times 1.00 \times 1.05$
Efficiency of secondary/supplementary heating system in § (Table 4a or Appendix E)
Space heating fuel

Water heating
Annual water heating requirement
Water heat from Boilers = $(64) \times 1.00 \times 1.00 \times 1.05$
Electricity used for heat distribution
Annual totals kWh/year

Electricity for pumps and fans:
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.8000)
mechanical ventilation fans (SFP = 0.8000)
Total electricity for the above, kWh/year
Electricity for lighting (calculated in Appendix L)
Total delivered energy for all uses

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Boilers			
Space heating from Boilers	3420.9083	0.2160	89.5000 (367)
Electrical energy for heat distribution	30.6171	0.5190	738.9162 (367)
Total CO2 associated with community systems (negative value allowed since DFEK <= FFEK)			15.8903 (372)
Space and water heating			784.8065 (373)
Pumps and fans	122.7320	0.5190	514.8065 (376)
Energy for lighting	233.0362	0.5190	514.8065 (378)
Total CO2, kg/year			120.9458 (379)
Dwelling Carbon Dioxide Emission Rate (DER)			339.4502 (383)
			18.6800 (384)

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

DER		18.6800	ZC1
Total Floor Area		50.3000	
Assumed number of occupants	N	1.6989	
CO2 emission factor in Table 12 for electricity displaced from grid	EF	0.5190	
CO2 emissions from appliances, equation (L14)		17.4373	ZC2
CO2 emissions from cooking, equation (L16)		3.1764	ZC3
Total CO2 emissions		39.2937	ZC4
Residual CO2 emissions offset from biofuel CHP		0.0000	ZC5
Additional allowable electricity generation, kWh/m ² /year		0.0000	ZC6
Revised CO2 emissions offset from additional allowable electricity generation		0.0000	ZC7
Net CO2 emissions		39.2937	ZC8

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				
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.3000	50.3000 (1b)	2.5000 (2b)	= 125.7500 (1b) - (3b)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 125.7500 (5)
				(5)

2. Ventilation rate

	main		secondary		other	total	m3 per hour
	heating		heating				
Number of chimneys	0	+	0	+	0	0 * 40 =	0.000 (6a)
Number of open flues	0	+	0	+	0	0 * 20 =	0.000 (6b)
Number of intermittent fans						2 * 10 =	20.000 (7a)
Number of passive vents						0 * 10 =	0.000 (7b)
Number of fuelless gas fires						0 * 40 =	0.000 (7c)

	Air changes per hour
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.1590 (8)
Pressure test	Yes
Measured/design AP50	5.0000
Infiltration rate	0.4090 (18)
Number of sides sheltered	3 (19)

Shelter factor	(20) = 1 - [0.075 x (19)] =	0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3170 (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 infill rate												
	0.4042	0.3963	0.3883	0.3487	0.3408	0.3012	0.3012	0.2932	0.3170	0.3408	0.3566	0.3725 (22b)
Effective ac	0.5817	0.5785	0.5754	0.5608	0.5581	0.5453	0.5453	0.5430	0.5581	0.5581	0.5636	0.5694 (25)

3. Heat losses and heat loss parameter

[illegible][illegible]

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.3255	1.3229	1.3203	1.3083	1.3060	1.2955	1.2955	1.2936	1.2995	1.3060	1.3106	1.3153 (40)
HLP (average)												1.3082 (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												1.6989 (42)
Average daily hot water use (litres/day)												74.5497 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	82.0047	79.0227	76.0407	73.0587	70.0768	67.0948	67.0948	70.0768	73.0587	76.0407	79.0227	82.0047 (44)
Energy content	121.6106	106.3614	109.7555	95.6875	91.8144	79.2289	73.4172	84.2473	85.2935	99.3547	108.5432	117.7345 (45)
Energy content (annual)										Total =	Sum(45)m =	1172.9577 (45)
Distribution loss (46)m = 0.15 x (45)m												
	18.2416	15.9542	16.4633	14.3531	13.7722	11.8843	11.0126	12.6371	12.7880	14.9032	16.2680	17.6660 (46)
Water storage loss:												
Store volume												3.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												2.2602 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.1405 (50)
Total storage loss	4.3553	3.9338	4.3553	4.2148	4.3553	4.2148	4.3553	4.3553	4.2148	4.3553	4.2148	4.3553 (56)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF TARGET EMISSIONS 09 Jan 2014

If cylinder contains dedicated solar storage												
	4.3553	3.9338	4.3553	4.3553	4.2148	4.3553	4.2148	4.3553	4.2148	4.3553	4.2148	4.3553 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month												
	149.2283	131.3064	137.3731	122.4143	119.4321	105.9556	101.0349	111.8650	111.9802	126.9724	135.1802	145.3911 (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)
Output from w/h												
	149.2283	131.3064	137.3731	122.4143	119.4321	105.9556	101.0349	111.8650	111.9802	126.9724	135.1802	145.3911 (64)
Heat gains from water heating, kWh/month												
	62.5297	55.3212	58.5878	53.1975	52.6224	47.7250	46.5054	50.1064	49.7282	55.1296	57.4422	61.2538 (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	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	13.1955	11.7201	9.5314	7.2159	5.3940	4.5538	4.9206	6.3959	8.5846	10.9001	12.7221	13.5622 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	148.0131	149.5490	145.6785	137.4388	127.0376	117.2620	110.7313	109.1954	113.0658	121.3055	131.7067	141.4824 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	31.4947	31.4947	31.4947	31.4947	31.4947	31.4947	31.4947	31.4947	31.4947	31.4947	31.4947	31.4947 (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)												
	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575 (71)
Water heating gains (Table 5)												
	84.0453	82.3232	78.7471	73.8854	70.7291	66.2847	62.5072	67.3473	69.0669	74.0989	79.7808	82.3304 (72)
Total internal gains	296.7379	295.0763	285.4411	270.0242	254.6447	239.5846	229.6431	234.4226	242.2014	257.7886	275.6936	288.8590 (73)

6. Solar gains												
[Jan]	Area	Solar flux	g	FF	Access	Gains						
	m2	Table 6a	W/m2	Specific data or Table 6b	Specific data or Table 6c	Table 6d						
South-east	2.2200	36.7938	0.6300	0.7000	0.7000	24.9632 (77)						
South-west	10.3500	36.7938	0.6300	0.7000	0.7000	116.3824 (79)						
Solar gains	141.3455	240.7638	329.4235	408.1717	457.1863	453.8801	437.5889	401.0218	356.6960	266.0952	169.2994	120.9623 (83)
Total gains	438.0834	535.8401	614.8646	678.1959	711.8310	693.4647	667.2320	635.4444	598.8974	523.8838	444.9930	409.8213 (84)

7. Mean internal temperature (heating season)												
Temperature during heating periods in the living area from Table 9, Th1 (C)												
Utilisation factor for gains for living area, nli,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	52.3919	52.4955	52.5975	53.0819	53.1735	53.6042	53.6042	53.6847	53.4375	53.1735	52.9885	52.7964
alpha	4.4928	4.4997	4.5065	4.5388	4.5449	4.5736	4.5736	4.5790	4.5625	4.5449	4.5326	4.5198
util living area	0.9908	0.9774	0.9477	0.8785	0.7520	0.5765	0.4245	0.4630	0.6888	0.9095	0.9802	0.9930 (86)
MIT	19.7708	20.0088	20.3114	20.6362	20.8627	20.9686	20.9937	20.9907	20.9300	20.6247	20.1290	19.7230 (87)
Th 2	19.8209	19.8230	19.8250	19.8344	19.8361	19.8444	19.8444	19.8459	19.8412	19.8361	19.8326	19.8288 (88)
util rest of house	0.9878	0.9703	0.9316	0.8428	0.6869	0.4828	0.3157	0.3509	0.5967	0.8742	0.9727	0.9907 (89)
MIT 2	18.2254	18.5688	18.9972	19.4411	19.7152	19.8258	19.8423	19.8426	19.7934	19.4406	18.7525	18.1617 (90)
Living area fraction	19.0897	19.3741	19.7321	20.1095	20.3569	20.4649	20.4862	20.4847	20.4291	20.1028	19.5223	19.0368 (92)
Temperature adjustment	19.0897	19.3741	19.7321	20.1095	20.3569	20.4649	20.4862	20.4847	20.4291	20.1028	19.5223	19.0368 (93)
adjusted MIT	19.0897	19.3741	19.7321	20.1095	20.3569	20.4649	20.4862	20.4847	20.4291	20.1028	19.5223	19.0368 (93)

8. Space heating requirement												
Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9853	0.9670	0.9302	0.8521	0.7176	0.5343	0.3767	0.4137	0.6455	0.8834	0.9702	0.9887 (94)
Useful gains	431.6495	518.1439	571.9205	577.8851	510.7933	370.5153	251.3631	262.8945	386.5907	462.7975	431.7357	405.1754 (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	986.0526	963.1103	878.7607	737.6397	568.6665	382.1817	253.2420	265.7730	413.7134	624.2529	818.8918	981.4859 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000 (97a)
Space heating	412.4760	299.0174	228.2891	115.0234	43.0726	0.0000	0.0000	0.0000	0.0000	120.1228	278.7524	428.7750 (98)
Space heating												1925.5287 (98)
Space heating per m2										(98) / (4) =		38.2809 (99)

8c. Space cooling requirement
Not applicable

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Calculation Type: New Build (As Designed)



CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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												
												2059.3890 (211)
Space heating requirement	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	412.4760	299.0174	228.2891	115.0234	43.0726	0.0000	0.0000	0.0000	0.0000	120.1228	278.7524	428.7750 (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)	441.1507	319.8047	244.1595	123.0197	46.0669	0.0000	0.0000	0.0000	0.0000	128.4736	298.1309	458.5829 (211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating												
Water heating requirement	149.2283	131.3064	137.3731	122.4143	119.4321	105.9556	101.0349	111.8650	111.9802	126.9724	135.1802	145.3911 (64)
Efficiency of water heater	(217)m	87.3871	86.9428	86.1598	84.6483	82.3817	79.8000	79.8000	79.8000	84.6664	86.7034	79.8000 (216)
Fuel for water heating, kWh/month	170.7670	151.0262	159.4399	144.6151	144.9741	132.7765	126.6101	140.1817	140.3261	149.9678	155.9112	166.1078 (219)
Water heating fuel used												1782.7035 (219)
Annual totals kWh/year												
Space heating fuel - main system												2059.3890 (211)
Space heating fuel - secondary												0.0000 (215)
Electricity for pumps and fans:												
central heating pump												30.0000 (230a)
main heating flue fan												45.0000 (230b)
Total electricity for the above, kWh/year												75.0000 (231)
Electricity for lighting (calculated in Appendix L)												233.0362 (232)
Total delivered energy for all uses												4150.1287 (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	2059.3890	0.2160	444.8280	(261)								
Space heating - secondary	0.0000	0.0000	0.0000	(263)								
Water heating (other fuel)												
Space and water heating	1782.7035	0.2160	385.0640	(264)								
Pumps and fans												
Pumps and fans	75.0000	0.5190	38.9250	(267)								
Energy for lighting												
Total CO2, kg/m2/year	233.0362	0.5190	120.9458	(268)								
Emissions per m2 for space and water heating			989.7628	(272)								
Fuel factor (main use)			16.4988	(272a)								
Emissions per m2 for lighting			1.0000									
Emissions per m2 for pumps and fans			2.4045	(272b)								
Target Carbon Dioxide Emission Rate (TER) = (16.4988 * 1.00) + 2.4045 + 0.7739, resulting to 2 d.p.			0.7739	(272c)								
			19.6800	(273)								

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1. Overall dwelling dimensions

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	50.3000 (1b)	2.5000 (2b)	125.7500 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.3000		125.7500 (4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	125.7500 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	0	0	0	0 * 40 = 0.0000 (6a)
Number of open flues	0	0	0	0	0 * 20 = 0.0000 (6b)
Number of intermittent fans	0	0	0	0	2 * 10 = 20.0000 (7a)
Number of passive vents	0	0	0	0	0 * 10 = 0.0000 (7b)
Number of fuelless gas fires	0	0	0	0	0 * 40 = 0.0000 (7c)

Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1590 (8)
Pressure test		Yes	4.0000
Measured/design AP50		Yes	0.3590 (18)
Infiltration rate		Yes	3 (19)
Number of sides sheltered			
Shelter factor	(20) = 1 - [0.075 x (19)] =		0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =		0.2783 (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	0.9250	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infiltr rate												
Effective ac	0.3548	0.3478	0.3409	0.3061	0.2991	0.2643	0.2643	0.2574	0.2783	0.2991	0.3130	0.3270 (22b)
	0.5629	0.5605	0.5581	0.5468	0.5447	0.5349	0.5349	0.5331	0.5387	0.5447	0.5490	0.5535 (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
Opening Type 1 (Uw = 0.90)			14.0400	0.8687	12.1969		(27)
External Wall	43.5100	14.0400	29.4700	0.2400	7.0728		(29a)
Roof	50.3000		50.3000	0.1400	7.0420		(30)
Total net area of external elements Aum(A, m2)			93.8100				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...	(30) + (32) =	26.3117	(33)
Wall to Corridor			4.0900	0.0000	0.0000		(32)
Party Wall			13.2900	0.0000	0.0000		(32)
Wall to stairs/lift			28.2200	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							11.2423 (36)
Total fabric heat loss						(33) + (36) =	37.5540 (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	23.3604	23.2590	23.1596	22.6927	22.6053	22.1987	22.1987	22.1234	22.3553	22.6053	22.7820	22.9668 (38)
Average = Sum(39)m / 12 =	60.9144	60.8130	60.7136	60.2467	60.1593	59.7527	59.7527	59.6774	59.9093	60.1593	60.3361	60.5208 (39)
												60.2463 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2110	1.2090	1.2070	1.1977	1.1960	1.1879	1.1879	1.1864	1.1910	1.1960	1.1995	1.2032 (40)
HLP (average)												1.1977 (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												1.6989 (42)
Average daily hot water use (litres/day)												78.4734 (43)
Daily hot water use	86.3208	83.1818	80.0429	76.9039	73.7650	70.6261	70.6261	73.7650	76.9039	80.0429	83.1818	86.3208 (44)
Energy conte	128.0112	111.9594	115.5321	100.7237	96.6467	83.3988	77.2812	88.6814	89.7405	104.5839	114.1615	128.0112 (45)
Energy content (annual)												Total = Sum(45)m = 1234.6923 (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 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												

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Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Heat gains from water heating, kWh/month	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)
	27.2024	23.7914	24.5506	21.4038	20.5374	17.7222	16.4223	18.8448	19.0699	22.2241	24.2593	26.3440 (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	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.1955	11.7201	9.5314	7.2159	5.3940	4.5538	4.9206	6.3959	8.5846	10.9001	12.7221	13.5622 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	148.0131	149.5490	145.6785	137.4388	127.0376	117.2620	110.7313	109.1954	113.0658	121.3055	131.7067	141.4824 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.4947	31.4947	31.4947	31.4947	31.4947	31.4947	31.4947	31.4947	31.4947	31.4947	31.4947	31.4947 (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)	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575 (71)
Water heating gains (Table 5)	36.5623	35.4038	32.9981	29.7275	27.6041	24.6142	22.0729	25.3290	26.4859	29.8711	33.6935	35.4087 (72)
Total internal gains	246.2549	245.1570	236.6921	222.8662	208.5197	194.9141	186.2088	189.4043	196.6204	210.5608	226.6063	238.9373 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
South-east	2.4800	36.7938	0.4000	0.8000	0.7700	20.2353 (77)
South-west	11.5600	36.7938	0.4000	0.8000	0.7700	94.3227 (79)
Solar gains	114.5580	195.1346	266.9917	330.8157	370.5411	367.8616
Total gains	360.8129	440.2916	503.6838	553.6819	579.0608	562.7756
						540.8666
						514.4252
						485.7159
						426.2261
						363.8204
						336.9750 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th 1 (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	8.8229	4.8293	4.8356	4.8653	4.8709	4.8792	4.8792	4.9022	4.8870	4.8709	4.8596	4.8478	
util living area	0.9956	0.9883	0.9701	0.9212	0.8151	0.6429	0.4787	0.5219	0.7570	0.9451	0.9901	0.9968 (86)	
MIT	19.7849	19.9952	20.2761	20.5948	20.8380	20.9618	20.9926	20.9888	20.9154	20.5874	20.1147	19.7410 (87)	
Th 2	19.9112	19.9128	19.9144	19.9218	19.9232	19.9297	19.9297	19.9309	19.9272	19.9232	19.9204	19.9174 (88)	
util rest of house	0.9942	0.9845	0.9602	0.8953	0.7585	0.5502	0.3661	0.4066	0.6718	0.9212	0.9863	0.9958 (89)	
MIT 2	19.8176	19.8270	19.9031	19.6102	19.8205	19.9133	19.9279	19.9280	19.8849	19.6117	19.1530	18.7789 (90)	
Living area fraction									fLA = Living area /	(4) =	0.5592 (91)		
MIT	19.3585	19.5685	19.8473	20.1608	20.3895	20.4997	20.5233	20.5212	20.4612	20.1574	19.6908	19.3170 (92)	
Temperature adjustment												0.0000	
adjusted MIT	19.3585	19.5685	19.8473	20.1608	20.3895	20.4997	20.5233	20.5212	20.4612	20.1574	19.6908	19.3170 (93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	358.3707	432.8006	483.2909	499.2755	454.3513	338.2940	232.1989	242.4527	348.0969	395.2212	358.4521	335.2903 (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	917.2821	892.0325	810.3606	678.4285	522.7549	352.5228	234.4291	245.9439	381.0941	574.9645	759.6805	914.8902 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	415.8300	308.6038	243.3399	128.9901	50.8923	0.0000	0.0000	0.0000	0.0000	133.7290	288.8844	431.2223 (98)
Space heating												2001.4919 (98)
Space heating per m2										(98) / (4) =		39.7911 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b												
Ext. temp.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (100)
Useful 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 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (103)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (103a)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	149.3377	202.1837	175.7173	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												527.2388 (104)
Cooled fraction												1.0000 (105)
												fc = cooled area / (4) =

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Intermittency factor (Table 10b)	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	37.3344	50.5459	43.9293	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling	0.0000	0.0000	0.0000	0.0000	2.6205	2.6205	2.6205	0.0000	0.0000	0.0000	0.0000	(108)
Energy for space heating					39.7911	39.7911	39.7911					(109)
Energy for space cooling					2.6205	2.6205	2.6205					(110)
Total					42.4116	42.4116	42.4116					(111)
Dwelling Fabric Energy Efficiency (DFEE)					42.4	42.4	42.4					(112)

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1. Overall dwelling dimensions

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	50.3000	2.5000	125.7500
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.3000		125.7500
Dwelling volume			125.7500

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	0	0	0	0.0000 (6a)
Number of open flues	0	0	0	0	0.0000 (6b)
Number of intermittent fans				2	20.0000 (7a)
Number of passive vents				0	0.0000 (7b)
Number of flueless gas fires				0	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				20.0000	Air changes per hour (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4090 (18)
Number of sides sheltered					3 (19)
Shelter factor				(20) = 1 - (0.075 x (19)) =	0.7750 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3170 (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 infiltr rate	0.4042	0.3963	0.3883	0.3487	0.3408	0.3012	0.3012	0.2932	0.3170	0.3408	0.3566	0.3725 (22b)
Effective ac	0.5817	0.5785	0.5754	0.5608	0.5581	0.5453	0.5453	0.5430	0.5502	0.5581	0.5636	0.5694 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
TER Opening Type (Uw = 1.40)							
External Wall	43.5100	12.5700	12.5700	1.3258	16.6648		(27)
Roof	50.3000		30.9400	0.1800	5.5692		(28a)
Total net area of external elements Aum(A, m2)			93.8100		6.5390		(31)
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		28.7730		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							13.7603 (36)
Total fabric heat loss						(33) + (36) =	42.5333 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)							
(38)m	24.1384	24.0068	23.8778	23.2718	23.1584	22.6306	23.6276 (38)
Heat transfer coeff	66.6717	66.5401	66.4111	65.8051	65.6917	65.1639	65.1639 (39)
Average = Sum(39)m / 12 =							65.8045 (39)
HLP	1.3255	1.3229	1.3203	1.3083	1.2955	1.2955	1.3153 (40)
HLP (average)							1.3082 (40)
Days in month	31	28	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												1.6989 (42)
Average daily hot water use (litres/day)												74.5497 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	82.0047	79.0227	76.0407	73.0387	70.0768	67.0948	67.0948	70.0768	73.0387	76.0407	79.0227	82.0047 (44)
Energy content	121.0106	106.3614	109.7555	95.6875	91.8144	79.2289	73.4172	84.2473	85.2335	99.3547	108.4534	117.7346 (45)
Energy content (annual)										Total = Sum(45)m =		1172.9577 (45)
Distribution loss (46)m = 0.15 x (45)m												
Water 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 (46)
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												

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25.8423 22.6018 23.3230 20.3336 19.5106 16.8361 15.6012 17.9025 18.1164 21.1129 23.0464 25.0268 (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	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.1955	11.7201	9.5314	7.2159	5.3940	4.5538	4.9206	6.3959	8.5846	10.9001	12.7221	13.5622 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	148.0131	149.5490	145.6785	137.4388	127.0376	117.2620	110.7313	109.1954	113.0658	121.3055	131.7067	141.4824 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.4947	31.4947	31.4947	31.4947	31.4947	31.4947	31.4947	31.4947	31.4947	31.4947	31.4947	31.4947 (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)	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575 (71)
Water heating gains (Table 5)	34.7342	33.6336	31.3482	28.2411	26.2239	23.3835	20.9693	24.0626	25.1616	28.3775	32.0088	33.6382 (72)
Total internal gains	244.4268	243.3868	235.0422	221.3799	207.1395	193.6834	185.1052	188.1379	195.2961	209.0672	224.9216	237.1669 (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						

South-east	2.2200	36.7938	0.6300	0.7000	0.7700	24.9632 (77)						
South-west	10.3500	36.7938	0.6300	0.7000	0.7700	116.3824 (79)						

Solar gains	141.3455	240.7638	329.4235	408.1717	457.1863	453.8801	437.5889	401.0218	356.6960	266.0952	169.2994	120.9623 (83)
Total gains	385.7724	484.1505	564.4657	629.5515	664.3258	647.5635	622.6941	589.1597	551.9920	475.1625	394.2210	358.1292 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation factor for gains for living area, nil _m (see Table 9a)	0.9944	0.9844	0.9606	0.9009	0.7837	0.6105	0.4532	0.4965	0.7290	0.9325	0.9874	0.9959 (86)
tau	52.3919	52.4955	52.5975	53.0819	53.1735	53.6042	53.6042	53.6847	53.4375	53.1735	52.9885	52.7964
alpha	4.4928	4.4997	4.5065	4.5388	4.5449	4.5736	4.5790	4.5625	4.5449	4.5326	4.5198	4.5198
util living area	0.9944	0.9844	0.9606	0.9009	0.7837	0.6105	0.4532	0.4965	0.7290	0.9325	0.9874	0.9959 (86)
MIT	19.6796	19.9235	20.2381	20.5843	20.8361	20.9605	20.9918	20.9877	20.9116	20.5641	20.0439	19.6318 (87)
Th 2	19.8209	19.8230	19.8250	19.8344	19.8361	19.8444	19.8444	19.8459	19.8412	19.8361	19.8326	19.8288 (88)
util rest of house	0.9925	0.9794	0.9479	0.8696	0.7210	0.5139	0.3379	0.3777	0.6375	0.9038	0.9825	0.9946 (89)
MIT 2	19.6414	18.8839	19.1914	19.5221	19.7354	19.8281	19.8425	19.8428	19.7987	19.5143	19.0126	18.6002 (90)
Living area fraction	19.2220	19.4653	19.7767	20.1161	20.3509	20.4614	20.4852	20.4831	20.4211	20.1014	19.5893	19.1772 (92)
Temperature adjustment	19.2220	19.4653	19.7767	20.1161	20.3509	20.4614	20.4852	20.4831	20.4211	20.1014	19.5893	19.1772 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	382.4061	473.2439	534.6953	552.7494	498.5434	367.1641	250.7112	261.8214	378.5593	433.0431	386.7985	355.8217 (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	994.8750	969.1762	881.7231	738.0775	568.2949	381.9515	253.1778	265.6698	413.1904	624.1621	823.3103	990.9017 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	455.6768	333.2665	258.1887	133.4362	51.8951	0.0000	0.0000	0.0000	0.0000	142.1925	314.2885	472.4996 (98)
Space heating												2161.4439 (98)
Space heating per m2										(98) / (4) =		42.9711 (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	612.5405	482.2127	494.5026	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9174	0.9566	0.9446	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	561.9365	461.3032	467.0872	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	821.1665	790.8801	752.6286	0.0000	0.0000	0.0000	0.0000 (103)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000 (103a)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	186.6456	245.2052	212.4428	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												644.2336 (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												

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 46.6614 61.3013 53.1107 0.0000 0.0000 0.0000 0.0000 (107)

Space cooling 0.0000 0.0000 0.0000 0.0000 46.6614 61.3013 53.1107 0.0000 0.0000 0.0000 0.0000 (107)
Space cooling per m2 3.2023 (108)
Energy for space heating 42.9711 (99)
Energy for space cooling 3.2023 (108)
Total 46.1735 (109)
Target Fabric Energy Efficiency (TFEE) 53.1 (109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



Property Reference	Flat Type T25 - MID				Issued on Date	23/05/2022
Assessment Reference	BE LEAN	Prop Type Ref	03rd Floor - 1B-MAN			
Property	Flat Type T25, London , N8					
SAP Rating	84 B	DER	15.92	TER	17.40	
Environmental	91 B	% DER<TER	8.53			
CO ₂ Emissions (t/year)	0.55	DFEE	26.54	TFEE	33.17	
General Requirements Compliance	Pass	% DFEE<TFEE	20.00			
Assessor Details	Mr. Simon Gowing, Simon Gowing, Tel: 02036031616, Simon@hodkinsonconsultancy.com				Assessor ID	R572-0001
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

Mid-floor flat, total floor area 39 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:Mains gas (c)
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 17.40 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 15.92 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)33.2 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)26.5 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.24 (max. 0.30)	0.24 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	0.90 (max. 2.00)	0.90 (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: 4.00 (design value)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Community heating scheme -
Secondary heating system: None

5 Cylinder insulation

Hot water storage: Nominal cylinder loss: 0.22 kWh/day
Permitted by DBSCG 0.35 OK
Primary pipework insulated: No primary pipework

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and TRVsOK

Hot water controls:

No cylinderstat

7 Low energy lights

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

8 Mechanical ventilation

Continuous supply and extract system
Specific fan power: 0.64
Maximum 1.5 OK
WWR efficiency: 90%
Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): Slight OK
Based on:
Overshading: Average
Windows facing North East: 8.26 m², No overhang
Air change rate: 4.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Party wall U-value 0.00 W/m²K
Window U-value 0.90 W/m²K

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

1. Overall dwelling dimensions															

Ground floor				Area	Storey height		Volume								
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	39.1800			(m2)	x	2.5000 (2b)	=	97.9500 (1b) - (3b)							
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)			=	97.9500 (5)							

2. Ventilation rate															

Number of chimneys				main heating	secondary heating		other		total		m3 per hour				
Number of open flues				0	+	0	+	0	=	0 * 40 =	0.0000 (6a)				
Number of intermittent fans				0	+	0	+	0	=	0 * 20 =	0.0000 (6b)				
Number of passive vents				0	+	0	+	0	=	0 * 10 =	0.0000 (7a)				
Number of fireless gas fires				0	+	0	+	0	=	0 * 40 =	0.0000 (7c)				

Infiltration due to chimneys, flues and fans				= (6a)+(6b)+(7a)+(7b)+(7c) =					0.0000 / (5) =						
Pressure test									Yes						
Measured/design AFS0									4.0000						
Infiltration rate									0.2000 (18)						
Number of sides sheltered									3 (19)						

Shelter factor				(20) = 1 - [0.075 x (19)] =					0.7750 (20)						
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =					0.1550 (21)						

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)			
Adj infiltr rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)			
Balanced mechanical ventilation with heat recovery	0.1976	0.1938	0.1899	0.1705	0.1666	0.1473	0.1473	0.1434	0.1550	0.1666	0.1744	0.1821 (22b)			
If mechanical ventilation:									0.5000 (23a)						
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =									63.0000 (23c)						
Effective ac	0.3826	0.3788	0.3749	0.3555	0.3516	0.3323	0.3323	0.3284	0.3400	0.3516	0.3594	0.3671 (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					
Opening Type 1 (Uw = 0.90)				8.2600		8.2600	0.8687	7.1757	2.4696	279 (27a)					
External Wall				18.5500	8.2600	10.2900	0.2400	2.4696		25 (27b)					
Total net area of external elements Aum(A, m2)				18.5500		10.5500				31 (31)					
Fabric heat loss, W/K = Sum (A x U)								(26)...(30) + (32) =	9.6453	32 (32)					
Wall to Corridor				15.4500	0.0000	0.0000				32 (32)					
Party Wall				35.1000	0.0000	0.0000				32 (32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K										250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)										3.3598 (36)					
Total fabric heat loss										(33) + (36) =	13.0051 (37)				

Ventilation heat loss calculated monthly (38m) = 0.33 x (25)m x (5)				Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38m)	12.3678	12.2425	12.1173	11.4910	11.3658	10.7395	10.7395	10.6142	10.9900	11.3658	11.6163	11.8668 (38)			
Heat transfer coeff	25.3729	25.2476	25.1223	24.4961	24.3708	23.7446	23.7446	23.6193	23.9951	24.3708	24.6213	24.8718 (39)			
Average = Sum(39m) / 12 =												24.4648 (39)			
HLP	0.6476	0.6444	0.6412	0.6252	0.6220	0.6060	0.6060	0.6028	0.6124	0.6220	0.6284	0.6348 (40)			
HLP (average)												0.6244 (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									1.3847 (42)						
Average daily hot water use (litres/day)									70.6179 (43)						
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
Energy conte	77.6797	74.8550	72.0303	69.2055	66.3808	63.5561	63.5561	66.3808	69.2055	72.0303	74.8550	77.6797 (44)			
Energy content (annual)	115.1967	100.7518	103.9668	90.6408	86.9720	75.0502	69.5451	79.8040	80.7571	94.1146	102.7335	111.5619 (45)			
Distribution loss (46)m = 0.15 x (45)m									Total = Sum(45)m =					1111.0945 (45)	
Water storage loss:	17.2795	15.1128	15.5950	13.5961	13.0458	11.2575	10.4318	11.9706	12.1136	14.1172	15.4100	16.7343 (46)			
Score volume									3.0000 (47)						



FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

b) If manufacturer declared loss factor is not known : Hot water storage loss factor from Table 2 (kWh/litre/day) Volume factor from Table 2a Temperature factor from Table 2b Enter (49) or (54) in (55) Total storage loss													0.0212 (51) 3.4200 (52) 1.0000 (53) 0.2173 (55)

If cylinder contains dedicated solar storage	6.7353	6.0835	6.7353	6.5180	6.7353	6.5180	6.7353	6.7353	6.5180	6.7353	6.5180	6.7353 (56)	
Primary loss	6.7353	6.0835	6.7353	6.5180	6.7353	6.5180	6.7353	6.7353	6.5180	6.7353	6.5180	6.7353 (57)	
Volume factor from Table 2a	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)	
Temperature factor from Table 2b	145.1944	127.8465	133.9645	119.6708	116.9697	104.0803	99.5428	109.8017	109.7871	124.1123	131.7635	141.5596 (62)	
Enter (49) or (54) in (55)	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)	
Total storage loss	6.7353	6.0835	6.7353	6.5180	6.7353	6.5180	6.7353	6.7353	6.5180	6.7353	6.5180	6.7353 (56)	
If cylinder contains dedicated solar storage	6.7353	6.0835	6.7353	6.5180	6.7353	6.5180	6.7353	6.7353	6.5180	6.7353	6.5180	6.7353 (57)	
Volume factor from Table 2a	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)	
Temperature factor from Table 2b	145.1944	127.8465	133.9645	119.6708	116.9697	104.0803	99.5428	109.8017	109.7871	124.1123	131.7635	141.5596 (62)	
Enter (49) or (54) in (55)	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)	
Total storage loss	6.7353	6.0835	6.7353	6.5180	6.7353	6.5180	6.7353	6.7353	6.5180	6.7353	6.5180	6.7353 (56)	
If cylinder contains dedicated solar storage	6.7353	6.0835	6.7353	6.5180	6.7353	6.5180	6.7353	6.7353	6.5180	6.7353	6.5180	6.7353 (57)	
Volume factor from Table 2a	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)	
Temperature factor from Table 2b	145.1944	127.8465	133.9645	119.6708	116.9697	104.0803	99.5428	109.8017	109.7871	124.1123	131.7635	141.5596 (62)	
Enter (49) or (54) in (55)	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)	
Total storage loss	6.7353	6.0835	6.7353	6.5180	6.7353	6.5180	6.7353	6.7353	6.5180	6.7353	6.5180	6.7353 (56)	
If cylinder contains dedicated solar storage	6.7353	6.0835	6.7353	6.5180	6.7353	6.5180	6.7353	6.7353	6.5180	6.7353	6.5180	6.7353 (57)	
Volume factor from Table 2a	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)	
Temperature factor from Table 2b	145.1944	127.8465	133.9645	119.6708	116.9697	104.0803	99.5428	109.8017	109.7871	124.1123	131.7635	141.5596 (62)	
Enter (49) or (54) in (55)	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)	
Total storage loss	6.7353	6.0835	6.7353	6.5180	6.7353	6.5180	6.7353	6.7353	6.5180	6.7353	6.5180	6.7353 (56)	
If cylinder contains dedicated solar storage	6.7353	6.0835	6.7353	6.5180	6.7353	6.5180	6.7353	6.7353	6.5180	6.7353	6.5180	6.7353 (57)	
Volume factor from Table 2a	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)	
Temperature factor from Table 2b	145.1944	127.8465	133.9645	119.6708	116.9697	104.0803	99.5428	109.8017	109.7871	124.1123	131.7635	141.5596 (62)	
Enter (49) or (54) in (55)	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)	
Total storage loss	6.7353	6.0835	6.7353	6.5180	6.7353	6.5180	6.7353	6.7353	6.5180	6.7353	6.5180	6.7353 (56)	
If cylinder contains dedicated solar storage	6.7353	6.0835	6.7353	6.5180	6.7353	6.5180	6.7353	6.7353	6.5180	6.7353	6.5180	6.7353 (57)	
Volume factor from Table 2a	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)	
Temperature factor from Table 2b	145.1944	127.8465	133.9645	119.6708	116.9697	104.0803	99.5428	109.8017	109.7871	124.1123	131.7635	141.5596 (62)	
Enter (49) or (54) in (55)	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)	
Total storage loss	6.7353	6.0835	6.7353	6.5180	6.7353	6.5180	6.7353	6.7353	6.5180	6.7353	6.5180	6.7353 (56)	
If cylinder contains dedicated solar storage	6.7353	6.0835	6.7353	6.5180	6.7353	6.5180	6.7353	6.7353	6.5180	6.7353	6.5180	6.7353 (57)	
Volume factor from Table 2a	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)	
Temperature factor from Table 2b	145.1944	127.8465	133.9645	119.6708	116.9697	104.0803	99.5428	109.8017	109.7871	124.1123	131.7635	141.5596 (62)	
Enter (49) or (54) in (55)	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)	
Total storage loss	6.7353	6.0835	6.7353	6.5180	6.7353	6.5180	6.7353	6.7353	6.5180	6.7353	6.5180	6.7353 (56)	
If cylinder contains dedicated solar storage	6.7353	6.0835	6.7353	6.5180	6.7353	6.5180	6.7353	6.7353	6.5180	6.7353	6.5180	6.7353 (57)	
Volume factor from Table 2a	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)	
Temperature factor from Table 2b	145.1944	127.8465	133.9645	119.6708	116.9697	104.0803	99.5428	109.8017	109.7871	124.1123	131.7635	141.5596 (62)	
Enter (49) or (54) in (55)	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)	
Total storage loss	6.7353	6.0835	6.7353	6.5180	6.7353	6.5180	6.7353	6.7353	6.5180	6.7353	6.5180	6.7353 (56)	
If cylinder contains dedicated solar storage	6.7353	6.0835	6.7353	6.5180	6.7353	6.5180	6.7353	6.7353	6.5180	6.7353	6.5180	6.7353 (57)	
Volume factor from Table 2a	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)	
Temperature factor from Table 2b	145.1944	127.8465	133.9645	119.6708	116.9697	104.0803	99.5428	109.8017	109.7871	124.1123	131.7635	141.5596 (62)	
Enter (49) or (54) in (55)	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)	
Total storage loss	6.7353	6.0835	6.7353	6.5180	6.7353	6.5180	6.7353	6.7353	6.5180	6.7353	6.5180	6.7353 (56)	
If cylinder contains dedicated solar storage	6.7353	6.0835	6.7353	6.5180	6.7353	6.5180	6.7353	6.7353	6.5180	6.7353	6.5180	6.7353 (57)	
Volume factor from Table 2a	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)	
Temperature factor from Table 2b	145.1944	127.8465	133.9645	119.6708	116.9697	104.0803	99.5428	109.8017	109.7871	124.1123	131.7635	141.5596 (62)	
Enter (49) or (54) in (55)	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)	
Total storage loss	6.7353	6.0835	6.7353	6.5180	6.7353	6.5180	6.7353	6.7353	6.5180	6.7353	6.5180	6.7353 (56)	
If cylinder contains dedicated solar storage	6.7353	6.0835	6.7353	6.5180	6.7353	6.5180	6.7353	6.7353	6.5180	6.7353	6.5180	6.7353 (57)	
Volume factor from Table 2a	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)	
Temperature factor from Table 2b	145.1944	127.8465	133.9645	119.6708	116.9697	104.0803	99.5428	109.8017	109.7871	124.1123	131.7635	141.5596 (62)	
Enter (49) or (54) in (55)	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)	
Total storage loss	6.7353	6.0835	6.7353	6.5180	6.7353	6.5180	6.7353	6.7353	6.5180	6.7353	6.5180	6.7353 (56)	
If cylinder contains dedicated solar storage	6.7353	6.0835	6.7353	6.5180	6.7353	6.5180	6.7353	6.7353	6.5180	6.7353	6.5180	6.7353 (57)	
Volume factor from Table 2a	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)	
Temperature factor from Table 2b	145.1944	127.8465	133.9645	119.6708	116.9697	104.0803	99.5428	109.8017	109.7871	124.1123	131.7635	141.5596 (62)	
Enter (49) or (54) in (55)	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)	
Total storage loss	6.7353	6.0835	6.7353	6.5180	6.7353	6.5180	6.7353	6.7353	6.5180	6.7353	6.5180	6.7353 (56)	
If cylinder contains dedicated solar storage	6.7353	6.0835	6.7353	6.5180	6.7353	6.5180	6.7353	6.7353	6.5180	6.7353	6.5180	6.7353 (57)	
Volume factor from Table 2a	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)	
Temperature factor from Table 2b	145.1944	127.8465	133.9645	119.6708	116.9697	104.0803	99.5428	109.8017	109.7871	124.1123	131.7635	141.5596 (62)	
Enter (49) or (54) in (55)	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)	
Total storage loss	6.7353	6.0835	6.7353	6.5180	6.7353	6.5180	6.7353	6.7353	6.5180	6.7353	6.5180	6.7353 (56)	
If cylinder contains dedicated solar storage	6.7353	6.0835	6.7353	6.5180	6.7353	6.5180	6.7353	6.7353	6.5180	6.7353	6.5180	6.7353 (57)	
Volume factor from Table 2a	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)	
Temperature factor from Table 2b	145.1944	127.8465	133.9645	119.6708	116.9697	104.0803	99.5428	109.8017	109.7871	124.1123	131.7635	141.5596 (62)	
Enter (49) or (54) in (55)	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)	
Total storage loss	6.7353	6.0835	6.7353	6.5180	6.7353	6.5180	6.7353	6.7353	6.5180	6.7353	6.5180	6.7353 (56)	
If cylinder contains dedicated solar storage	6.7353	6.0835	6.7353	6.5180	6.7353	6.5180	6.7353	6.7353	6.5180	6.7353	6.5180	6.7353 (57)	
Volume factor from Table 2a	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)	
Temperature factor from Table 2b	145.1944	127.8465	133.9645	119.6708	116.9697	104.0803	99.5428	109.8017	109.7871	124.1123	131.7635	141.5596 (62)	
Enter (49) or (54) in (55)	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)	
Total storage loss	6.7353	6.0835	6.7353	6.5180	6.7353	6.5180	6.7353						

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)
Fraction of space heat from community system
Fraction of heat from community Boilers
Fraction of total space heat from community Boilers
Factor for control and charging method (Table 4c(3)) for community space heating
Factor for control and charging method (Table 4c(3)) for community water heating
Distribution loss factor (Table 12c) for community heating system
Space heating:
Annual space heating requirement
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)
Space heating fuel for secondary/supplementary system

0.0000 (301)
1.0000 (302)
1.0000 (303a)
1.0000 (304a)
1.0000 (305)
1.0000 (305a)
1.0000 (306)
375.2000 (98)
393.9601 (307a)
0.0000 (308)
0.0000 (309)

Water heating
Annual water heating requirement
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05
Electricity used for heat distribution
Annual totals kWh/year

1464.2931 (64)
1537.5078 (310a)
19.3147 (313)

Electricity for pumps and fans:
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.8000)
mechanical ventilation fans (SFP = 0.8000)
Total electricity for the above, kWh/year
Electricity for lighting (calculated in Appendix L)
Total delivered energy for all uses

95.5992 (330a)
95.5992 (331)
188.5731 (332)
2215.6402 (338)

12b. Carbon dioxide emissions - Community heating scheme

Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Boilers		89.5000 (367a)
Space heating from Boilers	0.2160	466.1420 (367)
Electrical energy for heat distribution	0.5190	476.1663 (373)
Total CO2 associated with community systems (negative value allowed since DPER <= TPBE)		476.1663 (376)
Space and water heating		49.6160 (378)
Pumps and fans		97.8695 (379)
Energy for lighting		623.6517 (383)
Total CO2, kg/year		15.9200 (384)
Dwelling Carbon Dioxide Emission Rate (DER)		

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

TFA	N	EF	15.9200 EC1
Total Floor Area	39.1800		
Assumed number of occupants	1.3847		
CO2 emission factor in Table 12 for electricity displaced from grid	0.5190		
CO2 emissions from appliances, equation (L14)	18.0703	EC2	
CO2 emissions from cooking, equation (L16)	3.8855	EC3	
Total CO2 emissions	37.8758	EC4	
Residual CO2 emissions offset from biofuel CHP	0.0000	EC5	
Additional allowable electricity generation, kWh/m ² /year	0.0000	EC6	
Resulting CO2 emissions offset from additional allowable electricity generation	0.0000	EC7	
Net CO2 emissions	37.8758	EC8	

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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

Ground floor	Area (m ²)	Storey height (m)	Volume (m ³)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	39.1800	2.5000	97.9500
Dwelling volume			97.9500

2. Ventilation rate

Number of chimneys	main heating	secondary heating	other	total	m ³ per hour
Number of open flues	0	0	0	0	0.0000 (6a)
Number of intermittent fans	0	0	0	0	0.0000 (6b)
Number of passive vents	0	0	0	0	2.0000 (7a)
Number of fuelless gas fires	0	0	0	0	0.0000 (7b)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					0.0000 (7c)
Pressure test					20.0000 / (5) = 0.2042 (8)
Measured/design AP50					Yes 5.0000
Infiltration rate					0.4542 (18)
Number of sides sheltered					3 (19)
Shelter factor					(20) = 1 - [(0.075 x (19))] = 0.7750 (20)
Infiltration rate adjusted to include shelter factor					(21) = (18) x (20) = 0.3520 (21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Adj infiltr rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Effective ac	0.4488	0.4400	0.4312	0.3872	0.3784	0.3344	0.3344	0.3256	0.3520	0.3784	0.3960	0.4136 (22b)
	0.6007	0.5968	0.5930	0.5750	0.5716	0.5559	0.5559	0.5530	0.5619	0.5716	0.5784	0.5855 (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	K-value kJ/m ² K	A x K
TER Opening Type (Uw = 1.40)							
External Wall	18.5500	8.2600	8.2600	1.3258	10.9508	1.8522	105.9838 (27)
Total net area of external elements Aum(A, m ²)			18.5500				105.9838 (28a)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 12.8030		1.7898 (36)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							1.7898 (36)
Total fabric heat loss							(33) + (36) = 14.5928 (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	19.4170	19.2906	19.1667	18.5847	18.4758	17.9689	17.9689	17.8751	18.1642	18.4758	18.6961	18.9264 (38)
Heat transfer coeff	34.0097	33.8833	33.7594	33.1775	33.0686	32.5617	32.5617	32.4678	32.7569	33.0686	33.2888	33.1769 (39)
Average = Sum(39)m / 12 =												
HLP (average)	0.8680	0.8648	0.8616	0.8468	0.8440	0.8311	0.8311	0.8287	0.8361	0.8440	0.8496	0.8555 (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	1.3847 (42)
Average daily hot water use (litres/day)	67.0870 (43)
Daily hot water use	73.7957
Energy conte	109.4369
Energy content (annual)	95.7142
Distribution loss (46)m = 0.15 x (45)m	16.4155
Water storage loss:	
Store volume	3.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):	0.2602 (48)
Temperature factor from Table 2b	0.5400 (49)
Enter (49) or (54) in (55)	0.1405 (55)
Total storage loss	4.3553
If cylinder contains dedicated solar storage	4.3553

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Primary loss	4.3553	3.9338	4.3553	4.2148	4.3553	4.2148	4.3553	4.2148	4.3553	4.2148	4.3553 (57)	
23.2624	23.2624	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624 (59)	
Total heat required for water heating calculated for each month	137.0546	120.6592	126.3862	112.8355	110.2411	98.0245	93.6855	103.4315	103.4460	117.0266	124.3236	133.6015 (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)
Output from w/h	137.0546	120.6592	126.3862	112.8355	110.2411	98.0245	93.6855	103.4315	103.4460	117.0266	124.3236	133.6015 (64)
Heat gains from water heating, kWh/month	58.4819	51.7810	54.9347	50.0126	49.5664	45.0879	44.0617	47.3022	46.8906	51.8226	53.8324	57.3337 (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	69.2358	69.2358	69.2358	69.2358	69.2358	69.2358	69.2358	69.2358	69.2358	69.2358	69.2358	69.2358 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	10.6778	9.4839	7.7128	5.8391	4.3648	3.6850	3.9817	5.1756	6.9467	8.8204	10.2947	10.9746 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	119.4768	120.7166	117.5923	110.9412	102.5453	94.6544	89.3827	88.1429	91.2672	97.9183	106.3142	114.2051 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	29.9236	29.9236	29.9236	29.9236	29.9236	29.9236	29.9236	29.9236	29.9236	29.9236	29.9236	29.9236 (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)	-55.3886	-55.3886	-55.3886	-55.3886	-55.3886	-55.3886	-55.3886	-55.3886	-55.3886	-55.3886	-55.3886	-55.3886 (71)
Water heating gains (Table 5)	78.6047	77.0550	73.8369	69.4619	66.6215	62.6221	59.2227	63.5783	65.1258	69.6540	74.7672	77.0615 (72)
Total internal gains	255.5300	254.0262	245.9128	233.0130	220.3024	207.7322	199.3579	203.6675	210.1104	223.1635	238.1468	249.0119 (73)

6. Solar gains

[Jan]	Area		Solar flux		g		FF		Access		Gains	
	m2		Table 6a		Specific data		Specific data		factor		W	
			W/m2		or Table 6b		or Table 6c		Table 6d			
Northeast	8.2600		11.2829		0.6300		0.7000		0.7700		28.4822 (75)	
Solar gains	28.4822	57.9764	104.4551	171.5453	230.5905	245.8339	229.9725	183.3368	127.2802	70.8518	35.8380	23.2600 (83)
Total gains	284.0123	312.0027	350.3679	404.5582	450.8929	453.5660	429.3304	387.0043	337.3905	294.0153	273.9848	272.2720 (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	80.0016	80.3001	80.5948	82.0085	82.2785	83.5593	83.5593	83.8009	83.0613	82.2785	81.7341	81.1726	
alpha	6.3334	6.3533	6.3730	6.4672	6.4852	6.5706	6.5706	6.5867	6.5374	6.4852	6.4489	6.4115	
util living area	0.9938	0.9875	0.9631	0.8627	0.6628	0.4580	0.3335	0.3855	0.6530	0.9240	0.9858	0.9951 (86)	
MIT	20.2780	20.3997	20.6153	20.8670	20.9780	20.9983	20.9998	20.9996	20.9855	20.8166	20.5116	20.2599 (87)	
Th 2	20.1948	20.1975	20.2002	20.2130	20.2153	20.2265	20.2265	20.2285	20.2222	20.2153	20.2105	20.2055 (88)	
util rest of house	0.9919	0.9838	0.9526	0.8315	0.6131	0.4033	0.2750	0.3211	0.5862	0.8978	0.9809	0.9936 (89)	
MIT 2	19.2367	19.4147	19.7231	20.0683	20.1962	20.2254	20.2284	20.2284	20.2119	20.0146	19.5878	19.2188 (90)	
Living area fraction	19.7640	19.9135	20.1749	20.4727	20.5921	20.6168	20.6181	20.6189	20.6036	20.4207	20.0556	19.7460 (92)	
MIT	19.7640	19.9135	20.1749	20.4727	20.5921	20.6168	20.6181	20.6189	20.6036	20.4207	20.0556	19.7460 (93)	
adjusted adjustment												0.0000	
temperature	19.7640	19.9135	20.1749	20.4727	20.5921	20.6168	20.6181	20.6189	20.6036	20.4207	20.0556	19.7460 (93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9906	0.9822	0.9522	0.8424	0.6374	0.4310	0.3047	0.3537	0.6195	0.9054	0.9798	0.9925 (94)
Ext temp	281.3449	306.4471	333.6142	340.8010	287.3826	195.4680	130.7976	136.8834	209.0259	266.1877	268.4373	270.2299 (95)
Heat loss rate W	4.3000	4.9000	6.5000	8.3000	11.7000	14.6000	16.4000	16.4000	14.6000	11.7000	9.7000	8.3000 (96)
Month fracti	525.9267	508.7071	461.6563	383.9532	294.0489	195.9165	130.8346	136.9780	213.0384	324.7570	431.2757	521.0885 (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	181.9688	135.9187	95.2633	31.0695	4.9597	0.0000	0.0000	0.0000	0.0000	43.5681	117.2437	186.6388 (98)
Space heating per m2										(98) / (4) =		20.3326 (99)

8c. Space cooling requirement

Not applicable

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

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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													852.0114 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	181.9688	135.9187	95.2633	31.0695	4.9597	0.0000	0.0000	0.0000	0.0000	43.5681	117.2437	186.6388	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	93.5000	93.5000	93.5000	93.5000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	194.6191	145.3676	101.8859	33.2294	5.3045	0.0000	0.0000	0.0000	0.0000	46.5969	125.3943	199.6137	(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	137.0546	120.6592	126.3862	112.8355	110.2411	98.0245	93.6855	103.4315	103.4460	117.0266	124.3236	133.6015 (64)
Efficiency of water heater	85.5708	85.1320	84.0721	81.8904	80.2083	79.8000	79.8000	79.8000	79.8000	82.4444	84.6580	85.7057 (217)
Fuel for water heating, kWh/month	160.1651	141.7319	150.3306	137.7885	137.4435	122.8377	117.4004	129.6134	129.6316	141.9460	146.8539	155.8840 (219)
Water heating fuel used												1671.6267 (219)
Annual totals kWh/year												852.0114 (211)
Space heating fuel - main system												0.0000 (215)
Space heating fuel - secondary												
Electricity for pumps and fans:												30.0000 (230c)
central heating pump												45.0000 (230e)
main heating flue fan												75.0000 (231)
Total electricity for the above, kWh/year												188.5731 (232)
Electricity for lighting (calculated in Appendix L)												2787.2111 (238)
Total delivered energy for all uses												

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

Energy	Emission factor	Emissions
kWh/year	kg CO2/kWh	kg CO2/year
852.0114	0.2160	184.0345 (261)
0.0000	0.0000	0.0000 (263)
1671.6267	0.2160	361.0714 (264)
		545.1058 (265)
75.0000	0.5190	38.9250 (267)
188.5731	0.5190	97.8695 (268)
		681.9003 (272)
		13.9129 (272a)
		1.0000
		2.4979 (272b)
		0.9935 (272c)
		17.4000 (273)

Target Carbon Dioxide Emission Rate (TER) = (13.9129 * 1.00) + 2.4979 + 0.9935, rounded to 2 d.p.

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1. Overall dwelling dimensions

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	39.1800 (1b)	2.5000 (2b)	97.9500 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	39.1800		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	97.9500 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	0	0	0	0.0000 (6a)
Number of open flues	0	0	0	0	0.0000 (6b)
Number of intermittent fans	0	0	0	0	0.0000 (7a)
Number of passive vents	0	0	0	0	0.0000 (7b)
Number of fuelless gas fires	0	0	0	0	0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				20.0000 / (5) = 0.2042 (8)
Pressure test					Yes
Measured/design AFS0					4.0000
Infiltration rate					0.4042 (18)
Number of sides sheltered					3 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3132 (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 infiltr rate	0.3994	0.3916	0.3837	0.3446	0.3367	0.2976	0.2976	0.2898	0.3132	0.3367	0.3524	0.3681 (22b)
Effective ac	0.5798	0.5767	0.5736	0.5594	0.5567	0.5463	0.5463	0.5420	0.5491	0.5567	0.5621	0.5677 (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
Opening Type 1 (Uw = 0.90)			8.2600	0.8687	7.1757		(27)
External Wall	18.5500	8.2600	10.2900	0.2400	2.4696		(29a)
Total net area of external elements Aum(A, m2)			18.5500				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...	(30) + (32) =	9.6453		(33)
Party Wall			15.4500	0.0000	0.0000		(32)
Party Wall			35.1000	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							3.3598 (36)
Total fabric heat loss						(33) + (36) =	13.0051 (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	18.7397	18.6396	18.5415	18.0806	17.9944	17.5930	17.5930	17.5186	17.7476	17.9944	18.1688	18.3512 (38)
Heat transfer coeff	31.7448	31.6447	31.5465	31.0857	30.9994	30.5980	30.5980	30.5237	30.7526	30.9994	31.1739	31.3562 (39)
Average = Sum(39)m / 12 =												31.0853 (39)
HLP	0.8102	0.8077	0.8052	0.7934	0.7912	0.7810	0.7810	0.7791	0.7849	0.7912	0.7957	0.8003 (40)
HLP (average)												0.7934 (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	1.3847 (42)											
Average daily hot water use (litres/day)	70.6179 (43)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	77.6797	74.8550	72.0303	69.2055	66.3808	63.5561	63.5561	66.3808	69.2055	72.0303	74.8550	77.6797 (44)
Energy conte	115.1967	100.7518	103.9668	90.6408	86.9720	75.0502	69.5451	79.8040	80.7571	94.1146	102.7335	111.5619 (45)
Energy content (annual)										Total = Sum(45)m =		1111.0945 (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	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)

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Heat gains from water heating, kWh/month
24.4793 21.4098 22.0930 19.2612 18.4816 15.9482 14.7783 16.9583 17.1609 19.9994 21.8309 23.7069 (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	69.2358	69.2358	69.2358	69.2358	69.2358	69.2358	69.2358	69.2358	69.2358	69.2358	69.2358	69.2358 (66)
Lighting gains (calculated in Appendix L, equation L19 or L9a), also see Table 5	10.6778	9.4839	7.7128	5.8391	4.3648	3.6850	3.9817	5.1756	6.9467	8.8204	10.2947	10.9746 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	119.4768	120.7166	117.5923	110.9412	102.5453	94.6544	89.3827	88.1429	91.2672	97.9183	106.3142	114.2051 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	29.9236	29.9236	29.9236	29.9236	29.9236	29.9236	29.9236	29.9236	29.9236	29.9236	29.9236	29.9236 (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)	-55.3886	-55.3886	-55.3886	-55.3886	-55.3886	-55.3886	-55.3886	-55.3886	-55.3886	-55.3886	-55.3886	-55.3886 (71)
Water heating gains (Table 5)	22.9023	31.8598	29.6948	26.7516	24.8408	22.1502	19.8633	22.7935	23.8346	26.8809	30.3206	31.8641 (72)
Total internal gains	206.8276	205.8310	198.7707	187.3027	175.5216	164.2603	156.9985	159.8827	165.8192	177.3903	190.7003	200.8145 (73)

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	PF Specific data or Table 6c	Access factor Table 6d	Gains W
North-east	8.2600		0.4000	0.8000	0.7700	20.6674 (75)
Solar gains	20.6674	42.0691	75.7951	124.4773	178.3829	166.8735
Total gains	227.4950	247.9000	274.5658	311.7799	342.8435	342.6432

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation factor for gains for living area, nil,m (see Table 9a)												21.0000 (85)
tau	85.7096	85.9808	86.2482	87.5269	87.7704	88.9219	88.9219	89.1384	88.4748	87.7704	87.2793	86.7716
alpha	6.7140	6.7321	6.7499	6.8351	6.8514	6.9281	6.9426	6.8983	6.8983	6.8514	6.8186	6.7848
util living area	0.9980	0.9960	0.9870	0.9384	0.7860	0.5664	0.4151	0.4778	0.7739	0.9703	0.9955	0.9985 (86)
MIT	20.2256	20.3287	20.5232	20.7858	20.9517	20.9955	20.9995	20.9989	20.9682	20.7425	20.4425	20.2079 (87)
Th 2	20.2445	20.2467	20.2489	20.2591	20.2610	20.2699	20.2699	20.2715	20.2664	20.2610	20.2571	20.2531 (88)
util rest of house	0.9974	0.9947	0.9827	0.9198	0.7391	0.5041	0.3466	0.4030	0.7091	0.9576	0.9939	0.9981 (89)
MIT 2	19.5310	19.6355	19.8296	20.0890	20.2302	20.2679	20.2697	20.2712	20.2496	20.0548	19.7580	19.5206 (90)
Living area fraction	0.9974	0.9947	0.9827	0.9198	0.7391	0.5041	0.3466	0.4030	0.7091	0.9576	0.9939	0.9981 (89)
MIT	19.8827	19.9866	20.1808	20.4418	20.5956	20.6363	20.6393	20.6397	20.6134	20.4030	20.1046	19.8686 (92)
Temperature adjustment												0.0000
adjusted MIT	19.8827	19.9866	20.1808	20.4418	20.5956	20.6363	20.6393	20.6397	20.6134	20.4030	20.1046	19.8686 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	226.8257	246.4449	269.7020	288.3353	260.9592	183.5137	123.4979	129.1611	191.2959	219.7376	215.2854	217.2074 (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	494.6691	477.4092	431.5831	358.7853	275.7585	184.6996	123.5945	129.4102	200.3058	303.8889	405.4038	491.3099 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	199.2755	155.2080	120.4396	50.7240	11.0255	0.0000	0.0000	0.0000	0.0000	62.6086	136.8852	203.9323 (98)
Space heating per m2										(98) / (4) =		23.9944 (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	287.6213	226.4254	231.9801	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9840	0.9945	0.9896	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	283.0111	225.1688	229.5720	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	453.5246	430.6590	395.1701	0.0000	0.0000	0.0000	0.0000 (103)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000 (103a)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	122.7697	152.8847	123.2050	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												398.8594 (104)
Cooled fraction												1.0000 (105)
Intermittency factor (Table 10b)												0.0000 (106)
Space cooling kWh												0.0000 (106)

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Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	30.6924	38.2212	30.8013	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling per m2												99.7149 (107)
Energy for space heating												5.5450 (108)
Energy for space cooling												23.9944 (99)
Total												2.5450 (108)
Dwelling Fabric Energy Efficiency (DFEE)												26.5394 (109)
												26.5 (109)

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1. Overall dwelling dimensions

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	39.1800 (1b)	x 2.5000 (2b)	= 97.9500 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	39.1800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	97.9500 (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						2 * 10 =	20.0000 (7a)					
Number of passive vents						0 * 10 =	0.0000 (7b)					
Number of flueless gas fires						0 * 40 =	0.0000 (7c)					
							Air changes per hour					
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =					20.0000 / (5) =	0.2042 (8)					
Pressure test							Yes					
Measured/design AP50							5.0000					
Infiltration rate							0.4542 (18)					
Number of sides sheltered							3 (19)					
Shelter factor						(20) = 1 - [0.075 x (19)] =	0.7750 (20)					
Infiltration rate adjusted to include shelter factor						(21) = (18) x (20) =	0.3520 (21)					
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	1.1000	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infiltr rate	0.4488	0.4400	0.4312	0.3872	0.3784	0.3344	0.3344	0.3256	0.3520	0.3784	0.3960	0.4136 (22b)
Effective ac	0.6007	0.5968	0.5930	0.5750	0.5716	0.5559	0.5559	0.5530	0.5619	0.5716	0.5784	0.5855 (25)

3. Heat losses and heat loss parameter

Element	Gross		Openings		NetArea		U-value		A x U		K-value		A x K	
	m2		m2		m2		W/m2K		W/K		kJ/m2K		kJ/K	
TER Opening Type (Uw = 1.40)					8.2600		1.3258		10.9508				(27)	
External Wall	18.5500		8.2600		10.2900		0.1800		1.9522				(28a)	
Total net area of external elements Aum(A, m2)					18.5500								(31)	
Fabric heat loss, W/K = Sum (A x U)						(26)...	(30) + (32) =		12.8030				(33)	
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K													250.0000 (35)	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)													1.7898 (36)	
Total fabric heat loss											(33) + (36) =		14.5928 (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		
	19.4170	19.2906	19.1667	18.5847	18.4758	17.9689	17.9689	17.8751	18.1642	18.4758	18.6961	18.9264	(38)	
Heat transfer coeff														
	34.0097	33.8833	33.7594	33.1775	33.0686	32.5617	32.5617	32.4678	32.7569	33.0686	33.2888	33.5191	(39)	
Average = Sum(39)m / 12 =													(39)	
	33.1769													
HLP (average)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	0.8680	0.8648	0.8616	0.8468	0.8440	0.8311	0.8311	0.8287	0.8361	0.8440	0.8496	0.8555	(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												1.3847 (42)
Average daily hot water use (litres/day)												67.0870 (43)
Daily hot water use	Jan 73.7957	Feb 71.1122	Mar 68.4287	Apr 65.7453	May 63.0618	Jun 60.3783	Jul 60.3783	Aug 63.0618	Sep 65.7453	Oct 68.4287	Nov 71.1122	Dec 73.7957 (44)
Energy conte	109.4369	95.7142	98.7685	86.1088	82.6234	71.2977	66.0678	75.8138	76.7192	89.4089	97.5968	105.9838 (45)
Energy content (annual)										Total = Sum(45)m =		1055.5398 (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	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	23.2553	20.3393	20.9883	18.2981	17.5575	15.1508	14.0394	16.1104	16.3028	18.9994	20.7393	22.5216 (65)

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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
	69.2358	69.2358	69.2358	69.2358	69.2358	69.2358	69.2358	69.2358	69.2358	69.2358	69.2358
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5											
	10.6778	9.4839	7.7128	5.8391	4.3648	3.6850	3.9817	5.1756	6.9467	8.8204	10.2947
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5											
	119.4768	120.7166	117.5923	110.9412	102.5453	94.6544	89.3827	88.1429	91.2672	97.9183	106.3142
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5											
	29.9236	29.9236	29.9236	29.9236	29.9236	29.9236	29.9236	29.9236	29.9236	29.9236	29.9236
Pumps, fans (calculated in Appendix L, equation L15a), also see Table 5											
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Losses e.g. evaporation (negative values) (Table 5)											
	-55.3886	-55.3886	-55.3886	-55.3886	-55.3886	-55.3886	-55.3886	-55.3886	-55.3886	-55.3886	-55.3886
Water heating gains (Table 5)											
	31.2572	30.2668	28.2101	25.4140	23.5988	21.0427	18.8702	21.6538	22.6428	25.5368	28.8046
Total internal gains											
	205.1825	204.2380	197.2860	185.9651	174.2796	163.1528	156.0054	158.7431	164.6274	176.0463	189.1842

6. Solar gains											

[Jan]	Area	Solar flux	g	FF	Access	Gains					
	m2	Table 6a	Specific data	Specific data	factor	W					
	W/m2	or Table 6b	or Table 6c	or Table 6c	Table 6d						

Northeast	8.2600	11.2829	0.6300		0.7000	0.7700	28.4822 (75)				

Solar gains	28.4822	57.9764	104.4551	171.5453	230.5905	245.8339	229.9725	183.3368	127.2802	70.8518	35.8380
Total gains	233.6647	262.2144	301.7411	357.5103	404.8701	408.9867	385.9779	342.0799	291.9076	246.8981	225.0223

7. Mean internal temperature (heating season)											
Temperature during heating periods in the living area from Table 9, Th1 (C)											
Utilisation factor for gains for living area, nli,m (see Table 9a)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
tau	80.0016	80.3001	80.5948	82.0085	82.2785	83.5593	83.5593	83.8009	83.0613	82.2785	81.7341
alpha	6.3334	6.3333	6.3730	6.4672	6.4852	6.5706	6.5706	6.5867	6.5374	6.4852	6.4489
util living area											
	0.9979	0.9950	0.9819	0.9107	0.7244	0.5065	0.3708	0.4356	0.7359	0.9641	0.9951
MIT											
	20.1540	20.2804	20.5112	20.8075	20.9638	20.9969	20.9997	20.9991	20.9715	20.7312	20.3944
Th 2											
	20.1948	20.1975	20.2002	20.2130	20.2153	20.2265	20.2285	20.2222	20.2153	20.2105	20.2055
util rest of house											
	0.9972	0.9934	0.9761	0.8862	0.6740	0.4467	0.3058	0.3631	0.6674	0.9490	0.9932
MIT 2											
	19.4176	19.5456	19.7753	20.0645	20.1932	20.2252	20.2264	20.2283	20.2076	20.0030	19.6705
Living area fraction											
	19.7905	19.9177	20.1479	20.4408	20.5834	20.6159	20.6180	20.6186	FLA = Living area / (4) =	19.7773	19.7773
MIT											
	19.7905	19.9177	20.1479	20.4408	20.5834	20.6159	20.6180	20.6186	20.5944	20.3717	20.0371
Temperature adjustment											
	19.7905	19.9177	20.1479	20.4408	20.5834	20.6159	20.6180	20.6186	20.5944	20.3717	20.0371
adjusted MIT											
	19.7905	19.9177	20.1479	20.4408	20.5834	20.6159	20.6180	20.6186	20.5944	20.3717	20.0371

8. Space heating requirement											
Utilisation											
	0.9968	0.9928	0.9757	0.8939	0.6982	0.4770	0.3388	0.3998	0.7013	0.9525	0.9927
Useful gains											
	232.9079	260.3172	294.4018	319.5656	282.6927	195.0768	130.7608	136.7710	204.7045	235.1607	223.3755
Ext temp.											
	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000
Heat loss rate W											
	526.8280	508.8493	460.7452	382.8930	293.7630	195.8895	130.8316	136.9690	212.7376	323.1378	430.6616
Month fracti											
	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000
Space heating kWh											
	218.6765	167.0136	123.7595	45.5957	8.2363	0.0000	0.0000	0.0000	0.0000	65.4549	149.2460
Space heating											
Space heating per m2											
										(98) / (4) =	25.5371

8c. Space cooling requirement											
Calculated for June, July and August. See Table 10b											
Ext. temp.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000
Heat loss rate W											
	0.0000	0.0000	0.0000	0.0000	0.0000	306.0800	240.9566	246.7556	0.0000	0.0000	0.0000
Utilisation											
	0.0000	0.0000	0.0000	0.0000	0.0000	0.9885	0.9959	0.9916	0.0000	0.0000	0.0000
Useful loss											
	0.0000	0.0000	0.0000	0.0000	0.0000	302.5618	239.9608	244.6758	0.0000	0.0000	0.0000
Total gains											
	0.0000	0.0000	0.0000	0.0000	0.0000	531.2559	503.4180	452.8265	0.0000	0.0000	0.0000
Month fracti											
	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000
Space cooling kWh											
	0.0000	0.0000	0.0000	0.0000	0.0000	164.6598	196.0121	154.8641	0.0000	0.0000	0.0000
Space cooling											
Cooled fraction											
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
Space cooling kWh											
	0.0000	0.0000	0.0000	0.0000	0.0000	41.1649	49.0030	38.7160	0.0000	0.0000	0.0000
Space cooling											
FC = cooled area / (4) =											
Space cooling											
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FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



Property Reference	Flat Type T27 - HLF				Issued on Date	23/05/2022
Assessment Reference	BE LEAN	Prop Type Ref	02nd Floor - 2B3P			
Property	Flat Type T27, London , N8					
SAP Rating	84 B	DER	16.80	TER	17.31	
Environmental	88 B	% DER<TER	2.97			
CO ₂ Emissions (t/year)	0.98	DFEE	40.64	TFEE	49.32	
General Requirements Compliance	Pass	% DFEE<TFEE	17.59			
Assessor Details	Mr. Simon Gowing, Simon Gowing, Tel: 02036031616, Simon@hodkinsonconsultancy.com				Assessor ID	R572-0001
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

Mid-floor flat, total floor area 73 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:Mains gas (c)
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 17.31 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 16.80 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)49.3 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)40.6 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.24 (max. 0.30)	0.24 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)		OK
Floor	0.12 (max. 0.25)	0.12 (max. 0.70)	OK
Roof (no roof)			
Openings	0.90 (max. 2.00)	0.90 (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: 4.00 (design value)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system: None

5 Cylinder insulation

Hot water storage: Nominal cylinder loss: 0.22 kWh/day

Permitted by DBSCG 0.35 OK

Primary pipework insulated: No primary pipework

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and TRVsOK

Hot water controls: No cylinderstat

7 Low energy lights

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

8 Mechanical ventilation

Continuous supply and extract system
Specific fan power: 0.64
Maximum 1.5 OK
WWR efficiency: 90%
Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): Slight OK

Based on:

Overshading: Average
Windows facing South West: 8.26 m², No overhang
Windows facing North West: 7.44 m², No overhang

Air change rate: 4.00 ach

Blinds/curtains: None

10 Key features

Party wall U-value	0.00 W/m ² K
Party wall U-value	0.00 W/m ² K
Exposed floor U-value	0.12 W/m ² K
Window U-value	0.90 W/m ² K

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																					

Ground floor	Area (m2)			Storey height (m)			Volume (m3)														
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6000			(1b)			x	2.5000 (2b)			= 181.5000 (1b) - (3b) (4)										
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)						= 181.5000 (5)											

2. Ventilation rate																					

Number of chimneys	main heating			secondary heating			other			total			m3 per hour								
Number of open flues	0			0			0			0			0 * 40 = 0.0000 (6a)								
Number of intermittent fans	0			0			0			0			0 * 20 = 0.0000 (6b)								
Number of passive vents	0			0			0			0			0 * 10 = 0.0000 (7a)								
Number of fuelless gas fires	0			0			0			0			0 * 10 = 0.0000 (7b)								
													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										4.0000											
Number of sides sheltered										0.2000 (18)											
										2 (19)											
Shelter factor										(20) = 1 - [0.075 x (19)] =			0.8500 (20)								
Infiltration rate adjusted to include shelter factor										(21) = (18) x (20) =			0.1700 (21)								
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec									
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)									
Adj infiltr rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)									
	0.2168	0.2125	0.2083	0.1870	0.1828	0.1615	0.1615	0.1573	0.1700	0.1828	0.1913	0.1998 (22b)									
Balanced mechanical ventilation with heat recovery													0.5000 (23a)								
If mechanical ventilation:													63.0000 (23c)								
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =																					
Effective ac	0.4018	0.3975	0.3933	0.3720	0.3678	0.3465	0.3465	0.3423	0.3550	0.3678	0.3763	0.3848 (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		
Opening Type 1 (Uw = 0.90)																					
Floor above commercial							15.7000			0.8687			13.6390						(27)		
External Wall	51.2700			15.7000			72.6000			0.1200			8.7120			8.5368			(28b)		
Total net area of external elements Aum(A, m2)							35.5700			0.2400			8.5368						(29a)		
Fabric heat loss, W/K = Sum (A x U)							123.8700			(26)...(30) + (32) =			30.8878						(31)		
Wall to Corridor							10.8000			0.0000			0.0000						(32)		
Party Wall							33.8900			0.0000			0.0000						(32)		
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K																			250.0000 (35)		
Thermal bridges (Sum(L x Psi) calculated using Appendix K)																			11.5732 (36)		
Total fabric heat loss																(33) + (36) =			42.4610 (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	24.0628	23.8083	23.5537	22.2809	22.0264	20.7536	20.7536	20.4991	21.2627	22.0264	22.5355	23.0446 (38)									
Average = Sum(39)m / 12 =	66.5238	66.2693	66.0147	64.7419	64.4874	63.2146	63.2146	62.9601	63.7237	64.4874	64.9965	65.5056 (39)									
HLP	0.9163	0.9128	0.9093	0.8918	0.8883	0.8707	0.8707	0.8672	0.8777	0.8883	0.8953	0.9023 (40)									
HLP (average)													0.8909 (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													2.3076 (42)								
Average daily hot water use (litres/day)													93.6889 (43)								
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec									
Energy content	103.0578	99.3102	95.5627	91.8151	88.0676	84.3200	84.3200	88.0676	91.8151	95.5627	99.3102	103.0578 (44)									
Energy content (annual)	152.8317	133.6676	137.9330	120.2533	115.3859	99.5693	92.2656	105.8761	107.1406	124.8620	136.2967	148.0094 (45)									
Distribution loss (46)m = 0.15 x (45)m													Total = Sum(45)m = 1474.0912 (45)								
Water storage loss:	22.9248	20.0501	20.6899	18.0380	17.3079	14.9354	13.8398	15.8814	16.0711	18.7293	20.4445	22.2014 (46)									



FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Store volume													3.0000 (47)
b) If manufacturer declared loss factor is not known :													0.0212 (51)
Hot water storage loss factor from Table 2 (kWh/litre/day)													3.4200 (52)
Volume factor from Table 2a													1.0000 (53)
Temperature factor from Table 2b													0.2173 (55)
Enter (49) or (54) in (55)													
Total storage loss	6.7353	6.0835	6.7353	6.5180	6.7353	6.5180	6.7353	6.7353	6.5180	6.7353	6.5180	6.7353 (56)	
If cylinder contains dedicated solar storage	6.7353	6.0835	6.7353	6.5180	6.7353	6.5180	6.7353	6.7353	6.5180	6.7353	6.5180	6.7353 (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	182.8294	160.7623	167.9307	149.2834	145.3836	128.5993	122.2633	135.8738	136.1706	154.8597	165.3267	178.0071 (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)	
Output from w/h	182.8294	160.7623	167.9307	149.2834	145.3836	128.5993	122.2633	135.8738	136.1706	154.8597	165.3267	178.0071 (64)	
Heat gains from water heating, kWh/month	74.8147	66.1202	69.8609	63.2083	62.3640	56.3308	54.6765	59.2020	58.8483	65.5148	68.5427	73.2113 (65)	
Total per year (kWh/year) = Sum(64)m =													1827.2899 (64)
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	115.3778	115.3778	115.3778	115.3778	115.3778	115.3778	115.3778	115.3778	115.3778	115.3778	115.3778	115.3778 (66)	
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	18.1417	16.1133	13.1042	9.9207	7.4159	6.2608	6.7650	8.7934	11.8025	14.9860	17.4909	18.6459 (67)	
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	203.2876	205.3971	200.0813	188.7645	174.4790	161.0527	152.0832	149.9737	155.2895	166.6063	180.8918	194.3180 (68)	
Pumps, fans	34.5378	34.5378	34.5378	34.5378	34.5378	34.5378	34.5378	34.5378	34.5378	34.5378	34.5378	34.5378 (69)	
Losses e.g. evaporation (negative values) (Table 5)	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)	
Water heating gains (Table 5)	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022 (71)	
Total internal gains	100.5574	98.3932	93.8990	87.7892	83.8225	78.2372	73.4899	79.5725	81.7337	88.0575	95.1981	98.4022 (72)	
	379.6001	377.5170	364.6979	344.0878	323.3308	303.1641	289.9514	295.9529	306.4391	327.2631	351.1941	368.9796 (73)	
6. Solar gains													
[Jan]				Area m2	Solar flux Table 6a W/m2	q Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W				
Southwest				8.2600	36.7938	0.4000	0.8000	0.7700	67.3966 (79)				
Northwest				7.4400	11.2829	0.4000	0.8000	0.7700	18.6157 (81)				
Solar gains	86.0123	152.691	225.3469	306.7451	368.7077	377.0941	358.9593	311.0427	253.2693	173.1879	104.1490	72.8800 (83)	
Total gains	465.6124	530.2111	590.0448	650.8329	692.0385	680.2582	648.9107	606.9957	559.7083	500.4511	455.3431	441.8595 (84)	
7. Mean internal temperature (heating season)													
Temperature during heating periods in the living area from Table, Thl (C)													
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	75.7874	76.0785	76.5719	77.8733	78.1807	79.7548	79.7548	80.0772	79.1176	78.1807	77.5683	76.9654	
alpha	6.0525	6.0719	6.0915	6.1916	6.2120	6.3170	6.3170	6.3385	6.4745	6.6120	6.7172	6.8130	
util living area	0.9970	0.9927	0.9792	0.9271	0.7928	0.5855	0.4275	0.4748	0.7408	0.9532	0.9927	0.9978 (86)	
MIT	20.1262	20.2691	20.4866	20.7556	20.9306	20.9914	20.9990	20.9981	20.9659	20.7369	20.3876	20.1064 (87)	
Th 2	20.1537	20.1566	20.1596	20.1745	20.1775	20.1925	20.1925	20.1955	20.1865	20.1775	20.1715	20.1656 (88)	
util rest of house	0.9960	0.9905	0.9725	0.9052	0.7430	0.5157	0.3497	0.3930	0.6701	0.9342	0.9900	0.9971 (89)	
MIT 2	18.9844	19.1944	19.5099	19.8495	20.1129	20.1870	20.1921	20.1947	20.1609	19.8789	19.3791	18.9466 (90)	
Living area fraction	19.5012	19.6849	19.9520	20.2843	20.4830	20.5511	20.5523	20.5583	20.5253	20.4072	19.8356	19.4884 (92)	
Temperature adjustment												0.0000	
adjusted MIT	19.5012	19.6809	19.9520	20.2843	20.4830	20.5511	20.5573	20.5583	20.5253	20.2672	19.8356	19.4841 (93)	
8. Space heating requirement													
Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	463.3044	524.2801	572.6762	591.2253	527.6340	372.1561	249.7849	261.0849	392.2087	468.7339	450.1477	440.2154 (95)	
San temp	4.3000	4.9000	6.5000	8.5000	11.7000	14.6000	16.4000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)	
Heat loss rate W	1011.2933	979.5174	888.0282	737.4007	566.3938	376.1956	250.1583	261.8076	409.4414	623.4155	827.7689	1001.0160 (97)	
Month fraction	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000 (98)	
Space heating kWh	407.6636	305.9194	234.6219	104.9870	28.8372	0.0000	0.0000	0.0000	0.0000	115.0831	271.8873	417.2363 (98)	
Space heating per m2	(98) / (4) =												1886.2359 (98)
													25.9812 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Boilers	1.0000 (303a)
Fraction of total space heat from community Boilers	1.0000 (304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.0500 (306)
Space heating:	
Annual space heating requirement	1886.2359 (98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05	1980.5477 (307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	1827.2899 (64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05	1918.6544 (310a)
Electricity used for heat distribution	38.9920 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.8000)	
mechanical ventilation fans (SFP = 0.8000)	177.1440 (330a)
Total electricity for the above, kWh/year	177.1440 (331)
Electricity for lighting (calculated in Appendix L)	320.3886 (332)
Total delivered energy for all uses	4396.7346 (338)

12b. Carbon dioxide emissions - Community heating scheme

Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Boilers		89.5000 (367a)
Space heating from Boilers	0.2160	941.0365 (367)
Electrical energy for heat distribution	0.5190	20.2369 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFER)		961.2733 (373)
Space and water heating		961.2733 (376)
Pumps and fans	0.5190	91.9377 (378)
Energy for lighting	0.5190	166.2817 (379)
Total CO2, kg/year		1219.4927 (383)
Dwelling Carbon Dioxide Emission Rate (DER)		16.8000 (384)

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

DER	16.8000 ZC1
Total Floor Area	TFA 72.6000
Assumed number of occupants	N 2.3076
CO2 emission factor in Table 12 for electricity displaced from grid	EF 0.5190
CO2 emissions from appliances, equation (L14)	16.5928 ZC2
CO2 emissions from cooking, equation (L16)	2.4019 ZC3
Total CO2 emissions	35.7948 ZC4
Residual CO2 emissions offset from biofuel CHP	0.0000 ZC5
Additional allowable electricity generation, kWh/m ² /year	0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation	0.0000 ZC7
Net CO2 emissions	35.7948 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	72.6000 (1b)	x 2.5000 (2b)	= 181.5000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 181.5000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	0	0	0	0 * 40 = 0.0000 (6a)
Number of open flues	0	0	0	0	0 * 20 = 0.0000 (6b)
Number of intermittent fans					3 * 10 = 30.0000 (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) =				30.0000 / (5) =	0.1653 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4153 (18)
Number of sides sheltered					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3530 (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 infiltr rate	0.4501	0.4412	0.4324	0.3883	0.3795	0.3353	0.3353	0.3265	0.3530	0.3795	0.3971	0.4148 (22b)
Effective ac	0.6013	0.5973	0.5935	0.5754	0.5720	0.5562	0.5562	0.5533	0.5623	0.5720	0.5789	0.5860 (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 Opening Type (Uw = 1.40)			15.7000	1.3258	20.8144		(27)					
Floor above commercial			72.6000	0.1300	9.4380		(28a)					
External Wall	51.2700	15.7000	35.5700	0.1800	6.4026		(29a)					
Total net area of external elements Aum(A, m ²)			123.8700				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		36.6550		(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)							10.8516 (36)					
Total fabric heat loss						(33) + (36) =	47.5066 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 36.0137	Feb 35.7782	Mar 35.5473	Apr 34.4628	May 34.2599	Jun 33.3153	Jul 33.3153	Aug 33.1404	Sep 33.6791	Oct 34.2599	Nov 34.6704	Dec 35.0995 (38)
Heat transfer coeff	83.5203	83.2848	83.0539	81.9694	81.7665	80.8219	80.8219	80.6470	81.1857	81.7665	82.1770	82.6061 (39)
Average = Sum(39)m / 12 =												81.9684 (39)
HLP	Jan 1.1504	Feb 1.1472	Mar 1.1440	Apr 1.1291	May 1.1263	Jun 1.1132	Jul 1.1132	Aug 1.1108	Sep 1.1183	Oct 1.1263	Nov 1.1319	Dec 1.1378 (40)
HLP (average)												1.1290 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

												2.3076 (42)
Assumed occupancy												89.0045 (43)
Average daily hot water use (litres/day)												
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	97.9049	94.3447	90.7845	87.2244	83.6642	80.1040	80.1040	83.6642	87.2244	90.7845	94.3447	97.9049 (44)
Energy content	145.901	126.9842	131.0363	114.2407	109.6166	94.5908	87.6523	100.5823	101.7836	118.6189	129.4818	140.6089 (45)
Energy content (annual)												Total = Sum(45)m =
Distribution loss (46)m = 0.15 x (45)m												1400.3867 (45)
	21.7785	19.0476	19.6555	17.1361	16.4425	14.1886	13.1478	15.0873	15.2675	17.7928	19.4223	21.0913 (46)
Water storage loss:												
Store volume												3.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												0.2602 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.1405 (55)
Total storage loss	4.3553	3.9338	4.3553	4.2148	4.3553	4.2148	4.3553	4.3553	4.2148	4.3553	4.2148	4.3553 (56)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF TARGET EMISSIONS 09 Jan 2014

If cylinder contains dedicated solar storage												
	4.3553	3.9338	4.3553	4.3553	4.2148	4.3553	4.3553	4.2148	4.3553	4.2148	4.3553	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	(59)
Total heat required for water heating calculated for each month												
	172.8078	151.9292	158.6540	140.9674	137.2343	121.3176	115.2700	128.2000	128.5103	146.2366	156.2086	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Output from w/h												
	172.8078	151.9292	158.6540	140.9674	137.2343	121.3176	115.2700	128.2000	128.5103	146.2366	156.2086	(64)
Heat gains from water heating, kWh/month												
	70.3699	62.1783	65.6637	59.3664	58.5417	52.8329	51.2385	55.5378	55.2245	61.5349	64.4341	(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	115.3778	115.3778	115.3778	115.3778	115.3778	115.3778	115.3778	115.3778	115.3778	115.3778	115.3778	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	18.1417	16.1133	15.1042	9.9207	7.4159	6.2608	6.7650	8.7934	11.8025	14.9860	17.4909	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	203.2876	205.3971	200.0813	188.7645	174.4790	161.0527	152.0832	149.9737	155.2895	166.6063	180.8918	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	34.5378	34.5378	34.5378	34.5378	34.5378	34.5378	34.5378	34.5378	34.5378	34.5378	34.5378	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)												
	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022	(71)
Water heating gains (Table 5)												
	94.5831	92.5272	88.2577	82.4534	78.6850	73.3790	68.8690	74.6475	76.7006	82.7082	89.4919	(72)
Total internal gains	376.6258	374.6509	362.0565	341.7520	321.1933	301.3059	288.3305	294.0279	304.4060	324.9139	348.4878	(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 Table 6d	Gains W				
Southwest			8.2600	36.7938	0.6300	0.7000	0.7700	92.8810	(79)			
Northwest			7.4400	11.2829	0.6300	0.7000	0.7700	25.6547	(81)			
Solar gains	118.5357	210.4316	310.5563	422.7332	508.1252	519.6828	494.6908	428.6558	349.0367	238.6746	143.5303	(83)
Total gains	495.1616	585.0826	672.6128	764.4851	829.3185	820.9887	783.0213	722.6837	653.4427	563.5885	492.0181	(84)

7. Mean internal temperature (heating season)												
Temperature during heating periods in the living area from Table 9, Th1 (C)												
Utilisation factor for gains for living area, nil/m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	60.3645	60.5353	60.7036	61.5067	61.6593	62.3800	62.3800	62.5153	62.1004	61.6593	61.3513	61.0326
alpha	5.0243	5.0357	5.0469	5.1004	5.1106	5.1587	5.1587	5.1677	5.1400	5.1106	5.0901	5.0688
util living area												
	0.9964	0.9913	0.9759	0.9237	0.7981	0.6072	0.4499	0.5052	0.7666	0.9552	0.9921	0.9974
MIT	19.8340	20.0152	20.2905	20.6290	20.8719	20.9756	20.9957	20.9924	20.9229	20.5946	20.1510	19.8040
Th 2	19.9599	19.9625	19.9651	19.9772	19.9794	19.9900	19.9900	19.9920	19.9859	19.9794	19.9749	19.9701
util rest of house												
	0.9953	0.9884	0.9679	0.8989	0.7415	0.5209	0.3489	0.3987	0.6852	0.9352	0.9890	0.9965
MIT 2	18.4156	18.6807	19.0787	19.5572	19.8614	19.9749	19.9885	19.9890	19.9286	19.5230	18.8887	18.3792
Living area fraction												
	19.0576	19.2847	19.6272	20.0423	20.3188	20.4278	20.4444	20.4432	20.3786	20.0080	19.4600	19.0241
Temperature adjustment												
	19.0576	19.2847	19.6272	20.0423	20.3188	20.4278	20.4444	20.4432	20.3786	20.0080	19.4600	19.0241
adjusted MIT												(93)

8. Space heating requirement												
Utilisation	0.9939	0.9860	0.9646	0.9007	0.7616	0.5593	0.3948	0.4471	0.7189	0.9359	0.9870	0.9953
Useful gains	492.1172	576.8677	648.8204	688.5488	631.6154	459.2027	309.1113	323.1194	469.7601	527.4609	485.6020	464.3752
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W												
	1232.5624	1198.0282	1090.2637	913.3278	704.7285	471.0155	310.7089	326.0693	509.7347	769.2620	1015.7103	1224.5601
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh												
	550.8912	417.4198	328.4338	161.8409	54.3962	0.0000	0.0000	0.0000	0.0000	179.9000	381.6780	565.5776
Space heating												
												(98)
Space heating per m2												
												(98) / (4) =

8c. Space cooling requirement
Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP												
Fraction of space heat from secondary/supplementary system (Table 11)												
												0.0000
Fraction of space heat from main system(s)												
												1.0000
Efficiency of main space heating system 1 (in %)												
												93.5000
Efficiency of secondary/supplementary heating system, %												
												0.0000
Space heating requirement												
												2823.6765

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	550.8912	417.4198	328.4338	161.8409	54.3962	0.0000	0.0000	0.0000	0.0000	179.9000	381.6780	565.5776
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
Space heating fuel (main heating system)												
	589.1885	446.4383	351.2661	173.0919	58.1777	0.0000	0.0000	0.0000	0.0000	192.4064	408.2118	604.8958
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

Water heating												
Water heating requirement												
	172.8078	151.9292	158.6540	140.9674	137.2343	121.3176	115.2700	128.2000	128.5103	146.2366	156.2086	168.2266 (64)
Efficiency of water heater												
(217)m	87.6923	87.3737	86.7129	85.1828	82.5712	79.8000	79.8000	79.8000	79.8000	85.3675	87.1080	79.8000 (216)
Fuel for water heating, kWh/month												
	197.0615	173.8843	182.9648	165.4882	166.2012	152.0271	144.4486	160.6516	161.0405	171.3025	179.3275	191.5997 (219)
Water heating fuel used												
Annual totals kWh/year												2045.9974 (219)
Space heating fuel - main system												
Space heating fuel - secondary												2823.6765 (211)

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 (m2)	Storey height (m)	Volume (m3)
Ground floor	72.6000 (1b)	2.5000 (2b)	181.5000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6000		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	181.5000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	0	0	0	0.0000 (6a)
Number of open flues	0	0	0	0	0.0000 (6b)
Number of intermittent fans	0	0	0	0	0.0000 (7a)
Number of passive vents	0	0	0	0	0.0000 (7b)
Number of fuelless gas fires	0	0	0	0	0.0000 (7c)

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =

Pressure test	0.1633 (8)
Measured/design AP50	4.0000
Infiltration rate	0.3653 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3105 (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	1.0000	1.0750	1.1250	1.1750	1.1750 (22a)
Adj infiltr rate	0.3959	0.3881	0.3804	0.3415	0.3338	0.2950	0.2950	0.2872	0.3105	0.3338	0.3493	0.3648 (22b)
Effective ac	0.5784	0.5753	0.5723	0.5583	0.5557	0.5435	0.5435	0.5412	0.5482	0.5557	0.5610	0.5666 (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
Opening Type 1 (Uw = 0.90)			15.7000	0.8687	13.6390		(27)
Floor above commercial			72.6000	0.1200	8.7120		(28a)
External Wall	51.2700	15.7000	35.5700	0.2400	8.5368		(29a)
Total net area of external elements Aum(A, m2)			123.8700				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...	(30) + (32) =	30.8878		(33)
Wall to Corridor			10.8000	0.0000	0.0000		(32)
Party Wall			33.8900	0.0000	0.0000		(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 11.5732 (36)
Total fabric heat loss (33) + (36) = 42.4610 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	34.6410	34.4587	34.2801	33.4410	33.2840	32.5532	32.5532	32.4178	32.8347	33.2840	33.6016	33.9336 (38)
Average = Sum(39)/ 12 =	77.1020	76.9197	76.7411	75.9020	75.7450	75.0142	75.0142	74.8788	75.2957	75.7450	76.0626	75.9012 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0620	1.0595	1.0570	1.0455	1.0433	1.0333	1.0333	1.0314	1.0371	1.0433	1.0477	1.0523 (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 2.3076 (42)
Average daily hot water use (litres/day) 93.6889 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	103.0578	99.3102	95.5627	91.8151	88.0676	84.3200	84.3200	88.0676	91.8151	95.5627	99.3102	103.0578 (44)
Energy conte	152.8317	133.6676	137.9330	120.2533	115.3859	99.5693	92.2656	105.8761	107.1406	124.8620	136.2967	148.0094 (45)
Energy content (annual)												Total = Sum(45)m = 1474.0912 (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	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)

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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 32.4767 28.4044 29.3108 25.5538 24.5195 21.1585 19.6064 22.4987 22.7674 26.5332 28.9630 31.4520 (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	115.3778	115.3778	115.3778	115.3778	115.3778	115.3778	115.3778	115.3778	115.3778	115.3778	115.3778	115.3778 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.1417	16.1133	13.1042	9.9207	7.4159	6.2608	6.7650	8.7934	11.8025	14.9860	17.4909	18.6459 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	203.2876	205.3971	200.0813	188.7645	174.4790	161.0527	152.0832	149.9737	155.2895	166.6063	180.8918	194.3180 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5378	34.5378	34.5378	34.5378	34.5378	34.5378	34.5378	34.5378	34.5378	34.5378	34.5378	34.5378 (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)	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022 (71)
Water heating gains (Table 5)	43.6515	42.2684	39.3962	35.4914	32.9563	29.3868	26.3527	30.2401	31.6214	35.6629	40.2264	42.2742 (72)
Total internal gains	322.6942	321.3922	310.1950	291.7900	272.4646	254.3136	242.8142	246.6206	256.3267	274.8685	296.2224	312.8515 (73)

6. Solar gains

[Jan]											Gains W	
	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d							
Southwest	8.2600	36.7938	0.4000		0.8000	0.7700					67.3966 (79)	
Northwest	7.4400	11.2829	0.4000		0.8000	0.7700					18.6157 (81)	
Solar gains	86.0123	152.6941	225.3469	306.7451	368.7077	377.0941	358.9593	311.0427	253.2693	173.1879	104.1490	72.8800 (83)
Total gains	408.7065	474.0863	535.5420	598.5351	641.1722	631.4078	601.7736	557.6633	509.5960	448.0565	400.3714	385.7315 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation factor for gains for living area, nilym (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	65.3896	65.5445	65.6971	66.4234	66.5611	67.2095	67.2095	67.3310	66.9583	66.5611	66.2831	65.9951
alpha	5.3383	5.3686	5.3798	5.4282	5.4374	5.4806	5.4806	5.4887	5.4639	5.4374	5.4189	5.3997
util living area	0.9985	0.9964	0.9898	0.9636	0.8815	0.7115	0.5391	0.6001	0.8533	0.9794	0.9968	0.9989 (86)
MIT	19.8438	19.9925	20.2332	20.5494	20.8163	20.9592	20.9925	20.9871	20.8882	20.5397	20.1324	19.8171 (87)
Th 2	20.0320	20.0340	20.0361	20.0456	20.0474	20.0557	20.0557	20.0573	20.0525	20.0674	20.0438	20.0400 (88)
util rest of house	0.9980	0.9952	0.9861	0.9499	0.8387	0.6256	0.4283	0.4860	0.7863	0.9692	0.9955	0.9986 (89)
MIT 2	18.9736	19.1235	19.3641	19.6797	19.9227	20.0369	20.0538	20.0535	19.9898	19.6762	19.2714	18.9536 (90)
Living area fraction	19.3674	19.5168	19.7575	20.0734	20.3272	20.4544	20.4787	20.4760	20.3964	20.0670	19.6611	19.3444 (93)
MIT	19.3674	19.5168	19.7575	20.0734	20.3272	20.4544	20.4787	20.4760	20.3964	20.0670	19.6611	19.3444 (93)
Temperature adjustment												0.0000
adjusted MIT	19.3674	19.5168	19.7575	20.0734	20.3272	20.4544	20.4787	20.4760	20.3964	20.0670	19.6611	19.3444 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	407.7243	471.4193	527.3725	568.8097	546.6401	418.9605	288.1295	300.0529	414.4099	434.3599	398.2756	385.0480 (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	1161.7289	1124.3203	1017.3923	848.0812	653.4638	439.1598	290.9551	305.2098	474.0921	717.0809	955.4275	1156.9527 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	560.9794	438.7494	364.5747	201.0755	79.4768	0.0000	0.0000	0.0000	0.0000	210.3444	401.1493	574.2971 (98)
Space heating												2830.6467 (98)
Space heating per m2										(98) / (4) =		38.3896 (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	705.1332	555.1048	569.0791	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9032	0.9515	0.9322	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	636.8523	528.1696	530.4951	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	823.4794	787.1219	736.9234	0.0000	0.0000	0.0000	0.0000 (103)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000 (103a)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	134.3715	192.6605	153.5842	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												480.6162 (104)
Cooled fraction												1.0000 (105)
Intermittency factor (Table 10b)												

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Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	33.5929	48.1651	38.3960	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling per m2	0.0000	0.0000	0.0000	0.0000	0.0000	1.6550	1.6550	1.6550	0.0000	0.0000	0.0000	1.6550 (108)
Energy for space heating	0.0000	0.0000	0.0000	0.0000	0.0000	38.9896	38.9896	38.9896	0.0000	0.0000	0.0000	38.9896 (99)
Energy for space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	1.6550	1.6550	1.6550	0.0000	0.0000	0.0000	1.6550 (108)
Total	0.0000	0.0000	0.0000	0.0000	0.0000	40.6446	40.6446	40.6446	0.0000	0.0000	0.0000	40.6446 (109)
Dwelling Fabric Energy Efficiency (DFEE)	0.0000	0.0000	0.0000	0.0000	0.0000	40.6	40.6	40.6	0.0000	0.0000	0.0000	40.6 (109)

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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 (m2)	Storey height (m)	Volume (m3)
Ground floor	2.5000	181.5000
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6000	181.5000 (1b) - (3b)
Dwelling volume	(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	181.5000 (5)

2. Ventilation rate

main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	0	0	0.0000 (6a)
Number of open flues	0	0	0	0.0000 (6b)
Number of intermittent fans	0	0	0	3.0000 (7a)
Number of passive vents	0	0	0	0.0000 (7b)
Number of flueless gas fires	0	0	0	0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =			30.0000 / (5) = 0.1653 (8)
Pressure test				Yes
Measured/design AP50				5.0000
Infiltration rate				0.4153 (18)
Number of sides sheltered				2 (19)
Shelter factor	(20) = 1 - (0.075 x (19)) =			0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =			0.3530 (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
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250
Adj infiltr rate	0.4501	0.4412	0.4324	0.3883	0.3795	0.3353	0.3353	0.3265	0.3530	0.3795	0.3971
Effective ac	0.6013	0.5973	0.5935	0.5754	0.5720	0.5562	0.5562	0.5533	0.5623	0.5720	0.5789

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
TER Opening Type (Uw = 1.40)			15.7000	1.3258	20.8144		(27)
Floor above commercial			72.6000	0.1300	9.4380		(28a)
External Wall	51.2700	15.7000	35.5700	0.1800	6.4026		(29a)
Total net area of external elements Aum(A, m2)			123.8700				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		36.6550		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.8516 (36)
Total fabric heat loss						(33) + (36) =	47.5066 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)							
(38)m	36.0137	35.7782	35.5473	34.4628	34.2599	33.3153	33.3153
Heat transfer coeff	83.5203	83.2848	83.0539	81.9694	81.7665	80.8219	80.8219
Average = Sum(39)m / 12 =							
HLP	1.1504	1.1472	1.1440	1.1291	1.1263	1.1132	1.1132
HLP (average)							
Days in month	31	28	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.3076 (42)
Average daily hot water use (litres/day)												89.0045 (43)
Daily hot water use	97.9049	94.3447	90.7845	87.2244	83.6642	80.1040	80.1040	83.6642	87.2244	90.7845	94.3447	97.9049 (44)
Energy conte	145.1901	126.9842	131.0363	114.2407	109.6166	94.5908	87.6523	100.5823	101.7836	118.6189	129.4818	140.6089 (45)
Energy content (annual)												Total = Sum(45)m = 1400.3867 (45)
Distribution loss (46)m = 0.15 x (45)m												0.0000 (46)
Water storage loss:												
Total storage loss:												
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 (56)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Heat gains from water heating, kWh/month												0.0000 (59)

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30.8529 26.9841 27.8452 24.2761 23.2935 20.1005 18.6261 21.3737 21.6290 25.2065 27.5149 29.8794 (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	115.3778	115.3778	115.3778	115.3778	115.3778	115.3778	115.3778	115.3778	115.3778	115.3778	115.3778	115.3778 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.1417	16.1133	13.1042	9.9207	7.4159	6.2608	6.7650	8.7934	11.8025	14.9860	17.4909	18.6459 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	203.2876	205.3971	200.0813	188.7645	174.4790	161.0527	152.0832	149.9737	155.2895	166.6063	180.8918	194.3180 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5378	34.5378	34.5378	34.5378	34.5378	34.5378	34.5378	34.5378	34.5378	34.5378	34.5378	34.5378 (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)	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022 (71)
Water heating gains (Table 5)	41.4690	40.1550	37.4264	33.7169	31.3085	27.9174	25.0351	28.7281	30.0403	33.8797	38.2151	40.1605 (72)
Total internal gains	320.5117	319.2788	308.2252	290.0154	270.8168	252.8443	241.4966	245.1086	254.7456	273.0854	294.2111	310.7378 (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						
Southwest	8.2600	36.7938	0.6300	0.7000	0.7700	92.8810 (79)						
Northwest	7.4400	11.2829	0.6300	0.7000	0.7700	25.6547 (81)						
Solar gains	118.5357	210.4316	310.5563	422.7332	508.1252	519.6828						
Total gains	439.0474	529.7104	618.7815	712.7486	778.9420	772.5271	736.1874	673.7643	603.7823	511.7600	437.7414	411.1755 (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	60.3645	60.5353	60.7036	61.5067	61.6593	62.3800	62.3800	62.5153	62.1004	61.6593	61.3513	61.0326
alpha	5.0243	5.0357	5.0469	5.1004	5.1106	5.1587	5.1587	5.1677	5.1400	5.1106	5.0901	5.0688
util living area	0.9979	0.9943	0.9828	0.9398	0.8261	0.6390	0.4771	0.5390	0.8042	0.9689	0.9953	0.9985 (86)
MIT	19.7626	19.9462	20.2280	20.5819	20.8481	20.9693	20.9943	20.9898	20.9029	20.5394	20.0830	19.7331 (87)
Th 2	19.9559	19.9625	19.9651	19.9772	19.9794	19.9900	19.9900	19.9859	19.9794	19.9749	19.9749	19.9701 (88)
util rest of house	0.9972	0.9924	0.9768	0.9189	0.7726	0.5507	0.3707	0.4268	0.7264	0.9540	0.9934	0.9980 (89)
MIT 2	18.8344	19.0193	19.2396	19.6486	19.8818	19.9768	19.9887	19.9692	19.9348	19.6174	19.1661	18.8132 (90)
Living area fraction	0.9924	0.9924	0.9768	0.9189	0.7726	0.5507	0.3707	0.4268	0.7264	0.9540	0.9934	0.9980 (91)
MIT	19.2545	19.4388	19.7198	20.0710	20.3192	20.4260	20.4438	20.4421	20.3730	20.0347	19.5811	19.2295 (92)
Temperature adjustment	19.2545	19.4388	19.7198	20.0710	20.3192	20.4260	20.4438	20.4421	20.3730	20.0347	19.5811	19.2295 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	437.5549	525.0432	603.3542	656.5475	616.7909	455.8572	308.5605	321.9885	459.0239	488.7350	434.4321	410.1588 (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	1249.0057	1210.8632	1097.9550	915.6830	704.7586	470.8681	301.6664	325.9835	509.2783	771.4407	1025.6557	1241.5297 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	603.7194	460.8711	367.9830	186.5776	65.4480	0.0000	0.0000	0.0000	0.0000	210.3331	425.6810	618.5399 (98)
Space heating												2939.1531 (98)
Space heating per m2										(98) / (4) =		40.4842 (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	759.7259	598.0821	612.9170	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9259	0.9630	0.9460	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	703.3953	575.9813	579.8117	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	988.6722	944.4515	872.8832	0.0000	0.0000	0.0000	0.0000 (103)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000 (103a)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	205.3993	274.1418	218.0452	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												897.5863 (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												

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0.0000 0.0000 0.0000 0.0000 0.0000 51.3498 68.5354 54.5113 0.0000 0.0000 0.0000 0.0000 (107)

Space cooling 174.3966 (107)
Space cooling per m2 2.4022 (108)
Energy for space heating 40.4842 (99)
Energy for space cooling 2.4022 (108)
Total 42.8864 (109)
Target Fabric Energy Efficiency (TFEE) 49.3 (109)

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Property Reference	Flat Type T33 - MID				Issued on Date	23/05/2022
Assessment Reference	BE LEAN	Prop Type Ref	03rd Floor - 1B2P			
Property	Flat Type T33, London , N8					
SAP Rating	84 B	DER	16.23	TER	16.75	
Environmental	90 B	% DER<TER	3.08			
CO ₂ Emissions (t/year)	0.68	DFEE	32.59	TFEE	37.83	
General Requirements Compliance	Pass	% DFEE<TFEE	13.86			
Assessor Details	Mr. Simon Gowing, Simon Gowing, Tel: 02036031616, Simon@hodkinsonconsultancy.com				Assessor ID	R572-0001
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

Mid-floor flat, total floor area 51 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:Mains gas (c)
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 16.75 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 16.23 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)37.8 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)32.6 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.24 (max. 0.30)	0.24 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor (no floor)			
Roof (no roof)			
Openings	0.90 (max. 2.00)	0.90 (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:	4.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system:	Community heating scheme	-
Secondary heating system:	None	

5 Cylinder insulation

Hot water storage	Nominal cylinder loss: 0.22 kWh/day	
Permitted by DBSCG 0.35	OK	
Primary pipework insulated:	No primary pipework	

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and TRVsOK

Hot water controls:

No cylinderstat

7 Low energy lights

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

8 Mechanical ventilation

Continuous supply and extract system		
Specific fan power:	0.64	
Maximum	1.5	OK
WWR efficiency:	90%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley):	Slight	OK
Based on:		
Overshading:	Average	
Windows facing North East:	8.26 m ² , No overhang	
Windows facing South East:	2.48 m ² , No overhang	
Air change rate:	4.00 ach	
Blinds/curtains:	None	

10 Key features

Party wall U-value	0.00 W/m ² K
Party wall U-value	0.00 W/m ² K
Window U-value	0.90 W/m ² K

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

Heat losses and heat loss parameter												
Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	λ x U W/K	K-value kJ/m ² K	λ x K kJ/K					
Opening Type 1 (Uw = 0.90)			10.7400	0.8687	9.3301			(27)				
External Wall	40.3600	10.7400	29.6200	0.2400	7.1088			(29a)				
Total net area of external elements Aum(A, m ²)			40.3600					(31)				
Fabric heat loss, W/K = Sum (λ x U)				(26) ... (30) + (32) =	16.4389			(33)				
Wall to Corridor			22.9300	0.0000	0.0000			(32)				
Party Wall			17.5900	0.0000	0.0000			(32)				
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K								250.0000 (35)				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								5.6842 (36)				
Total fabric heat loss						(33) + (36) =		22.1231 (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	16.7677	16.5904	16.4130	15.5261	15.3487	14.4618	14.4618	14.2844	14.8165	15.3487	15.7035	16.0582 (38)
Heat transfer coeff	38.8909	38.7135	38.5361	37.6492	37.4718	36.5849	36.5849	36.4075	36.9397	37.4718	37.8266	38.1813 (39)
Average = Sum(39)m / 12 =												37.6048 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.7687	0.7652	0.7617	0.7442	0.7407	0.7232	0.7232	0.7197	0.7302	0.7407	0.7477	0.7547 (40)
HLP (average)												0.7433 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

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Elmhurst Energy Systems
SAP2012 Calculator (Design
System) version 4.14r19

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9924	0.9844	0.9581	0.8615	0.6711	0.4584	0.3245	0.3657	0.6187	0.9043	0.9819	0.9941 (94)
Useful gas	338.6024	369.2274	394.3620	392.6988	328.8669	222.4588	149.6730	156.2448	240.1389	316.6331	323.1925	324.5535 (95)
Air 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	609.0791	588.4491	532.5327	439.2707	336.0433	222.8357	149.6974	156.3011	243.1310	372.6125	496.5885	601.3055 (97)
Month factor	1.0000	1.0000	1.0000	1.0000	1.0000	0.8350	0.6900	0.6000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	201.2347	147.3170	102.7990	33.5340	5.3325	0.0000	0.0000	0.0000	0.0000	41.6487	124.8459	205.9035 (98)
Space heating per m2												862.4153 (98)
Space heating per m2												17.0511 (99)
										(98) / (4) =		

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)
Fraction of space heat from community system
Fraction of heat from community Boilers
Fraction of total space heat from community Boilers
Factor for control and charging method (Table 4c(3)) for community space heating
Factor for control and charging method (Table 4c(3)) for community water heating
Distribution loss factor (Table 12c) for community heating system
Space heating:
Annual space heating requirement
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)
Space heating fuel for secondary/supplementary system

0.0000 (301)
1.0000 (302)
1.0000 (303a)
1.0000 (304a)
1.0000 (305)
1.0000 (305a)
1.0500 (306)
862.6153 (98)
905.7460 (207a)
0.0000 (308)
0.0000 (309)

Water heating
Annual water heating requirement
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05
Electricity used for heat distribution
Annual totals kWh/year

1591.2525 (64)
1670.8151 (310a)
25.7656 (313)

Electricity for pumps and fans:
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.8000)
mechanical ventilation fans (SFP = 0.8000)
Total electricity for the above, kWh/year
Electricity for lighting (calculated in Appendix L)
Total delivered energy for all uses

123.4396 (330a)
123.4396 (331)
234.6960 (332)
2934.6968 (338)

Efficiency of heat source Boilers
Space heating from Boilers
Electrical energy for heat distribution
Total CO2 associated with community systems
(negative value allowed since DFEE <= TFEF)
Space and water heating
Pumps and fans
Energy for lighting
Total CO2, kg/year
Dwelling Carbon Dioxide Emission Rate (DER)

Energy
kWh/year
Emission factor
kg CO2/kWh
Emissions
kg CO2/year
83.5000 (367a)
621.8293 (367)
13.3724 (372)
635.2016 (373)
635.2016 (376)
64.0652 (378)
121.8072 (379)
821.0740 (383)
16.2300 (384)

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

DER
Total Floor Area
Assumed number of occupants
CO2 emission factor in Table 12 for electricity displaced from grid
CO2 emissions from appliances, equation (L14)
CO2 emissions from cooking, equation (L16)
Total CO2 emissions
Residual CO2 emissions offset from biofuel CHP
Additional allowable electricity generation, kWh/m²/year
Resulting CO2 emissions offset from additional allowable electricity generation
Net CO2 emissions

16.2300 ZC1
50.5900
1.7075
0.5190
17.4255 ZC2
3.1623 ZC3
36.8178 ZC4
0.0000 ZC5
0.0000 ZC6
0.0000 ZC7
36.8178 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

Ground floor
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)
Dwelling volume
Storey height
Volume
(3a)+(3b)+(3c)+(3d)+(3e)...(3n)

2. Ventilation rate

Number of chimneys
Number of open flues
Number of intermittent fans
Number of passive vents
Number of flueless gas fires
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =
Pressure test
Measured/design AP50
Infiltration rate
Number of sides sheltered
Shelter factor
Infiltration rate adjusted to include shelter factor
Wind speed
Wind factor
Adj infiltr rate
Effective ac

3. Heat losses and heat loss parameter

Element
Gross
m2
Openings
m2
NetArea
m2
U-value
W/m2K
A x U
W/K
K-value
kJ/m2K
A x K
kJ/K
TER Opening Type (Uw = 1.40)
External Wall
Total net area of external elements Aum(A, m2)
Fabric heat loss, W/K = Sum (A x U)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K
Thermal bridges (Sum(L x Psi) calculated using Appendix K)
Total fabric heat loss
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)
Heat transfer coeff
Average = Sum(39)m / 12 =
HLP
HLP (average)
Days in month

4. Water heating energy requirements (kWh/year)

Assumed occupancy
Average daily hot water use (litres/day)
Daily hot water use
Energy conte
Energy content (annual)
Distribution loss (46)m = 0.15 x (45)m
Water storage loss:
Store volume
a) If manufacturer declared loss factor is known (kWh/day):
Temperature factor from Table 2b
Enter (49) or (54) in (55)
Total storage loss
If cylinder contains dedicated solar storage

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	4.3553	9.0338	3.5553	4.2148	4.3553	4.2148	4.3553	4.3553	4.2148	4.3553	4.2148	4.3553	4.2148	4.3553	(57)
Primary losses	23.6264	21.0112	23.6264	22.5120	23.6264	22.5120	23.6264	23.6264	22.5120	23.6264	22.5120	23.6264	22.5120	23.6264	(59)
Total heat required for water heating calculated for each month															
Solar input	149.5994	131.5960	137.6720	122.6748	137.6720	122.6748	137.6720	122.6748	137.6720	122.6748	137.6720	122.6748	137.6720	122.6748	(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	0.0000	0.0000	(63)
Output from w/h															
	149.5994	131.5960	137.6720	122.6748	137.6720	122.6748	137.6720	122.6748	137.6720	122.6748	137.6720	122.6748	137.6720	122.6748	(64)
Heat gains from water heating, kWh/month	62.6398	55.4175	58.6872	53.2841	52.7055	47.7967	46.5718	50.1826	49.8054	55.2195	57.5404	61.3604	61.3604	57.5404	(65)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66m)	85.3741	85.3741	85.3741	85.3741	85.3741	85.3741	85.3741	85.3741	85.3741	85.3741	85.3741	85.3741 (66)
Lighting gains (calculated in Appendix L, equation L19 or L20), also see Table 5												
	13.2895	11.8036	9.5993	7.2673	5.4324	4.5863	4.9556	6.4415	8.6458	10.9778	12.8127	13.6588 (67)
Appliances gains (calculated in Appendix L, equation L13 or L14), also see Table 5												
	148.7662	150.3099	146.4598	138.1381	127.6840	117.8586	111.2947	109.7510	113.6411	121.9228	132.3769	142.2022 (68)
Cooking gains (calculated in Appendix L, equation L15 or L16), also see Table 5												
	31.5374	31.5374	31.5374	31.5374	31.5374	31.5374	31.5374	31.5374	31.5374	31.5374	31.5374	31.5374 (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 ex. evaporator (negative values)												
	-68.2993	-68.2993	-68.2993	-68.2993	-68.2993	-68.2993	-68.2993	-68.2993	-68.2993	-68.2993	-68.2993	-68.2993 (71)
Water heating gains (Table 5)												
	84.1932	82.9662	78.8600	74.0057	70.8408	66.3844	62.5965	67.4498	69.1741	74.2198	79.7182	82.4737 (72)
Total internal gains												
	297.8611	296.1922	286.5120	271.0234	255.5694	240.4415	230.4591	235.2544	243.0732	258.7325	276.9178	289.9407 (73)

[Jan]		Area m ²	Solar flux Table 6a W/m ²	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W					
Northeast			11.2829	0.6300	0.7000	0.7700	28.4822 (75)					
Southeast		2.4800	36.7938	0.6300	0.7000	0.7700	27.8868 (77)					
Solar gains	56.3690	105.4780	169.4487	252.0756	320.7911	335.3822	316.3067	262.4564	197.6545	123.3511	69.2400	47.1253 (83)
Total gains	354.2302	401.6701	455.9607	523.0990	576.3606	575.8237	546.7658	497.7109	440.7278	382.0836	345.9589	337.0723 (84)

Temperature during heating periods in the living area from Table 9, Thl (C)												21.0000 (85)
Utilisation factor for gains for living area, util_m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	73.2860	73.5291	73.7691	74.9173	75.1361	76.1717	76.1717	76.1717	75.7694	75.1361	74.6498	74.2389
alpha	5.8857	5.9019	5.9179	5.9945	6.0091	6.0781	6.0781	6.0911	6.0513	6.0091	5.9797	5.9493
util living area	0.9954	0.9896	0.9691	0.8894	0.7149	0.5083	0.3706	0.4238	0.6939	0.9383	0.9894	0.9965 (86)
MIT	20.1365	20.2830	20.5201	20.8023	20.9558	20.9951	20.9994	20.9987	20.9727	20.7526	20.3976	20.1375 (87)
Th 2	20.1272	20.1299	20.1325	20.1447	20.1469	20.1576	20.1576	20.1596	20.1535	20.1469	20.1423	20.1375 (88)
util rest of house	0.9939	0.9863	0.9597	0.8604	0.6613	0.4433	0.3000	0.3471	0.6211	0.9148	0.9855	0.9954 (89)
MIT 2	19.9139	19.1935	19.5343	19.9258	20.1078	20.1546	20.1378	20.1972	20.1584	20.1705	20.1705	20.1705 (90)
Living area fraction									$\text{Lfr} = \text{Living area} / (\text{A} + \text{B})$			
MIT 2	19.6118	19.7890	20.0731	20.4049	20.5713	20.6140	20.6176	20.6180	20.5923	20.3534	19.9319	19.5869 (92)
adjusted MIT									0.0000			
adjusted MIT	19.6118	19.7890	20.0731	20.4049	20.5713	20.6140	20.6176	20.6180	20.5923	20.3534	19.9319	19.5869 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilization	0.9928	0.9848	0.9590	0.8699	0.6886	0.4787	0.3386	0.3891	0.6599	0.9212	0.9844	0.9945 (94)
Useful gains	351.692	395.589	437.261	455.055	396.996	275.672	185.128	193.662	290.832	351.976	340.550	335.2110 (95)
Waste	4.3300	4.3500	4.3600	8.900	11.700	14.600	16.600	16.400	14.100	10.600	7.100	4.2000 (96)
Heat loss rate W												
Month factor	734.0184	711.3888	646.0490	539.1529	414.8019	277.3784	185.2899	194.0444	301.0270	456.0486	603.5337	728.1517 (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 (97)
Space heating per m2	284.4470	212.2377	155.6060	60.8090	13.3122	0.0000	0.0000	0.0000	0.0000	77.4296	189.3482	292.3479 (98)
												285.5376 (98)
										(98)	(98)	25.4109 (99)

Not applicable

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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	1374.9065	(211)

[illegible]

Water heating																	
Water heating requirement	149,5594	131.5960	137.6720	122.6748	119.6821	106.1713	101.2347	112.0943	112.2124	127.2429	135.4755	145.7117 (64)					
Efficiency of water heater												79.8000 (216)					
(217)M	86.5030	86.0824	85.1410	83.0544	80.7557	79.8000	79.8000	79.8000	79.8000	83.5364	85.7070	86.6360 (217)					
Fuel for water heating - kWh/year																	
	172.8949	152.8722	161.6988	147.7042	148.2026	133.0468	126.8606	140.4691	140.6170	152.3202	158.0682	168.1885 (218)					
Water heating fuel used												1802.9430 (219)					
Annual totals kWh/year																	
Space heating fuel – main system												1374.9065 (211)					
Space heating fuel – secondary												0.0000 (215)					
Electricity for pumps and fans:																	
central heating pump												30.0000 (230)					
main heating flow fan												45.0000 (230)					
Total electricity for the above, kWh/year												75.0000 (231)					
Electricity for lighting (calculated in Appendix L)												234.6960 (232)					
Total delivered energy for all uses												730.6965 (233)					
												234.7545 (238)					

	Energy kWh/year	Emission factor kg CO ₂ /kWh	Emissions kg CO ₂ /year
Space heating - main system 1	1374.9065	0.2160	296.9798 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	1802.9430	0.2160	389.4357 (264)
Space and water heating			686.4155 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	234.6960	0.5190	121.8072 (268)
Total CO ₂ kg/m ² /year			847.1477 (272)
Emissions per m ² for space and water heating			13.5682 (272)
Fuel factor (mains gas)			1.0000
Emissions per m ² for lighting			2.4077 (272)
Emissions per m ² for pumps and fans			0.7694 (272)
Target Carbon Dioxide Emission Rate (TER) = (13.5682 * 1.00) + 2.4077 + 0.7694, rounded to 2 d.p.			16.7500 (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 (m2)	Storey height (m)	Volume (m3)
Ground floor	50.5900 (1b)	2.5000 (2b)	126.4750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.5900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	126.4750 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	0	0	0	0.0000 (6a)
Number of open flues	0	0	0	0	0.0000 (6b)
Number of intermittent fans	0	0	0	0	20.0000 (7a)
Number of passive vents	0	0	0	0	0.0000 (7b)
Number of fuelless gas fires	0	0	0	0	0.0000 (7c)

Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1581 (8)
Pressure test		Yes	4.0000
Measured/design AP50		0.3381 (18)	2 (19)
Infiltration rate		2 (19)	0.8500 (20)
Number of sides sheltered		(20) = 1 - [0.075 x (19)] =	0.3044 (21)
Shelter factor		(21) = (18) x (20) =	0.3044 (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 (22a)
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	0.3881	0.3805	0.3729	0.3349	0.3272	0.2892	0.2892	0.2816	0.3044	0.3272	0.3425	0.3577 (22b)
Effective ac	0.5753	0.5724	0.5695	0.5561	0.5535	0.5418	0.5396	0.5463	0.5535	0.5586	0.5640	0.5640 (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
Opening Type 1 (Uw = 0.90)			10.7400	0.8687	9.3301		(27)
External Wall	40.3600	10.7400	29.6200	0.2400	7.1088		(29a)
Total net area of external elements Aum(A, m2)			40.3600				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		16.4389		(32)
Wall to Corridor			22.9300	0.0000	0.0000		(33)
Party Wall			17.5900	0.0000	0.0000		(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.6842 (36)
Total fabric heat loss						(33) + (36) =	22.1231 (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	24.0121	23.8900	23.7703	23.2083	23.1032	22.6137	22.6137	22.5230	22.8022	23.1032	23.3159	23.5383 (38)
Average = Sum(39)m / 12 =	46.1352	46.0131	45.8934	45.3314	45.2263	44.7368	44.7368	44.6461	44.9253	45.2263	45.4390	45.6614 (39)
HLP	0.9119	0.9095	0.9072	0.8961	0.8940	0.8843	0.8843	0.8825	0.8880	0.8940	0.8982	0.9026 (40)
HLP (average)												0.8960 (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												1.7075 (42)
Average daily hot water use (litres/day)												78.6871 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	128.5558	83.4083	80.2608	77.1133	73.9658	70.8184	70.8184	73.9658	77.1133	80.2608	83.4083	86.5558 (44)
Energy content (annual)	128.5558	112.2642	115.8466	100.9979	96.9099	89.9848	88.9228	104.4723	124.3095	124.3095	124.3095	124.3095 (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	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)



FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Heat gains from water heating, kWh/month
27.2764 23.8561 24.6174 21.4620 20.5933 17.7705 16.4670 18.8961 19.1218 22.2846 24.3254 26.4158 (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	85.3741	85.3741	85.3741	85.3741	85.3741	85.3741	85.3741	85.3741	85.3741	85.3741	85.3741	85.3741 (66)
Lighting gains (calculated in Appendix L, equation L19 or L9a), also see Table 5	13.2885	11.8036	9.5983	7.2673	5.4324	4.5863	4.9556	6.4415	8.6458	10.9778	12.8127	13.6588 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	148.7662	150.3099	146.4198	138.1381	127.6840	117.8586	111.2947	109.7510	113.6411	121.9228	132.3769	142.2022 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5374	31.5374	31.5374	31.5374	31.5374	31.5374	31.5374	31.5374	31.5374	31.5374	31.5374	31.5374 (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)	-68.2993	-68.2993	-68.2993	-68.2993	-68.2993	-68.2993	-68.2993	-68.2993	-68.2993	-68.2993	-68.2993	-68.2993 (71)
Water heating gains (Table 5)	26.6619	35.5002	33.0879	29.8084	27.6792	24.6812	22.1330	25.3980	26.5580	29.9524	33.7852	35.5051 (72)
Total internal gains	247.3298	246.2260	237.7192	223.8261	209.4079	195.7384	186.9956	190.2027	197.4571	211.4652	227.5870	239.9784 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
Northeast	8.2600	11.2829	0.4000	0.8000	0.7700	20.6674 (75)
Southeast	2.4800	36.7938	0.4000	0.8000	0.7700	20.2353 (77)

Solar gains	40.9027	76.5373	122.9560	182.9120	232.7736	243.3612	229.5196	190.4446	143.4228	89.5065	50.2422	34.1952 (83)
Total gains	288.2325	322.7633	360.6753	406.7380	442.1815	439.0996	416.5152	380.6472	340.8799	300.9716	277.8292	274.1736 (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	76.1500	76.3521	76.5511	77.5002	77.6804	78.5304	78.5304	78.6898	78.2008	77.6804	77.3167	76.9402
util living area	6.0787	6.0901	6.1034	6.1667	6.1787	6.2354	6.2354	6.2460	6.2134	6.1787	6.1544	6.1293
MIT	0.9984	0.9964	0.9890	0.9537	0.8383	0.6355	0.4703	0.5342	0.8173	0.9762	0.9964	0.9988 (86)
Th2	20.0633	20.1861	20.4003	20.6874	20.9028	20.9859	20.9981	20.9960	20.9388	20.6562	20.3097	20.0411 (87)
util rest of house	20.1574	20.1594	20.1614	20.1709	20.1726	20.1809	20.1809	20.1824	20.1777	20.1726	20.1690	20.1653 (88)
MIT 2	0.9979	0.9952	0.9852	0.9379	0.7923	0.5612	0.3840	0.4421	0.7507	0.9652	0.9950	0.9984 (89)
Living area fraction	19.2958	19.4199	19.6338	19.9189	20.1086	20.1745	20.1804	20.1812	20.1443	19.8953	19.5515	19.2803 (90)
MIT	19.7153	19.8387	20.0527	20.3389	20.5427	20.6180	20.6273	20.6266	20.5785	20.3112	19.9659	19.6961 (91)
Temperature adjustment	19.7153	19.8387	20.0527	20.3389	20.5427	20.6180	20.6273	20.6266	20.5785	20.3112	19.9659	19.6961 (92)
adjusted MIT	19.7153	19.8387	20.0527	20.3389	20.5427	20.6180	20.6273	20.6266	20.5785	20.3112	19.9659	19.6961 (93)

8. Space heating requirement

Utilization	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9975	0.9947	0.9846	0.9415	0.8140	0.6016	0.4312	0.4926	0.7851	0.9674	0.9946	0.9982 (94)
Ext. temp.	287.5225	321.0409	355.1137	382.9493	359.9297	264.1452	179.6173	187.5043	267.6190	291.1515	276.3246	273.6702 (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	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	315.2070	246.1764	198.5493	97.6271	29.7535	0.0000	0.0000	0.0000	0.0000	110.1482	221.9686	322.8242 (98)
Space heating												1542.2542 (98)
Space heating per m2										(98) / (4) =		30.4854 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b												
Ext. temp.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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
Utilization	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (100)
Useful 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 (101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (103)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000 (103a)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	125.7506	167.1465	133.3130	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												426.2101 (104)
Cooled fraction												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)



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SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)				
CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014				
1. Overall dwelling dimensions				
	Area (m ²)	Storey height (m)		Volume (m ³)
Ground floor	50.5900 (1b)	x	2.5000 (2b)	= 126.4750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.5900			(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	126.4750 (5)

	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 * 20 =	0.0000 (6b)
Number of intermittent fans													2 * 10 =	20.0000 (7a)
Number of passive vents													0 * 10 =	0.0000 (7b)
Number of fuelless gas fires													0 * 40 =	0.0000 (7c)
Air changes per hour														
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =												20,000 / (5) =	0.1581 (8)
Pressure test													yes	
Measured/design AP50													5.0000	
Infiltration rate													4.0081 (18)	
Number of sides sheltered													2 (19)	
Shelter factor														
Infiltration rate adjusted to include shelter factor	(20) = 1 - [0.075 x (19)] =												0.8500 (20)	
	(21) = (18) x (20) =												0.3469 (21)	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
Wind speed	5.0000	4.9000	4.8000	4.8000	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 infiltrate ac	0.4423	0.4336	0.4250	0.3816	0.3729	0.3296	0.3296	0.3209	0.3469	0.3729	0.3903	0.4076	(22b)	
Effective ac	0.1978	0.1940	0.1903	0.1728	0.1695	0.1553	0.1553	0.1513	0.1602	0.1695	0.1762	0.1831	(22c)	

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/m2K	R-value kJ/m2K	A x R kJ/K
TER Opening Type (Uw = 1.40)			10.7400	1.3258	14.2386		(27)
External Wall	40.3600	10.7400	29.6200	0.1800	5.3316		(29)
Total net area of external elements Aum(A, m2)			40.3600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	19.5702		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							3.4168 (36)
Total fabric heat loss						(33) + (36) =	22.9870 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)							
(38m)	Jan	Feb	Mar	Apr	May	Jun	Jul
	24.9511	24.7926	24.6372	23.9073	23.7707	23.1350	23.1350
Heat transfer coeff	47.9382	47.7796	47.6242	46.8943	46.7578	46.1220	46.0043
Average = Sum(39)m / 12 =							46.3669
	Jan	Feb	Mar	Apr	May	Jun	Jul
HLP	0.9476	0.9444	0.9414	0.9269	0.9242	0.9117	0.9117
HLP (average)							0.9094
Days in month	31	28	31	30	31	30	31
							0.9165
							0.9242
							0.9297
							0.9354 (40)
							0.9269 (40)
							31 (41)

Assumed occupancy													1.7075 (42)
Average daily hot water use (litres/day)													74.7527 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	82.2280	79.2379	76.2478	73.2577	70.2675	67.2774	67.2774	70.2675	73.2577	76.2478	79.2379	82.2280 (44)	
Energy cost	121.9417	106.6510	110.0543	95.9480	92.0644	79.4446	73.6171	84.4767	85.4856	99.6252	108.7487	118.0940 (45)	
Energy content (annual)										Total = Sum(45)m =		1176.1511 (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	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	25.9126	22.5633	23.3865	20.3889	19.5637	16.8820	15.6436	17.9513	18.1657	21.1704	23.1091	25.0950 (55)	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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
	85.3741	85.3741	85.3741	85.3741	85.3741	85.3741	85.3741	85.3741	85.3741	85.3741	85.3741	85.3741
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.2895	11.8036	9.5993	7.2673	5.4324	4.5863	4.9556	6.4415	8.6458	10.9778	12.8127	13.6588
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	148.7662	150.3099	146.4198	138.1381	127.6840	117.8586	111.2947	109.7510	113.6411	121.9228	132.3769	142.2022
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5374	31.5374	31.5374	31.5374	31.5374	31.5374	31.5374	31.5374	31.5374	31.5374	31.5374	31.5374
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Losses e.g. evaporation (negative values) (Table 5)	-68.2993	-68.2993	-68.2993	-68.2993	-68.2993	-68.2993	-68.2993	-68.2993	-68.2993	-68.2993	-68.2993	-68.2993
Water heating gains (Table 5)	34.8288	33.7252	31.4335	28.3180	26.2953	23.4472	21.0264	24.1281	25.2301	28.4548	32.0960	33.7298
Total internal gains	245.4967	244.4510	236.0649	222.3356	208.0239	194.5043	185.8889	188.9328	196.1292	209.9675	225.8977	238.2031

6. Solar gains												
[Jan]												
	Area	Solar flux	g	FP	Access	Gains						
	m2	Table 6a	Specific data	Specific data	factor	W						
		W/m2	or Table 6b	or Table 6c	Table 6d							
Northeast	8.2600	11.2829	0.6300	0.7000	0.7700	28.4822	(75)					
Southeast	2.4800	36.7938	0.6300	0.7000	0.7700	27.8868	(77)					
Solar gains	56.3690	105.4780	169.4487	252.0756	320.7911	335.3822	316.3067	262.4564	197.6545	123.3511	69.2400	47.1253
Total gains	301.8657	349.9289	405.5136	474.4112	528.8150	529.8865	502.1956	451.3892	393.7837	333.3186	295.1377	285.3284

7. Mean internal temperature (heating season)												
Temperature during heating periods in the living area from Table 9, Thl (C)												
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	73.2860	73.5291	73.7693	74.9173	74.9173	74.9173	75.1361	74.6948	74.2389	74.2389	74.2389	74.2389
alpha	5.8857	5.9019	5.9179	5.9945	6.0091	6.0781	6.0781	6.0911	6.0513	6.0091	5.9797	5.9493
util living area	0.9980	0.9948	0.9819	0.9215	0.7619	0.5499	0.4031	0.4663	0.7561	0.9650	0.9953	0.9986
MIT	20.0376	20.1877	20.4358	20.7480	20.9381	20.9926	20.9978	20.9569	20.6813	20.3037	20.0145	(87)
Th 2	20.1272	20.1299	20.1325	20.1447	20.1469	20.1576	20.1576	20.1596	20.1535	20.1469	20.1423	20.1375
util rest of house	0.9973	0.9931	0.9759	0.8981	0.7093	0.4807	0.3265	0.3825	0.6837	0.9497	0.9934	0.9981
MIT 2	19.2451	19.3967	19.6433	19.9488	20.1085	20.1545	20.1573	20.1590	20.1313	19.8956	19.5230	19.2306
Living area fraction	19.6782	19.8290	20.0764	20.3856	20.5619	20.6126	20.6174	20.6174	20.5826	20.3250	19.9497	19.6590
MIT	19.6782	19.8290	20.0764	20.3856	20.5619	20.6126	20.6174	20.6174	20.5826	20.3250	19.9497	19.6590
Temperature adjustment												0.0000
adjusted MIT	19.6782	19.8290	20.0764	20.3856	20.5619	20.6126	20.6174	20.6174	20.5826	20.3250	19.9497	19.6590

8. Space heating requirement												
Utilisation	0.9969	0.9923	0.9754	0.9053	0.7358	0.5184	0.3684	0.4284	0.7219	0.9534	0.9929	0.9977
Useful gains	300.9352	347.2447	395.5581	429.5036	389.0762	274.7033	185.0165	193.3728	284.2708	317.7819	293.0456	284.6849
Ext temp	4.3000	4.9000	6.5000	8.3000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000
Heat loss rate W	737.2046	713.3035	646.5662	538.6087	414.3632	277.3117	185.2896	194.0204	300.5759	454.7194	604.3720	731.5662
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Space heating kWh	324.5859	245.9915	186.7500	78.5557	18.8136	0.0000	0.0000	0.0000	0.0000	101.8741	224.1551	332.4797
Space heating												1513.2055
Space heating per m2												29.9112

8c. Space cooling requirement												
Calculated for June, July and August. See Table 10b												
Ext. temp.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat loss rate W	4.3000	4.9000	6.5000	8.3000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Useful gains	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
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
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	187.7260	232.3446	184.6695	0.0000	0.0000	0.0000	0.0000
Space cooling												604.7401
Cooled fraction												1.0000
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
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	46.9315	58.0861	46.1674	0.0000	0.0000	0.0000	0.0000

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Space cooling	151.1850	(107)
Space cooling per m2	2.9884	(108)
Energy for space heating	29.9112	(99)
Energy for space cooling	2.9884	(108)
Total	32.8996	(109)
Target Fabric Energy Efficiency (TFEE)	37.8	(109)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



Property Reference	Flat Type T39 - TOP				Issued on Date	23/05/2022
Assessment Reference	BE LEAN	Prop Type Ref	07th Floor - 2B3P			
Property	Flat Type T39, London , N8					
SAP Rating	84 B	DER	16.89	TER	17.50	
Environmental	88 B	% DER<TER	3.49			
CO ₂ Emissions (t/year)	0.87	DFEE	37.37	TFEE	47.18	
General Requirements Compliance	Pass	% DFEE<TFEE	20.78			
Assessor Details	Mr. Simon Gowing, Simon Gowing, Tel: 02036031616, Simon@hodkinsonconsultancy.com				Assessor ID	R572-0001
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

Top-floor flat, total floor area 63 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:Mains gas (c)
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 17.50 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 16.89 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)47.2 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)37.4 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.24 (max. 0.30)	0.24 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor (no floor)			
Roof	0.14 (max. 0.20)	0.14 (max. 0.35)	OK
Openings	0.90 (max. 2.00)	0.90 (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:	4.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system:	Community heating scheme	-
Secondary heating system:	None	

5 Cylinder insulation

Hot water storage	Nominal cylinder loss: 0.22 kWh/day
Permitted by DBSCG 0.35	OK
Primary pipework insulated:	No primary pipework

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and TRVsOK

Hot water controls:

No cylinderstat

7 Low energy lights

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

8 Mechanical ventilation

Continuous supply and extract system		
Specific fan power:	0.72	
Maximum	1.5	OK
WWR efficiency:	90%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley):	Slight	OK
Based on:		
Overshading:	Average	
Windows facing South East:	8.14 m ² , No overhang	
Windows facing South West:	4.96 m ² , No overhang	
Air change rate:	4.00 ach	
Blinds/curtains:	None	

10 Key features

Party wall U-value	0.00 W/m ² K
Party wall U-value	0.00 W/m ² K
Window U-value	0.90 W/m ² K

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															

Ground floor				Area	Storey height			Volume							
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	63.0700			63.0700 (1b)	x	2.5000 (2b)	=	157.6750 (1b) - (3b)							
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)			=	157.6750 (5)							

2. Ventilation rate															

Number of chimneys				main heating	0	+	0	=	0 x 40 =	0.0000 (6a)					
Number of open flues				0	+	0	=	0 x 20 =	0.0000 (6b)						
Number of intermittent fans								0 x 10 =	0.0000 (7a)						
Number of passive vents								0 x 10 =	0.0000 (7b)						
Number of fuelless gas fires								0 x 40 =	0.0000 (7c)						
										Air changes per hour					
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =							0.0000 / (5) =			0.0000 (8)					
Pressure test										Yes					
Measured/design AP50										4.0000					
Infiltration rate										0.2000 (18)					
Number of sides sheltered										2 (19)					
Shelter factor							(20) = 1 - [0.075 x (19)] =			0.8500 (20)					
Infiltration rate adjusted to include shelter factor							(21) = (18) x (20) =			0.1700 (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 infiltr rate	0.2168	0.2125	0.2083	0.1870	0.1828	0.1615	0.1615	0.1573	0.1700	0.1828	0.1913	0.1998 (22b)			
Balanced mechanical ventilation with heat recovery													0.5000 (23a)		
If mechanical ventilation with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =													63.0000 (23c)		
Effective ac	0.4018	0.3975	0.3933	0.3720	0.3678	0.3465	0.3465	0.3423	0.3550	0.3678	0.3763	0.3848 (25)			

3. Heat losses and heat loss parameter															

Element	Gross			Openings			NetArea			U-value			A x U		
	m2			m2			m2			W/m2K			W/K		
Opening Type 1 (Uw = 0.90)															
External Wall	43.5900			13.1000			30.4900			0.8687			11.3803 (27)		
Roof	63.0700						0.2400			7.3176			8.8298 (29a)		
Total net area of external elements Aum(A, m2)							106.6600								
Fabric heat loss, W/K = Sum (A x U)							(26)...(30) + (32) =			27.5277			(33)		
Wall to Corridor							8.2200			0.0000			0.0000 (32)		
Party Wall							33.5100			0.0000			0.0000 (32)		
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K													250.0000 (35)		
Thermal bridges (Sum(L x Psi) calculated using Appendix K)													10.3290 (36)		
Total fabric heat loss							(33) + (36) =			37.8567 (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	58.7609	20.6830	20.4619	19.3562	19.1350	18.0293	18.0293	17.8082	18.4716	19.1350	19.5773	20.0196 (38)			
Average = Sum(39)m / 12 =															
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec				
HLP	0.9317	0.9282	0.9247	0.9071	0.9036	0.8861	0.8861	0.8826	0.8931	0.9036	0.9106	0.9177 (40)			
HLP (average)													0.9063 (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													2.0670 (42)		
Average daily hot water use (litres/day)													87.6743 (43)		
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec				
Daily hot water use	96.4417	92.9348	89.4278	85.9208	82.4138	78.9069	78.9069	82.4138	85.9208	89.4278	92.9348	96.4417 (44)			
Energy conte	143.0203	125.0865	129.0780	112.5334	107.9784	93.1772	86.3424	99.0791	100.2624	116.8462	127.5468	138.5075 (45)			
Energy content (annual)													Total = Sum(45)m = 1379.4582 (45)		
Distribution loss (46)m = 0.15 x (45)m															
21.4530	18.7630	19.3617	16.8800	16.1968	13.9766	12.9514	14.8619	15.0394	17.5269	19.1320	20.7761 (46)				
Water storage loss:															



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Regs Region: England
Elmhurst Energy Systems
SAP2012 Calculator (Design
System) version 4.14r19

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Store volume												3.0000 (47)
b) If manufacturer declared loss factor is not known : Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0212 (51)
Volume factor from Table 2a												3.4200 (52)
Temperature factor from Table 2b												1.0000 (53)
Enter (49) or (54) in (55)												0.2173 (55)
Total storage loss												6.7353 (56)
If cylinder contains dedicated solar storage												
Primary loss												6.7353 (57)
Total heat required for water heating calculated for each month												23.2624 (59)
Solar input												168.5052 (62)
Solar input (sum of months) = Sum(63)m =												0.0000 (63)
Output from w/h												168.5052 (64)
Heat gains from water heating, kWh/month												1732.6568 (64)
Total per year (kWh/year) = Sum(64)m =												70.0519 (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												
Lighting gains (calculated in Appendix L, equation L3 or L9a), also see Table 5												
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
Pumps, fans e.g. evaporation (negative values) (Table 5)												
Water heating gains (Table 5)												
Total internal gains												
6. Solar gains												
[Jan]												
Area m2												
Solar flux Table 6a W/m2												
Specific data or Table 6b												
FF												
Access factor Table 6d												
Gains W												
Southeast												
Southwest												
Solar gains												
Total gains												
7. Mean internal temperature (heating season)												
Temperature during heating periods in the living area from Table 9, Thl (C)												
Utilisation factor for gains for living area, nil/m (see Table 9a)												
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec												
Tau												
alpha												
util living area												
MIT												
Th 2												
util rest of house												
MIT 2												
Living area fraction												
Temperature adjustment												
adjusted MIT												
8. Space heating requirement												
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec												
Utilisation												
Useful gains												
Sea temp												
Heat loss rate W												
Month fraction												
Space heating kWh												
Space heating per m2												
Space heating per m2												
(98) / (4) =												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9a. Energy requirements	
Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Boilers	1.0000 (303a)
Fraction of total space heat from community Boilers	1.0000 (304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.0500 (306)
Space heating:	
Annual space heating requirement	1463.4496 (98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05	1536.6221 (307a)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	1732.6568 (64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05	1819.2897 (310a)
Electricity used for heat distribution	33.5591 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.9000)	
mechanical ventilation fans (SFP = 0.9000)	173.1272 (330a)
Total electricity for the above, kWh/year	173.1272 (331)
Electricity for lighting (calculated in Appendix L)	285.3829 (332)
Total delivered energy for all uses	3814.4218 (338)

12b. Carbon dioxide emissions - Community heating scheme

Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Boilers		89.5000 (367a)
Space heating from Boilers	0.2160	809.9184 (367)
Electrical energy for heat distribution	0.5190	17.4172 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFER)		827.3355 (373)
Space and water heating		827.3355 (376)
Pumps and fans		89.8530 (378)
Energy for lighting		148.1137 (379)
Total CO2, kg/year		1065.3023 (383)
Dwelling Carbon Dioxide Emission Rate (DER)		16.8900 (384)

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

DER	16.8900 ZC1
Total Floor Area	63.0700 TFA
Assumed number of occupants	2.0670 N
CO2 emission factor in Table 12 for electricity displaced from grid	0.5190 EF
CO2 emissions from appliances, equation (L14)	16.9701 ZC2
CO2 emissions from cooking, equation (L16)	2.6733 ZC3
Total CO2 emissions	36.5334 ZC4
Residual CO2 emissions offset from biofuel CHP	0.0000 ZC5
Additional allowable electricity generation, kWh/m ² /year	0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation	0.0000 ZC7
Net CO2 emissions	36.5334 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	63.0700 (1b)	x 2.5000 (2b)	= 157.6750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	63.0700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 157.6750 (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					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					20.0000 / (5) = 0.1268 (8)
Pressure test					Yes
Measured/design APS0					5.0000
Infiltration rate					0.3768 (18)
Number of sides sheltered					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.3203 (21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Adj infiltr rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Effective ac	0.4084	0.4004	0.3924	0.3523	0.3443	0.3043	0.3043	0.2963	0.3203	0.3443	0.3604	0.3764 (22b)
	0.5834	0.5802	0.5770	0.5621	0.5593	0.5463	0.5463	0.5439	0.5513	0.5593	0.5649	0.5708 (25)

3. Heat losses and heat loss parameter

Element	Gross		Openings		NetArea		U-value		A x U		K-value	A x K	
	m2		m2		m2		W/m2K		W/K		kJ/m2K	kJ/K	
TER Opening Type (Uw = 1.40)					13.1000	1.3258			17.3674				(27)
External Wall	43.5900	13.1000			30.4900	0.1800			5.4882				(28a)
Roof	63.0700				63.0700	0.1300			8.1991				(30)
Total net area of external elements Aum(A, m2)					106.6600								(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...	(30) + (32) =			31.0547				(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K													250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)													13.7203 (36)
Total fabric heat loss											(33) + (36) =		44.7750 (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	30.3557	30.1872	30.0221	29.2463	29.1011	28.4255	28.4255	28.3003	28.6857	29.1011	29.3948	29.7018	(38)
Average = Sum(39)m / 12 =	75.1308	74.9623	74.7971	74.0213	73.8762	73.2005	73.2005	73.0754	73.4608	73.8762	74.1698	74.4768	(39)
													74.0206 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.1912	1.1886	1.1859	1.1736	1.1713	1.1606	1.1606	1.1586	1.1647	1.1713	1.1760	1.1809	(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												2.0670 (42)
Average daily hot water use (litres/day)												83.2906 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	91.6196	88.2880	84.9564	81.6248	78.2932	74.9615	74.9615	78.2932	81.6248	84.9564	88.2880	91.6196 (44)
Energy content (annual)	135.8693	118.8321	122.6241	106.9067	102.5795	88.5183	82.0252	94.1252	95.2493	111.0039	121.1694	131.5822 (45)
Distribution loss (46)m = 0.15 x (45)m												
	20.3804	17.8248	18.3936	16.0360	15.3869	13.2777	12.3038	14.1188	14.2874	16.6506	18.1754	19.7373 (46)
Water storage loss:												
Store volume												
a) If manufacturer declared loss factor is known (kWh/day):												
Temperature factor from Table 2b												
Enter (49) or (54) in (55)												
Total storage loss	4.3553	3.9338	4.3553	4.2148	4.3553	4.2148	4.3553	4.3553	4.2148	4.3553	4.2148	4.3553 (56)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF TARGET EMISSIONS 09 Jan 2014

If cylinder contains dedicated solar storage	4.3553	3.9338	4.2148	4.3553	4.2148	4.3553	4.3553	4.2148	4.3553	4.2148	4.3553 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month											
163.4870	143.7771	150.2418	133.6335	130.1972	115.2451	109.6429	121.7428	121.9761	138.6216	147.8962	159.1998 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	163.4870	143.7771	150.2418	133.6335	130.1972	115.2451	109.6429	121.7428	121.9761	138.6216	147.8962
Heat gains from water heating, kWh/month	67.2707	59.4677	62.8667	56.9279	56.2018	50.8138	49.3675	53.3908	53.0518	59.0029	61.6703
											65.8452 (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
(66)m	103.3486	103.3486	103.3486	103.3486	103.3486	103.3486	103.3486	103.3486	103.3486	103.3486	103.3486 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	16.1596	14.3528	11.6725	8.8368	6.6056	5.5767	6.0259	7.8326	10.5130	13.3486	15.5798
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	180.6179	182.4921	177.7691	167.7143	155.0219	143.0928	135.1235	133.2492	137.9723	148.0271	160.7195
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.3349	33.3349	33.3349	33.3349	33.3349	33.3349	33.3349	33.3349	33.3349	33.3349	33.3349 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-82.6789	-82.6789	-82.6789	-82.6789	-82.6789	-82.6789	-82.6789	-82.6789	-82.6789	-82.6789	-82.6789 (71)
Water heating gains (Table 5)	90.4176	88.4936	84.4982	79.0665	75.5401	70.5747	66.3542	71.7618	73.6831	79.3050	85.6531
Total internal gains	344.1996	342.3431	330.9443	312.6222	294.1722	276.2488	264.5081	269.8482	279.1729	297.6853	318.9570
											334.7634 (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					
South-east	8.1400	36.7938	0.6300	0.7000	0.7700	91.5316 (77)					
South-west	4.9600	36.7938	0.6300	0.7000	0.7700	55.7736 (79)					
Solar gains	147.3052	250.9153	343.3132	425.3818	476.4630	473.0175	456.0393	417.9304	371.7356	277.3149	176.4377
Total gains	491.5048	593.2583	674.2576	738.0039	770.6352	749.2663	720.5475	687.7787	650.9086	575.0002	495.3947
											460.8260 (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, n1/m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
tau	58.2965	58.4275	58.5566	59.1703	59.2865	59.8338	59.8338	59.9362	59.6218	59.2865	59.0518
alpha	4.8864	4.8952	4.9038	4.9447	4.9524	4.9889	4.9889	4.9957	4.9748	4.9524	4.9368
util living area	0.9937	0.9840	0.9609	0.9012	0.7809	0.6013	0.4425	0.4817	0.7147	0.9271	0.9859
MIT	19.8675	20.0786	20.3540	20.6581	20.8736	20.9733	20.9952	20.9928	20.9381	20.6511	20.1959
Th 2	19.9270	19.9292	19.9313	19.9411	19.9430	19.9516	19.9516	19.9532	19.9483	19.9430	19.9393
util rest of house	0.9917	0.9790	0.9486	0.8712	0.7217	0.5128	0.3395	0.3757	0.6290	0.8981	0.9805
MIT 2	18.4406	18.7471	19.1403	19.5626	19.8283	19.9353	19.9500	19.9505	19.9044	19.5653	18.9266
Living area fraction	19.0223	19.2899	19.6351	20.0092	20.2544	20.3584	20.3761	20.3754	20.3258	20.0079	19.4440
MIT	19.0223	19.2899	19.6351	20.0092	20.2544	20.3584	20.3761	20.3754	20.3258	20.0079	19.4440
Temperature adjustment											
adjusted MIT	19.0223	19.2899	19.6351	20.0092	20.2544	20.3584	20.3761	20.3754	20.3258	20.0079	19.4440
											18.9738 (93)

8. Space heating requirement											
Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
Useful gains	486.2726	578.5214	636.8094	644.5635	570.5286	410.7189	274.9747	288.2249	430.6052	517.5949	484.1392
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000
Heat loss rate W	1106.0961	1078.6972	982.4638	822.3147	631.9646	421.5204	276.4097	290.5019	457.3518	695.0228	915.5519
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000 (97a)
Space heating	461.1486	336.1182	257.1668	127.9809	45.7084	0.0000	0.0000	0.0000	0.0000	132.0063	310.6171
Space heating											
Space heating per m2											
											98) / (4) =
											34.0778 (99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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											2298.7003 (211)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	461.1486	336.1182	257.1668	127.9809	45.7084	0.0000	0.0000	0.0000	132.0063	310.6171	478.5384 (98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000 (210)
Space heating fuel (main heating system)	493.2071	359.4847	275.0448	136.8780	48.8860	0.0000	0.0000	0.0000	141.1832	332.2108	511.8058 (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 (215)
Water heating											
Water heating requirement	163.4870	143.7771	150.2418	133.6335	130.1972	115.2451	109.6429	121.7428	121.9761	138.6216	147.8962
Efficiency of water heater	93.5000	93.5000	93.5000	93.5000	93.5000	93.5000	93.5000	93.5000	93.5000	93.5000	93.5000 (216)
Fuel for water heating, kWh/month	186.9883	165.2519	174.2219	157.7748	158.1419	144.4174	137.3971	152.5599	152.8522	163.6931	170.4892
Water heating fuel used											
Annual totals kWh/year											
Space heating fuel - main system											2298.7003 (211)
Space heating fuel - secondary											0.0000 (215)
Electricity for pumps and fans:											
central heating pump											30.0000 (230a)
main heating flue fan											45.0000 (230b)
Total electricity for the above, kWh/year											75.0000 (231)
Electricity for lighting (calculated in Appendix L)											285.3829 (232)
Total delivered energy for all uses											4604.6706 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP											
Energy											
kWh/year	2298.7003										
Emission factor	0.2160										
kg CO2/kWh	0.0000										
Emissions	496.5193 (261)										
Space heating - main system 1											
Space heating - secondary											
Water heating (other fuel)											
Space and water heating											
Pumps and fans											
Energy for lighting											
Total CO2, kg/m2/year											
Emissions per m2 for space and water heating											
Fuel factor (main gas)											
Emissions per m2 for lighting											
Emissions per m2 for pumps and fans											
Target Carbon Dioxide Emission Rate (TER) = (14.5357 * 1.00) + 2.3484 + 0.6172, rounded to 2 d.p.											
											17.5000 (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 (m2)	Storey height (m)	Volume (m3)
Ground floor	63.0700 (1b)	x 2.5000 (2b)	= 157.6750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	63.0700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 157.6750 (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					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of fuelless gas fires					0 * 40 = 0.0000 (7c)

Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1268 (8)
Pressure test			Yes
Measured/design AP50			4.0000
Infiltration rate			0.3268 (18)
Number of sides sheltered			2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =		0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =		0.2778 (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 infiltr rate												
Effective ac	0.3542	0.3473	0.3403	0.3056	0.2987	0.2639	0.2639	0.2570	0.2778	0.2987	0.3125	0.3264 (22b)
	0.5627	0.5603	0.5579	0.5467	0.5446	0.5348	0.5348	0.5330	0.5386	0.5446	0.5488	0.5533 (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
Opening Type 1 (Uw = 0.90)			13.1000	0.8687	11.3803		(27)
External Wall	43.5900	13.1000	30.4900	0.2400	7.3176		(29a)
Roof	63.0700		63.0700	0.1400	8.8298		(30)
Total net area of external elements Aum(A, m2)			106.6600				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...	(30) + (32) =	27.5277		(33)
Wall to Corridor			8.2200	0.0000	0.0000		(35)
Party Wall			33.5100	0.0000	0.0000		(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	10.3290 (36)
Total fabric heat loss	(33) + (36) = 37.8567 (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	29.2806	29.1539	29.0296	28.4461	28.3369	27.8286	27.8286	27.7345	28.0244	28.3369	28.5577	28.7887 (38)
Heat transfer coeff	67.1373	67.0106	66.8863	66.3028	66.1936	65.6853	65.6853	65.5912	65.8811	66.1936	66.4145	66.6454 (39)
Average = Sum(39)m / 12 =												66.3022 (39)

HLP (average)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0645	1.0625	1.0605	1.0513	1.0495	1.0415	1.0415	1.0400	1.0446	1.0495	1.0530	1.0567 (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	2.0670 (42)
Average daily hot water use (litres/day)	87.6743 (43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	96.4417	92.9348	89.4278	85.9208	82.4138	78.9069	78.9069	82.4138	85.9208	89.4278	92.9348	96.4417 (44)
Energy conte	143.0203	125.0865	129.0780	112.5334	107.9784	93.1772	86.3424	99.0791	100.2624	116.8462	127.5468	138.5075 (45)
Energy content (annual)												Total = Sum(45)m = 1379.4582 (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	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)



FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

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	10.3918	26.5859	27.4291	23.9133	22.9454	19.8002	18.3478	21.0543	21.3058	24.8298	27.1037	29.4329 (65)

5. Internal gains (see Table 5 and Sa)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	103.3486	103.3486	103.3486	103.3486	103.3486	103.3486	103.3486	103.3486	103.3486	103.3486	103.3486	103.3486 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	16.1596	14.3528	11.6725	8.8368	6.6056	5.5767	6.0259	7.8326	10.5130	13.3486	15.5798	16.6087 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	33.3349	33.3349	33.3349	33.3349	33.3349	33.3349	33.3349	33.3349	33.3349	33.3349	33.3349	33.3349 (69)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	180.6179	182.4921	177.7651	167.7143	155.0219	143.0928	135.1235	133.2492	137.9723	148.0271	160.7195	172.6485 (68)
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)	-82.6789	-82.6789	-82.6789	-82.6789	-82.6789	-82.6789	-82.6789	-82.6789	-82.6789	-82.6789	-82.6789	-82.6789 (71)
Water heating gains (Table 5)	40.8492	39.5549	36.8670	33.2130	30.8406	27.5002	24.6610	28.2988	29.5913	33.3734	37.6440	39.5603 (72)
Total internal gains	291.6312	290.4043	280.3132	263.7686	246.4727	230.1744	219.8149	223.3853	232.0812	248.7537	267.9479	282.8221 (73)

6. Solar gains

[Jan]	Area m2	Solar Flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W						
Southeast	8.1400	36.7938	0.4000	0.8000	0.7700	66.4175 (77)						
Southwest	4.9600	36.7938	0.4000	0.8000	0.7700	40.4706 (79)						
Solar gains	106.8881	182.0701	249.1162	308.6670	345.7328	343.2326	330.9129	303.2602	269.7401	201.2262	128.0274	91.4740 (83)
Total gains	398.5194	472.4744	529.4293	572.4357	592.2055	573.4070	550.7278	526.6454	501.8213	449.9799	395.9752	374.2961 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation factor for gains for living area, nilym (see Table 9a)												21.0000 (85)
tau	65.2373	65.3607	65.4821	66.0585	66.1675	66.6795	66.6795	66.7752	66.4813	66.1675	65.9474	65.7189
alpha	5.3482	5.3574	5.3655	5.4039	5.4112	5.4453	5.4453	5.4517	5.4321	5.4112	5.3965	5.3813
util living area	0.9974	0.9932	0.9820	0.9478	0.8599	0.6914	0.5172	0.5608	0.7999	0.9629	0.9940	0.9982 (86)
MIT	19.9053	20.0776	20.3189	20.6062	20.8387	20.9636	20.9937	20.9903	20.9193	20.6130	20.1973	19.8699 (87)
Th 2	20.0299	20.0316	20.0332	20.0408	20.0423	20.0489	20.0489	20.0502	20.0464	20.0423	20.0394	20.0364 (88)
util rest of house	0.9966	0.9910	0.9758	0.9295	0.8131	0.6053	0.4094	0.4512	0.7247	0.9461	0.9917	0.9976 (89)
MIT 2	19.0333	19.2058	19.4451	19.7276	19.9350	20.0324	20.0473	20.0474	20.0037	19.7400	19.3320	19.0032 (90)
Living area fraction												0.4076 (91)
MIT	19.3887	19.5611	19.8013	20.0857	20.3034	20.4120	20.4331	20.4318	20.3769	20.0959	19.6847	19.3565 (92)
Temperature adjustment												0.0000
adjusted MIT	19.3887	19.5611	19.8013	20.0857	20.3034	20.4120	20.4331	20.4318	20.3769	20.0959	19.6847	19.3565 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	396.8704	467.5711	515.6911	532.6308	489.7851	366.7483	249.8386	261.3349	377.8126	426.2434	392.2454	373.1668 (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	1013.0185	982.4516	889.6724	741.6433	569.4887	381.7654	251.7774	264.4508	413.5312	628.5651	835.8070	1010.1105 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	458.4142	345.9997	278.2421	150.4890	59.2995	0.0000	0.0000	0.0000	0.0000	150.5273	319.3643	473.8862 (98)
Space heating per m2										(98) / (4) =		35.4562 (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	617.4418	486.0712	498.4930	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9131	0.9582	0.9468	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	563.7592	465.7638	471.9853	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	747.0627	718.9920	692.0281	0.0000	0.0000	0.0000	0.0000 (103)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000 (103a)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	131.9353	188.4018	163.7118	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												484.0490 (104)
Cooled fraction												1.0000 (105)
Intermittency factor (Table 10b)												



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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	63.0700	x	2.5000	157.6750
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	63.0700			157.6750 (1b) - (3b)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	157.6750 (5)

2. Ventilation rate										total		m3 per hour	
main heating		secondary heating		other									
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								2 * 10 =	20.0000	(7a)			
Number of passive vents								0 * 10 =	0.0000	(7b)			
Number of flueless gas fires								0 * 40 =	0.0000	(7c)			
									Air changes per hour				
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =									20.0000 / (5) =		4.1268	(8)	
Pressure test											Yes		
Measured/design AP90											5.0000		
Infiltration rate											0.7668	(18)	
Number of sides sheltered											2	(19)	
Shelter factor									(20) = 1 - [0.075 x (19)] =		0.8500	(20)	
Infiltration rate adjusted to include shelter factor									(21) = (18) x (20) =		0.3203	(21)	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.8000	4.7000	3.8000	3.8000	3.7000	4.0000	4.0000	4.5000	4.7000 (2)
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 (2a)
Adj inflator rate												
	0.0804	0.0804	0.3924	0.3523	0.3443	0.3043	0.3043	0.2963	0.3203	0.3443	0.3604	0.3708 (2b)
Effective ac	0.5834	0.5802	0.5770	0.5621	0.5593	0.5463	0.5463	0.5439	0.5513	0.5593	0.5649	0.5784 (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 Opening Type (Uw = 1.40)			13.1000	1.2358	17.3674		(27)						
External Wall	43.5900	13.1000	30.4900	0.1800	5.4882		(28)						
Roof	63.0700		63.0700	0.1300	8.1991		(29)						
Total net area of external elements Aum(A, m ²)			106.6600				(31)						
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		31.0547		(33)						
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000	(35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							13.7203	(36)					
Total fabric heat loss						(33) + (36) =	44.7750	(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	30.3557	30.1872	30.0221	29.2463	29.1011	28.4255	28.4255	28.3003	28.6857	29.1011	29.3948	29.7018 (38)	
	75.1308	74.9623	74.7971	74.0213	73.8762	73.2005	73.2005	73.0754	73.4608	73.8762	74.1698	74.4768 (39)	
Average = Sum(39)/ 12 =												74.0206 (39)	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.1912	1.1886	1.1859	1.1736	1.1713	1.1606	1.1606	1.1586	1.1647	1.1713	1.1760	1.1809 (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												2.0670 (42)
Average daily hot water use (litres/day)												83.2906 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	81.6196	88.2880	84.9564	81.6248	78.2932	74.9615	74.9615	78.2932	81.6248	84.9564	88.2880	91.6196 (44)
Energy cost	135.8693	118.8321	122.6241	106.9067	102.5795	88.5183	82.0252	94.1252	95.2493	111.0039	121.1694	131.5822 (45)
Energy content (annual)	Total = Sum(45)m =											1310.4853 (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	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												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

28.8722 25.2518 26.0576 22.7177 21.7981 18.8101 17.4304 20.0016 20.2405 23.5883 25.7485 27.9612 (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	103.3486	103.3486	103.3486	103.3486	103.3486	103.3486	103.3486	103.3486	103.3486	103.3486	103.3486	103.3486 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	16.1596	14.3528	11.6723	8.8368	6.6056	5.5767	6.0259	7.8326	10.5130	13.3486	15.5798	16.6087 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	180.6179	182.4921	177.7691	167.7143	155.0219	143.0928	135.1235	133.2492	137.9723	148.0271	160.7195	172.6485 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.3349	33.3349	33.3349	33.3349	33.3349	33.3349	33.3349	33.3349	33.3349	33.3349	33.3349	33.3349 (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)	-82.6789	-82.6789	-82.6789	-82.6789	-82.6789	-82.6789	-82.6789	-82.6789	-82.6789	-82.6789	-82.6789	-82.6789 (71)
Water heating gains (Table 5)	38.8068	37.5771	35.0237	31.5523	29.2986	26.1252	23.4279	26.8839	28.1118	31.7047	35.7618	37.5823 (72)
Total internal gains	289.5888	288.4266	278.4698	262.1080	244.9307	228.7993	218.5818	221.9703	230.6016	247.0850	266.0657	280.8441 (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

South-east	8.1400	36.7938	0.6300	0.7000	0.7700	91.5316 (77)
South-west	4.9600	36.7938	0.6300	0.7000	0.7700	55.7736 (78)

Solar gains	147.3052	250.9153	343.3132	425.3818	476.4630	473.0175
Total gains	436.8940	539.3419	621.7830	687.4897	721.3937	701.8168

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	58.2965	58.4275	58.5566	59.1703	59.2865	59.8338	59.8338	59.9362	59.6218	59.2865	59.0518	58.8084
alpha	4.8864	4.8952	4.9038	4.9447	4.9524	4.9889	4.9889	4.9957	4.9748	4.9524	4.9368	4.9206
util living area	0.9962	0.9892	0.9710	0.9207	0.8111	0.6351	0.4711	0.5151	0.7537	0.9466	0.9912	0.9973 (86)
MIT	19.7889	20.0043	20.2887	20.6105	20.8488	20.9662	20.9937	20.9903	20.9214	20.5967	20.1221	19.7482 (87)
Th 2	19.9270	19.9292	19.9313	19.9411	19.9430	19.9516	19.9516	19.9532	19.9483	19.9430	19.9393	19.9353 (88)
util rest of house	0.9950	0.9857	0.9615	0.8949	0.7547	0.5443	0.3622	0.4031	0.6693	0.9235	0.9877	0.9964 (89)
MIT 2	18.8342	19.0493	19.3295	19.6415	19.8472	19.9372	19.9501	19.9507	19.9090	19.6375	19.1757	18.8004 (90)
Living area fraction	19.2234	19.4386	19.7205	20.0365	20.2555	20.3566	20.3755	20.3745	20.3217	20.0285	19.5615	19.1867 (91)
MIT	19.2234	19.4386	19.7205	20.0365	20.2555	20.3566	20.3755	20.3745	20.3217	20.0285	19.5615	19.1867 (92)
Temperature adjustment	adjusted MIT	19.4386	19.7205	20.0365	20.2555	20.3566	20.3755	20.3745	20.3217	20.0285	19.5615	19.1867 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	434.2174	530.4968	596.4205	617.0304	557.3982	407.5209	274.4598	287.3432	422.4817	485.4366	436.3475	405.0981 (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	1121.2065	1089.8462	988.8556	824.3409	632.0485	421.3882	276.3702	290.4358	457.0518	696.5417	924.2641	1116.1645 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	511.1199	375.8828	291.9717	149.2636	55.5398	0.0000	0.0000	0.0000	0.0000	157.0622	351.2999	529.0334 (98)
Space heating												2421.1734 (98)
Space heating per m2										(98) / (4) =		38.3887 (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	688.0846	541.6836	555.3728	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9221	0.9613	0.9500	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	634.4910	520.7302	527.6112	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	897.3243	864.0107	824.6433	0.0000	0.0000	0.0000	0.0000 (103)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000 (103a)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	189.2399	255.4007	220.9919	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												665.6325 (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												

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 47.3100 63.8502 55.2480 0.0000 0.0000 0.0000 0.0000 (107)

Space cooling 0.0000 0.0000 0.0000 0.0000 0.0000 47.3100 63.8502 55.2480 0.0000 0.0000 0.0000 0.0000 (107)
Space cooling per m2 166.4081 (107)
Energy for space heating 2.6385 (108)
Energy for space cooling 38.3887 (99)
Total 2.6385 (108)
Target Fabric Energy Efficiency (TFEE) 41.0271 (109)
47.2 (109)

Appendix D

BRUKL Outputs – *Be Lean*

BRUKL Output Document



Compliance with England Building Regulations Part L 2013

Project name

Shell and Core

Clarendon Cafe Be Lean

As designed

Date: Wed Dec 05 18:16:02 2018

Administrative information

Building Details

Address: Clarendon Cafe, London, N22

Certification tool

Calculation engine: SBEM

Calculation engine version: v5.4.b.0

Interface to calculation engine: DesignBuilder SBEM

Interface to calculation engine version: v5.4.0

BRUKL compliance check version: v5.4.b.0

Owner Details

Name:

Telephone number:

Address: , ,

Certifier details

Name:

Telephone number:

Address: , ,

Criterion 1: The calculated CO₂ emission rate for the building must not exceed the target

CO ₂ emission rate from the notional building, kgCO ₂ /m ² .annum	80
Target CO ₂ emission rate (TER), kgCO ₂ /m ² .annum	80
Building CO ₂ emission rate (BER), kgCO ₂ /m ² .annum	76.8
Are emissions from the building less than or equal to the target?	BER =< TER
Are as built details the same as used in the BER calculations?	Separate submission

Criterion 2: The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Values which do not achieve the standards in the Non-Domestic Building Services Compliance Guide and Part L are displayed in red.

Building fabric

Element	U _a -Limit	U _a -Calc	U _i -Calc	Surface where the maximum value occurs*
Wall**	0.35	0.25	0.25	02 Lower Ground Floor - Kitchen_P_8
Floor	0.25	0.14	0.14	02 Lower Ground Floor - Kitchen_S_3
Roof	0.25	0.14	0.14	02 Lower Ground Floor - Cafe_R_5
Windows***, roof windows, and rooflights	2.2	1.4	1.4	02 Lower Ground Floor - Cafe_G_7
Personnel doors	2.2	-	-	"No external personnel doors"
Vehicle access & similar large doors	1.5	-	-	"No external vehicle access doors"
High usage entrance doors	3.5	-	-	"No external high usage entrance doors"
U _a -Limit = Limiting area-weighted average U-values [W/(m ² K)] U _a -Calc = Calculated area-weighted average U-values [W/(m ² K)] U _i -Calc = Calculated maximum individual element U-values [W/(m ² K)]				
* There might be more than one surface where the maximum U-value occurs. ** Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows. *** Display windows and similar glazing are excluded from the U-value check. N.B.: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.				

Air Permeability	Worst acceptable standard	This building
m ³ /(h.m ²) at 50 Pa	10	5

Building services

The standard values listed below are minimum values for efficiencies and maximum values for SFPs. Refer to the Non-Domestic Building Services Compliance Guide for details.

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

1- Project HVAC

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	2.5	2.5	-	-	-
Standard value	2.5*	N/A	N/A	N/A	N/A

Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system

NO

* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps. For types <=12 kW output, refer to EN 14825 for limiting standards.

1- Project DHW

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	Hot water provided by HVAC system	0.004
Standard value	N/A	N/A

1- CHP 1

	CHPQA quality index	CHP electrical efficiency
This building	110	0.4
Standard value	Not provided	N/A

Local mechanical ventilation, exhaust, and terminal units

ID	System type in Non-domestic Building Services Compliance Guide
A	Local supply or extract ventilation units serving a single area
B	Zonal supply system where the fan is remote from the zone
C	Zonal extract system where the fan is remote from the zone
D	Zonal supply and extract ventilation units serving a single room or zone with heating and heat recovery
E	Local supply and extract ventilation system serving a single area with heating and heat recovery
F	Other local ventilation units
G	Fan-assisted terminal VAV unit
H	Fan coil units
I	Zonal extract system where the fan is remote from the zone with grease filter

Zone name	SFP [W/(l/s)]										HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		Zone	Standard
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1			
02 Lower Ground Floor - Kitchen	0.3	-	-	-	-	-	-	-	-	-	-	N/A
02 Lower Ground Floor - WCs	0.3	-	-	-	-	-	-	-	-	-	-	N/A
02 Lower Ground Floor - Cafe	-	-	-	1.5	-	-	-	-	-	-	0.85	0.5

Shell and core configuration

Zone	Assumed shell?
02 Lower Ground Floor - Kitchen	NO
02 Lower Ground Floor - WCs	NO
02 Lower Ground Floor - Cafe	NO

General lighting and display lighting		Luminous efficacy [lm/W]			General lighting [W]
Zone name		Luminaire	Lamp	Display lamp	
	Standard value	60	60	22	
02 Lower Ground Floor - Kitchen	-	100	-		338
02 Lower Ground Floor - WCs	-	100	-		58
02 Lower Ground Floor - Cafe	-	100	50		557

Criterion 3: The spaces in the building should have appropriate passive control measures to limit solar gains

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
02 Lower Ground Floor - Kitchen	N/A	N/A
02 Lower Ground Floor - WCs	N/A	N/A
02 Lower Ground Floor - Cafe	NO (-15.5%)	NO

Criterion 4: The performance of the building, as built, should be consistent with the calculated BER

Separate submission

Criterion 5: The necessary provisions for enabling energy-efficient operation of the building should be in place

Separate submission

EPBD (Recast): Consideration of alternative energy systems

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

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters			Building Use	
	Actual	Notional	% Area	Building Type
Area [m ²]	279.1	279.1		A1/A2 Retail/Financial and Professional services
External area [m ²]	617	617	100	A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways
Weather	LON	LON		B1 Offices and Workshop businesses
Infiltration [m ³ /hm ² @ 50Pa]	5	3		B2 to B7 General Industrial and Special Industrial Groups
Average conductance [W/K]	262.97	255.52		B8 Storage or Distribution
Average U-value [W/m ² K]	0.43	0.41		C1 Hotels
Alpha value* [%]	13.21	12.51		C2 Residential Institutions: Hospitals and Care Homes
				C2 Residential Institutions: Residential schools
				C2 Residential Institutions: Universities and colleges
				C2A Secure Residential Institutions
				Residential spaces
				D1 Non-residential Institutions: Community/Day Centre
				D1 Non-residential Institutions: Libraries, Museums, and Galleries
				D1 Non-residential Institutions: Education
				D1 Non-residential Institutions: Primary Health Care Building
				D1 Non-residential Institutions: Crown and County Courts
				D2 General Assembly and Leisure, Night Clubs, and Theatres
				Others: Passenger terminals
				Others: Emergency services
				Others: Miscellaneous 24hr activities
				Others: Car Parks 24 hrs
				Others: Stand alone utility block

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

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	5.08	6.53
Cooling	50.97	35.97
Auxiliary	11.99	8.5
Lighting	28.12	56.95
Hot water	124.51	117.6
Equipment*	129.28	129.28
TOTAL**	220.67	225.54

* Energy used by equipment does not count towards the total for consumption or calculating emissions.
** Total is net of any electrical energy displaced by CHP generators, if applicable.

Energy Production by Technology [kWh/m²]

	Actual	Notional
Photovoltaic systems	0	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0

Energy & CO₂ Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m ²]	368.3	523.27
Primary energy* [kWh/m ²]	447.12	466.57
Total emissions [kg/m ²]	76.8	80

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

HVAC Systems Performance									
System Type	Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEFF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Split or multi-split system, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity									
Actual	42.6	325.7	5.1	51	12	2.33	1.78	2.5	2.5
Notional	57.1	466.2	6.5	36	8.5	2.43	3.6	----	----

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

Key Features

The Building Control Body is advised to give particular attention to items whose specifications are better than typically expected.

Building fabric			
Element	U _{i-Typ}	U _{i-Min}	Surface where the minimum value occurs*
Wall	0.23	0.24	02 Lower Ground Floor - Cafe_W_6
Floor	0.2	0.14	02 Lower Ground Floor - Kitchen_S_3
Roof	0.15	0.14	02 Lower Ground Floor - Cafe_R_5
Windows, roof windows, and rooflights	1.5	1.4	02 Lower Ground Floor - Cafe_G_7
Personnel doors	1.5	-	"No external personnel doors"
Vehicle access & similar large doors	1.5	-	"No external vehicle access doors"
High usage entrance doors	1.5	-	"No external high usage entrance doors"
U _{i-Typ} = Typical individual element U-values [W/(m²K)]		U _{i-Min} = Minimum individual element U-values [W/(m²K)]	
* There might be more than one surface where the minimum U-value occurs.			

Air Permeability	Typical value	This building
m³/(h.m²) at 50 Pa	5	5

BRUKL Output Document

Compliance with England Building Regulations Part L 2013



HM Government

Project name

Shell and Core

Clarendon Offices Be Lean

As designed

Date: Wed Dec 05 17:46:24 2018

Administrative information

Building Details

Address: Clarendon Offices, London, N22

Certification tool

Calculation engine: SBEM

Calculation engine version: v5.4.b.0

Interface to calculation engine: DesignBuilder SBEM

Interface to calculation engine version: v5.4.0

BRUKL compliance check version: v5.4.b.0

Owner Details

Name:

Telephone number:

Address: , ,

Certifier details

Name:

Telephone number:

Address: , ,

Criterion 1: The calculated CO₂ emission rate for the building must not exceed the target

CO ₂ emission rate from the notional building, kgCO ₂ /m ² .annum	19.6
Target CO ₂ emission rate (TER), kgCO ₂ /m ² .annum	19.6
Building CO ₂ emission rate (BER), kgCO ₂ /m ² .annum	18.1
Are emissions from the building less than or equal to the target?	BER <= TER
Are as built details the same as used in the BER calculations?	Separate submission

Criterion 2: The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Values which do not achieve the standards in the Non-Domestic Building Services Compliance Guide and Part L are displayed in red.

Building fabric

Element	U _a -Limit	U _a -Calc	U _i -Calc	Surface where the maximum value occurs*
Wall**	0.35	0.24	0.25	01 Lower Ground Floor - Offices 1_P_6
Floor	0.25	0.16	0.25	03 First Floor 1 - Offices 1_F_4
Roof	0.25	0.14	0.14	01 Lower Ground Floor - Offices_R_5
Windows***, roof windows, and rooflights	2.2	1.4	1.4	01 Lower Ground Floor - Offices 1_G_8
Personnel doors	2.2	-	-	"No external personnel doors"
Vehicle access & similar large doors	1.5	-	-	"No external vehicle access doors"
High usage entrance doors	3.5	-	-	"No external high usage entrance doors"
U _a -Limit = Limiting area-weighted average U-values [W/(m ² K)] U _a -Calc = Calculated area-weighted average U-values [W/(m ² K)] U _i -Calc = Calculated maximum individual element U-values [W/(m ² K)]				
* There might be more than one surface where the maximum U-value occurs. ** Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows. *** Display windows and similar glazing are excluded from the U-value check. N.B.: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.				

Air Permeability	Worst acceptable standard	This building
m ³ /(h.m ²) at 50 Pa	10	5

Building services

The standard values listed below are minimum values for efficiencies and maximum values for SFPs. Refer to the Non-Domestic Building Services Compliance Guide for details.

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

1- Project HVAC

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	2.5	2.5	-	-	-
Standard value	2.5*	N/A	N/A	N/A	N/A

Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system

NO

* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps. For types <=12 kW output, refer to EN 14825 for limiting standards.

1- Project DHW

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	Hot water provided by HVAC system	0.006
Standard value	N/A	N/A

1- CHP 1

	CHPQA quality index	CHP electrical efficiency
This building	110	0.4
Standard value	Not provided	N/A

Local mechanical ventilation, exhaust, and terminal units

ID	System type in Non-domestic Building Services Compliance Guide
A	Local supply or extract ventilation units serving a single area
B	Zonal supply system where the fan is remote from the zone
C	Zonal extract system where the fan is remote from the zone
D	Zonal supply and extract ventilation units serving a single room or zone with heating and heat recovery
E	Local supply and extract ventilation system serving a single area with heating and heat recovery
F	Other local ventilation units
G	Fan-assisted terminal VAV unit
H	Fan coil units
I	Zonal extract system where the fan is remote from the zone with grease filter

Zone name	ID of system type	SFP [W/(l/s)]									HR efficiency	
		A	B	C	D	E	F	G	H	I	Zone	Standard
01 Lower Ground Floor - Offices 1		-	-	-	1.5	-	-	-	-	-	0.85	0.5
01 Lower Ground Floor - Offices		-	-	-	1.5	-	-	-	-	-	0.85	0.5
03 First Floor 1 - Offices 1		-	-	-	1.5	-	-	-	-	-	0.85	0.5
03 First Floor 1 - Offices 2		-	-	-	1.5	-	-	-	-	-	0.85	0.5
03 First Floor 1 - Offices 3		-	-	-	1.5	-	-	-	-	-	0.85	0.5
03 First Floor 1 - Offices		-	-	-	1.5	-	-	-	-	-	0.85	0.5

Shell and core configuration

Zone	Assumed shell?
01 Lower Ground Floor - Offices 1	NO
01 Lower Ground Floor - Offices	NO
03 First Floor 1 - Offices 1	NO
03 First Floor 1 - Offices 2	NO

Shell and core configuration

Zone	Assumed shell?
03 First Floor 1 - Offices 3	NO
03 First Floor 1 - Offices	NO

General lighting and display lighting

Zone name	Standard value	Luminous efficacy [lm/W]			General lighting [W]
		Luminaire	Lamp	Display lamp	
01 Lower Ground Floor - Offices 1		100	-	-	1918
01 Lower Ground Floor - Offices		100	-	-	2264
03 First Floor 1 - Offices 1		100	-	-	1167
03 First Floor 1 - Offices 2		100	-	-	1195
03 First Floor 1 - Offices 3		100	-	-	2648
03 First Floor 1 - Offices		100	-	-	1086

Criterion 3: The spaces in the building should have appropriate passive control measures to limit solar gains

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
01 Lower Ground Floor - Offices 1	NO (-17.7%)	NO
01 Lower Ground Floor - Offices	NO (-13.7%)	NO
03 First Floor 1 - Offices 1	NO (-13.6%)	NO
03 First Floor 1 - Offices 2	NO (-41.1%)	NO
03 First Floor 1 - Offices 3	NO (-23.2%)	NO
03 First Floor 1 - Offices	NO (-31.5%)	NO

Criterion 4: The performance of the building, as built, should be consistent with the calculated BER

Separate submission

Criterion 5: The necessary provisions for enabling energy-efficient operation of the building should be in place

Separate submission

EPBD (Recast): Consideration of alternative energy systems

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

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters			Building Use	
	Actual	Notional	% Area	Building Type
Area [m ²]	1680.7	1680.7		A1/A2 Retail/Financial and Professional services
External area [m ²]	2181.1	2181.1		A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways
Weather	LON	LON	100	B1 Offices and Workshop businesses
Infiltration [m ³ /hm ² @ 50Pa]	5	3		B2 to B7 General Industrial and Special Industrial Groups
Average conductance [W/K]	896.2	832.27		B8 Storage or Distribution
Average U-value [W/m ² K]	0.41	0.38		C1 Hotels
Alpha value* [%]	11.49	11.2		C2 Residential Institutions: Hospitals and Care Homes
* Percentage of the building's average heat transfer coefficient which is due to thermal bridging				C2 Residential Institutions: Residential schools
				C2 Residential Institutions: Universities and colleges
				C2A Secure Residential Institutions
				Residential spaces
				D1 Non-residential Institutions: Community/Day Centre
				D1 Non-residential Institutions: Libraries, Museums, and Galleries
				D1 Non-residential Institutions: Education
				D1 Non-residential Institutions: Primary Health Care Building
				D1 Non-residential Institutions: Crown and County Courts
				D2 General Assembly and Leisure, Night Clubs, and Theatres
				Others: Passenger terminals
				Others: Emergency services
				Others: Miscellaneous 24hr activities
				Others: Car Parks 24 hrs
				Others: Stand alone utility block

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	2.35	1.31
Cooling	12.3	9.08
Auxiliary	4.5	2.7
Lighting	13.81	24.3
Hot water	4.48	3.34
Equipment*	42.19	42.19
TOTAL**	37.44	40.72

* Energy used by equipment does not count towards the total for consumption or calculating emissions.
 ** Total is net of any electrical energy displaced by CHP generators, if applicable.

Energy Production by Technology [kWh/m²]

	Actual	Notional
Photovoltaic systems	0	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0

Energy & CO₂ Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m ²]	98.28	129.12
Primary energy* [kWh/m ²]	106.64	115.97
Total emissions [kg/m ²]	18.1	19.6

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

HVAC Systems Performance									
System Type	Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Split or multi-split system, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity									
Actual	19.7	78.6	2.4	12.3	4.5	2.33	1.78	2.5	2.5
Notional	11.5	117.6	1.3	9.1	2.7	2.43	3.6	----	----

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

Key Features

The Building Control Body is advised to give particular attention to items whose specifications are better than typically expected.

Building fabric

Element	U _{i-Typ}	U _{i-Min}	Surface where the minimum value occurs*
Wall	0.23	0.24	01 Lower Ground Floor - Offices 1_W_7
Floor	0.2	0.14	01 Lower Ground Floor - Offices 1_S_3
Roof	0.15	0.14	01 Lower Ground Floor - Offices_R_5
Windows, roof windows, and rooflights	1.5	1.4	01 Lower Ground Floor - Offices 1_G_8
Personnel doors	1.5	-	"No external personnel doors"
Vehicle access & similar large doors	1.5	-	"No external vehicle access doors"
High usage entrance doors	1.5	-	"No external high usage entrance doors"
U _{i-Typ} = Typical individual element U-values [W/(m²K)]			U _{i-Min} = Minimum individual element U-values [W/(m²K)]
* There might be more than one surface where the minimum U-value occurs.			

Air Permeability	Typical value	This building
m³/(h.m²) at 50 Pa	5	5

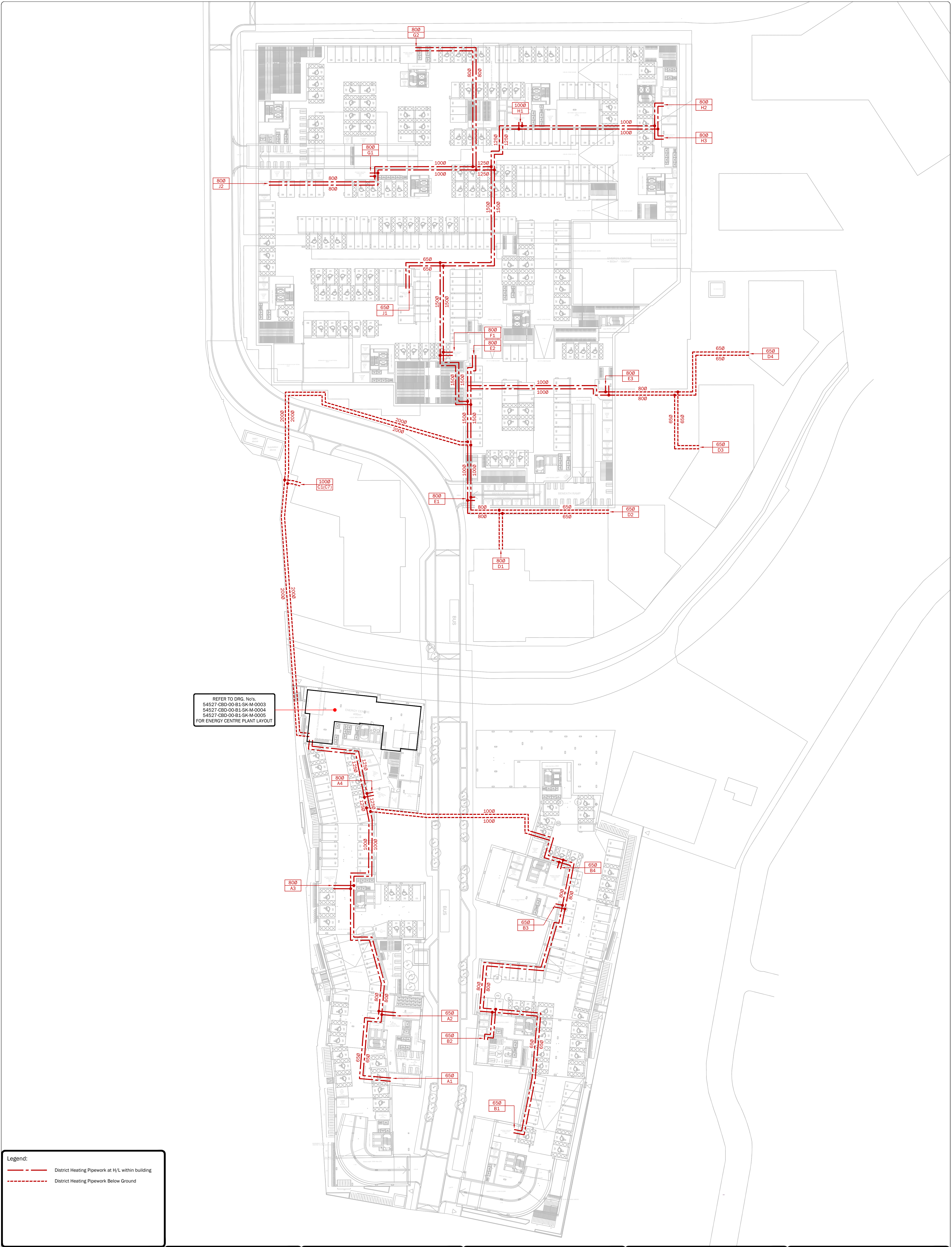
Appendix E

DER Worksheets – *Be Lean*

Included in
Appendix C

Appendix F

Indicative Heat Network Layout



Appendix G

Summary CO₂ Emissions Rates – *Be Clean*

CO₂ Emissions at Be Clean Stage

Unit Type Description	Unit Floor Area	Individual		Number of Units	Total			Emissions Rate Improvement
		Dwelling Emissions Rate	Target Emissions Rate		Total Floor Area	Dwelling Emissions Rate	Target Emissions Rate	
Domestic	m ²	kg CO ₂ /m ² /year	kg CO ₂ /m ² /year		m ²	kg CO ₂ /year	kg CO ₂ /year	-
Flat Type T27 - MID 03rd Floor - 2B3P	73	7.3	14.6	75	5,445	39,694	79,388	50.0%
Flat Type T43 - MID 03rd Floor - 2B3P	63	8.1	15.9	77	4,873	39,565	77,376	48.9%
Flat Type T22 - TOP 13th Floor - 1B2P	50	9.4	19.7	30	1,509	14,154	29,697	52.3%
Flat Type T25 - MID 03rd Floor - 1B-MAN	39	8.4	17.4	24	940	7,889	16,362	51.8%
Flat Type T27 - HLF 02nd Floor - 2B3P	73	8.6	17.3	42	3,049	26,223	52,782	50.3%
Flat Type T33 - MID 03rd Floor - 1B2P	51	8.5	16.8	89	4,503	38,046	75,417	49.6%
Flat Type T39 - TOP 07th Floor - 2B3P	63	8.8	17.5	38	2,397	21,019	41,942	49.9%
			Subtotal	375	22,715	186,591	372,963	50.0%
Non-Domestic								
Café	1,050	59.0	80.0	1	1,050	61,938	83,984	26.3%
Office	1,050	17.6	19.6	1	1,050	18,477	20,576	10.2%
			Subtotal		2,100	80,415	104,561	23.1%
Total for All Units					24,815	267,006	477,524	44.1%

CO₂ Emissions at Be Clean Stage

Unit Type Description	Unit Floor Area	Individual		Number of Units	Total			Emissions Rate Improvement
		Dwelling Emissions Rate	Target Emissions Rate		Total Floor Area	Dwelling Emissions Rate	Target Emissions Rate	
Domestic	m ²	kg CO ₂ /m ² /year	kg CO ₂ /m ² /year		m ²	kg CO ₂ /year	kg CO ₂ /year	-
Flat Type T27 - MID 03rd Floor - 2B3P	73	7.3	14.6	95	6,897	50,279	100,558	50.0%
Flat Type T43 - MID 03rd Floor - 2B3P	63	8.1	15.9	95	6,012	48,814	95,464	48.9%
Flat Type T22 - TOP 13th Floor - 1B2P	50	9.4	19.7	25	1,258	11,795	24,748	52.3%
Flat Type T25 - MID 03rd Floor - 1B-MAN	39	8.4	17.4	20	784	6,574	13,635	51.8%
Flat Type T27 - HLF 02nd Floor - 2B3P	73	8.6	17.3	25	1,815	15,609	31,418	50.3%
Flat Type T33 - MID 03rd Floor - 1B2P	51	8.5	16.8	99	5,008	42,321	83,891	49.6%
Flat Type T39 - TOP 07th Floor - 2B3P	63	8.8	17.5	40	2,523	22,125	44,149	49.9%
			Subtotal	399	24,296	197,518	393,862	49.9%
Non-Domestic								
Café	2,996	59.0	80.0	1	2,996	176,755	239,668	26.3%
Office	2,996	17.6	19.6	1	2,996	52,727	58,719	10.2%
			Subtotal		5,992	229,482	298,386	23.1%
Total for All Units					30,288	427,000	692,248	38.3%

Appendix H

DER Worksheets – *Be Clean*

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



Property Reference	Flat Type T27 - MID				Issued on Date	01/06/2022
Assessment Reference	BE CLEAN DLF 1.05		Prop Type Ref	03rd Floor - 2B3P		
Property	Flat Type T27, London , N8					
SAP Rating	87 B	DER	7.29	TER	14.58	
Environmental	94 A	% DER<TER	49.99			
CO ₂ Emissions (t/year)	0.47	DFEE	30.27	TFEE	35.47	
General Requirements Compliance	Pass	% DFEE<TFEE	14.65			
Assessor Details	Mr. Michael Wride, Michael Wride, Tel: 02036 031 600, Michael@hodkinsonconsultancy.com				Assessor ID	R572-0001
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

Mid-floor flat, total floor area 73 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:Mains gas (c)
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 14.58 kgCO₂/m²/yr
Dwelling Carbon Dioxide Emission Rate (DER) 7.29 kgCO₂/m²/yrOK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)35.5 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)30.3 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.24 (max. 0.30)	0.24 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor (no floor)			
Roof (no roof)			
Openings	0.90 (max. 2.00)	0.90 (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:	4.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system:	Community heating scheme	-
Secondary heating system:	None	

5 Cylinder insulation

Hot water storage	Nominal cylinder loss: 0.22 kWh/day
Permitted by DBSCG 0.35	OK
Primary pipework insulated:	No primary pipework

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and TRVsOK

Hot water controls:

No cylinderstat

7 Low energy lights

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

8 Mechanical ventilation

Continuous supply and extract system	
Specific fan power:	0.64
Maximum	1.5
WWR efficiency:	90%
Minimum:	70% OK

9 Summertime temperature

Overheating risk (Thames Valley):	Slight	OK
Based on:		
Overshading:	Average	
Windows facing South West:	8.26 m ² , No overhang	
Windows facing North West:	7.44 m ² , No overhang	
Air change rate:	4.00 ach	
Blinds/curtains:	None	

10 Key features

Party wall U-value	0.00 W/m ² K
Party wall U-value	0.00 W/m ² K
Window U-value	0.90 W/m ² K
Community CHP, Mains gas	

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												

Ground floor	Area		Storey height		Volume							
	(m2)		(m)		(m3)							
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6000		(1b) x (2b) =		181.5000 (1b) - (3b)		(4)					
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =		181.5000 (5)							

2. Ventilation rate												

Number of chimneys	main heating		secondary heating		other		total		m3 per hour			
Number of open flues	0		0		0		0		0 * 40 = 0.0000 (6a)			
Number of intermittent fans	0		0		0		0		0 * 20 = 0.0000 (6b)			
Number of passive vents									0 * 10 = 0.0000 (7b)			
Number of fuelless 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 AFS0									Yes			
Infiltration rate									4.0000			
Number of sides sheltered									0.2000 (18)			
									2 (19)			
Shelter factor									(20) = 1 - [0.075 x (19)] =			
Infiltration rate adjusted to include shelter factor									(21) = (18) x (20) =			
									0.8500 (20)			
									0.1700 (21)			
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Adj infiltr rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
	0.2168	0.2125	0.2083	0.1870	0.1828	0.1615	0.1615	0.1573	0.1700	0.1828	0.1913	0.1998 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4th) =												
Effective ac	0.3343	0.3300	0.3258	0.3045	0.3003	0.2790	0.2790	0.2748	0.2875	0.3003	0.3088	0.3173 (25)

3. Heat losses and heat loss parameter												

Element	Gross		Openings		NetArea		U-value		A x U		K-value	
	m2		m2		m2		W/m2K		W/K		kJ/m2K	
Opening Type 1 (Uw = 0.90)												
External Wall	51.2700		15.7000		15.7000		0.8687		13.6390		279 (27a)	
Total net area of external elements Aum(A, m2)												
Fabric heat loss, W/K = Sum (A x U)												
Wall to Corridor												
Party Wall												
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K											250.0000 (35)	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)											7.4006 (36)	
Total fabric heat loss											(33) + (36) =	
											29.5764 (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	20.0199	19.7654	19.5108	18.2380	17.9835	16.7107	16.7107	16.4562	17.2198	17.9835	18.4926	19.0017 (38)
Average = Sum(39)m / 12 =	49.5963	49.3417	49.0872	47.8144	47.5599	46.2871	46.2871	46.0325	46.7962	47.5599	48.0690	48.5781 (39)
HLP	0.6831	0.6796	0.6761	0.6586	0.6551	0.6376	0.6376	0.6341	0.6446	0.6551	0.6621	0.6691 (40)
HLP (average)	0.6831	0.6796	0.6761	0.6586	0.6551	0.6376	0.6376	0.6341	0.6446	0.6551	0.6621	0.6691 (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											2.3076 (42)	
Average daily hot water use (litres/day)											93.6889 (43)	
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	103.0578	99.3102	95.5627	91.8151	88.0676	84.3200	84.3200	88.0676	91.8151	95.5627	99.3102	103.0578 (44)
Energy content (annual)	152.8317	133.6676	137.9330	120.2533	115.3859	99.5693	92.2656	105.8761	107.1406	124.8620	136.2967	148.0094 (45)
Distribution loss (46)m = 0.15 x (45)m	22.9248	20.0501	20.6899	18.0380	17.3079	14.9354	13.8398	15.8814	16.0711	18.7293	20.4445	22.2014 (46)
Water storage loss:												
Store volume	3.0000 (47)											



FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

b) If manufacturer declared loss factor is not known : Hot water storage loss factor from Table 2a (kWh/litre/day) Volume factor from Table 2a Temperature factor from Table 2b Enter (49) or (54) in (55) Total storage loss													0.0212 (51) 3.4200 (52) 1.0000 (53) 0.2173 (55)
If cylinder contains dedicated solar storage													6.7353 (56)
Primary loss													6.7353 (57)
Total heat required for water heating calculated for each month													178.0071 (62)
Solar input													0.0000 (63)
Output from w/h													178.0071 (64)
Heat gains from water heating, kWh/month													1827.2899 (64)
													73.2113 (65)

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

Metabolic gains (Table 5), Watts													
(66m)													
Lighting gains (calculated in Appendix L, equation L19 or L19a), also see Table 5													
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
Pumps, fans, etc.													
Losses e.g. evaporation (negative values) (Table 5)													
Water heating gains (Table 5)													
Total internal gains													

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
Southwest			8.2600		36.7938		0.4000		0.8000		0.7700		67.3966 (79)
Northwest			7.4600		11.2829		0.4000		0.8000		0.7700		18.6157 (81)

Solar gains													
Total gains													

7. Mean internal temperature (heating season)													

Temperature during heating periods in the living area from Table 9, Th1 (C)													
Utilisation factor for gains for living area, nil, n (see Table 9a)													

tau	101.6541	102.1785	102.7084	105.4424	106.0067	108.9216	108.9216	109.5240	107.7366	106.0067	104.8840	103.7848	
alpha	7.7679	7.8119	7.8472	8.0295	8.0671	8.2614	8.2614	8.3016	8.1824	8.0671	7.9923	7.9190	
util living area	0.9950	0.9855	0.9515	0.8303	0.6328	0.4352	0.3138	0.3488	0.5742	0.8844	0.9846	0.9964 (86)	
MIT	20.4840	20.6153	20.7872	20.9458	20.9938	20.9998	21.0000	21.0000	20.9978	20.9261	20.6879	20.4672 (87)	
Th 2	20.3557	20.3589	20.3620	20.3775	20.3807	20.3963	20.3963	20.3994	20.3900	20.3807	20.3744	20.3682 (88)	
util rest of house	0.9935	0.9815	0.9394	0.8004	0.5928	0.3943	0.2708	0.3033	0.5246	0.8545	0.9797	0.9954 (89)	
MIT 2	19.6647	19.8566	20.1004	20.3196	20.3752	20.3962	20.3963	20.3994	20.3885	20.3025	19.9752	19.9947 (90)	
Living area fraction	20.0355	20.2000	20.1142	20.6030	20.6552	20.6694	20.6695	20.6712	20.6643	20.5848	20.2978	20.2021 (92)	
MIT	20.0355	20.2000	20.1142	20.6030	20.6552	20.6694	20.6695	20.6712	20.6643	20.5848	20.2978	20.2021 (93)	
adjusted MIT	20.0355	20.2000	20.1142	20.6030	20.6552	20.6694	20.6695	20.6712	20.6643	20.5848	20.2978	20.2021 (93)	

8. Space heating requirement													

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	462.1925	519.7608	554.9137	528.2390	422.6044	280.8222	188.3624	196.6048	306.1579	432.8810	445.7831	439.4669 (94)	
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.4000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)	
Heat loss rate W	780.6647	754.9281	682.8639	559.5734	425.9079	280.9328	188.3673	196.6163	307.1847	474.8736	634.4055	768.5122 (97)	
Month factor	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	236.7648	158.0325	95.1949	22.5608	2.4578	0.0000	0.0000	0.0000	0.0000	31.2425	135.0874	244.7874 (98)	
Space heating per m2										(98) / (4) =		12.7665 (99)	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement
Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)
Fraction of space heat from community system
Fraction of heat from community Boilers
Fraction of heat from community Combined Heat and Power
Fraction of total space heat from community Boilers
Fraction of total space heat from community Combined Heat and Power
Factor for control and charging method (Table 4c(3)) for community space heating
Factor for control and charging method (Table 4c(3)) for community water heating
Distribution loss factor (Table 12c) for community heating system
Space heating:
Annual space heating requirement
Space heat from Boilers = (98) x 0.25 x 1.00 x 1.05
Space heat from Combined Heat and Power = (98) x 0.75 x 1.00 x 1.05
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)
Space heating fuel for secondary/supplementary system
Water heating
Annual water heating requirement
Water heat from Boilers = (64) x 0.25 x 1.00 x 1.05
Water heat from Combined Heat and Power = (64) x 0.75 x 1.00 x 1.05
Electricity used for heat distribution
Annual totals kWh/year
Electricity for pumps and fans:
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.8000)
mechanical ventilation fans (SFP 0.8000)
Total electricity for the above, kWh/year
Electricity for lighting (calculated in Appendix L)
Total delivered energy for all uses

0.0000 (301)
1.0000 (302)
0.2500 (303a)
0.7500 (303b)
0.2500 (304a)
0.7500 (304b)
1.0000 (305)
1.0000 (305a)
1.0500 (306)
926.8481 (98)
243.2976 (307a)
729.8929 (307b)
0.0000 (308)
0.0000 (309)
1827.2899 (64)
479.6636 (310a)
1438.9908 (310b)
28.9184 (313)
177.1440 (330a)
177.1440 (331)
320.3886 (332)
3389.3774 (338)

12b. Carbon dioxide emissions - Community heating scheme

Energy kWh/year
Emission factor kg CO2/kWh
Emissions kg CO2/year
Efficiency of heat source Boilers
Space heating from Boilers
Electrical efficiency of CHP unit
Heat efficiency of CHP unit
Space heating from Combined Heat and Power
less credit emissions for electricity
Water heating from Combined Heat and Power
less credit emissions for electricity
Electrical energy for heat distribution
Total CO2 associated with community systems
(negative value allowed since DFEE <= TFEE)
Space and water heating
Pumps and fans
Energy for lighting
Total CO2, kg/year
Dwelling Carbon Dioxide Emission Rate (DER)

95.0000 (367a)
164.3786 (367)
38.3000 (361)
40.6000 (362)
388.3174 (363)
-357.3545 (364)
3544.3122 (365)
-704.5278 (366)
15.0087 (372)
271.3938 (373)
271.3938 (376)
91.9377 (378)
166.2817 (379)
529.6132 (383)
7.2900 (384)

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

DER
Total Floor Area
Assumed number of occupants
CO2 emission factor in Table 12 for electricity displaced from grid
CO2 emissions from appliances, equation (L14)
CO2 emissions from cooking, equation (L16)
Total CO2 emissions
Residual CO2 emissions offset from biofuel CHP
Additional allowable electricity generation, kWh/m²/year
Resulting CO2 emissions offset from additional allowable electricity generation
Net CO2 emissions

7.2900 EC1
72.6000
2.3076
0.5190
16.5928 EC2
2.4019 EC3
26.2848 EC4
0.0000 EC5
0.0000 EC6
0.0000 EC7
26.2848 EC8

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

Ground floor
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)
Dwelling volume
Storey height (m)
Volume (m3)
(3a)+(3b)+(3c)+(3d)+(3e)...(3n)

2. Ventilation rate

Number of chimneys
Number of open flues
Number of intermittent fans
Number of passive vents
Number of flueless gas fires
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =
Pressure test
Measured/design APS0
Infiltration rate
Number of sides sheltered
Shelter factor
Infiltration rate adjusted to include shelter factor
Air changes per hour
Yes
5.0000
0.4153 (18)
2 (19)
(20) = 1 - (0.075 x (19)) = 0.8500 (20)
(21) = (18) x (20) = 0.3530 (21)

Wind speed Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
Wind factor 5.1000 5.0000 4.9000 4.4000 4.3000 3.8000 3.8000 3.7000 4.0000 4.3000 4.5000 4.7000 (22)
Adj infiltr rate 1.2750 1.2500 1.2250 1.1000 1.0750 0.9500 0.9500 0.9250 1.0000 1.0750 1.1250 1.1750 (22a)
Effective ac 0.4501 0.4412 0.4324 0.3883 0.3795 0.3353 0.3353 0.3265 0.3530 0.3795 0.3971 0.4148 (22b)
0.6013 0.5973 0.5935 0.5754 0.5720 0.5562 0.5562 0.5533 0.5623 0.5720 0.5789 0.5860 (25)

3. Heat losses and heat loss parameter

Element Gross m2 Openings m2 NetArea m2 U-value W/m2K A x U W/K F-value kJ/m2K A x K kJ/K
TER Opening Type (Uw = 1.40)
External Wall
Total net area of external elements Aum(A, m2)
Fabric heat loss, W/K = Sum (A x U)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K
Thermal bridges (Sum(L x Psi) calculated using Appendix K)
Total fabric heat loss
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)
Heat transfer coeff
Average = Sum(39)m / 12 =
HLP (average)
Days in month

4. Water heating energy requirements (kWh/year)

Assumed occupancy
Average daily hot water use (litres/day)
Daily hot water use
Energy conte
Energy content (annual)
Distribution loss (46)m = 0.15 x (45)m
Water storage loss:
Store volume
a) If manufacturer declared loss factor is known (kWh/day):
Temperature factor from Table 2b
Enter (49) or (54) in (55)
Total storage loss
If cylinder contains dedicated solar storage

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	4.3553	9.3038	3.3553	4.2148	4.3553	4.2148	4.3553	4.3553	4.2148	4.3553	4.2148	4.3553	(57)
Primary loss	23.6264	21.0112	23.6264	22.5120	23.6264	22.5120	23.6264	23.6264	22.5120	23.6264	22.5120	23.6264	(59)
Total heat required for water heating calculated for each month	172.8078	151.9292	158.6540	140.9674	172.8078	172.8078	172.8078	172.8078	151.9292	172.8078	151.9292	172.8078	(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)
Output from w/h	172.8078	151.9292	158.6540	140.9674	172.8078	172.8078	172.8078	172.8078	151.9292	172.8078	151.9292	172.8078	(64)
Heat gains from water heating, kWh/month	70.3699	62.1783	65.6637	59.3664	58.5417	52.8329	51.2385	55.5378	55.2245	61.5349	64.4341	68.8466	(65)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66m)	115.3778	115.3778	115.3778	115.3778	115.3778	115.3778	115.3778	115.3778	115.3778	115.3778	115.3778	115.3778 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.1417	16.1133	13.1042	9.9207	7.4159	6.2608	6.7650	8.7934	11.8025	14.9860	17.4909	18.6459 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	203.2876	205.3917	200.0813	188.7665	174.4790	161.0527	152.0832	149.9377	155.2895	166.6035	180.8918	194.3180 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5378	34.5378	34.5378	34.5378	34.5378	34.5378	34.5378	34.5378	34.5378	34.5378	34.5378	34.5378 (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)	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022 (71)
Water heating gains (Table 5)	94.5831	92.5272	88.2577	82.4534	78.6850	73.3159	68.8690	74.6475	76.7006	82.7082	89.4891	92.5357 (72)
Total internal gains	376.2528	374.6509	362.0565	341.7520	321.1933	301.3050	288.3305	294.0279	304.4060	324.9139	348.4878	366.1131 (73)

[Jan]		Area m ²	Solar flux Table 6a W/m ²	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W					

Southwest		8.2600	36.7938	0.6300	0.7000	0.7700	92.8810 (79)					
Northwest		7.4400	11.2829	0.6300	0.7000	0.7700	25.6547 (81)					

Solar gains	118.5357	210.4316	310.5563	422.7332	508.1252	519.6828	494.6908	349.0367	238.6746	143.5303	100.4370 (84)	
Total gains	495.1616	585.0826	672.6128	764.4851	829.3185	820.9887	783.0213	722.6837	653.4427	653.5885	492.0181	166.3558 (83)

Temperature during heating periods in the living area from Table 9, Th (C)												21.0000 (85)
Utilisation factor for gains for living area, nL,m (see Table 9)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	74.4259	76.5013	87.882	77.3151	77.3151	77.3151	76.8862	76.2112	75.7412	75.2561		
alpha	5.9495	5.9668	5.9838	6.0652	6.0807	6.1543	6.1543	6.1682	6.1257	6.0807	6.0494	6.017
util living area	0.9959	0.9885	0.9641	0.8786	0.7064	0.5044	0.3659	0.4129	0.6682	0.9289	0.9896	0.9971 (86)
MIT	20.1372	20.3114	20.5360	20.8226	20.9603	20.9956	20.9995	20.9990	20.9786	20.7776	20.4078	20.1089 (87)
Th 2	20.1375	20.1403	20.1430	20.1356	20.1590	20.1690	20.1690	20.1711	20.1668	20.1580	20.1532	20.1482 (88)
util rest of house	0.9946	0.9850	0.9535	0.8683	0.6533	0.4407	0.2971	0.3391	0.5969	0.9031	0.9858	0.9961 (89)
MIT	18.9880	19.2425	19.5927	19.9608	20.1229	20.1664	20.1696	20.1707	20.1498	20.9532	20.9537	20.9550 (90)
Living area fraction									F _{LA} = Living area / (			0.4526 (91)
MIT	19.5081	19.7263	20.0287	20.3509	20.5019	20.5417	20.5448	20.5456	20.5248	20.3047	19.8527	19.4773 (92)
Temperature adjustment									20.5248	20.3047	19.8527	19.4773 (93)
Adjusted MIT	19.5081	19.7263	20.0287	20.3509	20.5019	20.5417	20.5448	20.5456	20.5248	20.3047	19.8527	19.4773 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilization	0.9934	0.9829	0.9519	0.8558	0.6756	0.4695	0.3283	0.3725	0.6285	0.9082	0.9841	0.9952 (94)
Heat inputs #1	491.892	575.085	680.512	654.274	560.286	385.432	257.053	269.2183	410.6561	511.8408	484.2173	464.2941 (95)
Unit loss rate	4.3000	4.9500	6.4000	8.9000	11.7000	14.6000	16.6000	16.1000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate per m2	1032.7510	1003.3000	912.9921	759.8436	582.2788	387.4548	257.2382	269.6046	421.2953	642.0036	848.8761	1023.4804 (97)
Month factor	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (98)
Space heating km.	402.3989	287.7806	202.4728	76.0113	16.3622	0.0000	0.0000	0.0000	0.0000	96.8411	262.5543	416.0346 (99)
Space heating per m2												1765.4559 (99)
										(98) / (4)		24.2487 (99)

Not applicable

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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	1882.8405 (211)

[illegible]

Water heating															
Water heating requirement															
Efficiency of water heater	171.8078	151.9292	158.6540	140.9674	137.2343	121.3176	115.2700	128.2000	128.5103	146.2366	156.2086	168.2266	(64)		
(217)M	86.9956	86.4928	85.4654	83.2480	80.8179	79.8000	79.8000	79.8000	79.8000	83.7446	86.1891	87.1359	(217)		
Fuel for water heating, kWh/year	198.6350	175.6552	185.6353	169.3343	169.8068	152.0271	144.4486	160.6516	161.0405	174.6221	181.2395	193.0622	(19)		
Annual totals kWh/year												2066.1305	(219)		
Water heating fuel - main system															
Space heating fuel - main system												1882.8405	(211)		
Space heating fuel - secondary												0.0000	(215)		
Electricity for pumps and fans:															
central heating pump												30.0000	(230)		
main heating fuel fan												45.0000	(230a)		
Total electricity for the above, kWh/year												75.0000	(231)		
Electricity for lighting (calculated in Appendix L)												320.3886	(232)		
Total delivered energy for all use												4384.3921	(238)		

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1882.8405	0.2160	406.6935 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2066.1630	0.2160	446.2912 (264)
Space and water heating			852.9848 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	320.3886	0.5190	166.2817 (268)
Total CO2, kg/m2/year			1058.1914 (272)
Emissions per m2 for space and water heating			11.7491 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for pumps and fans			2.2904 (272b)
Emissions per m2 for lighting			0.5362 (272c)
Target Carbon Dioxide Emission Rate (TER) = $(11.7491 * 1.00) + 2.2904 + 0.5362$, rounded to 2 d.p.			14.5800 (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 (m2)	Storey height (m)	Volume (m3)
Ground floor	72.6000 (1b)	2.5000 (2b)	181.5000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	181.5000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	0	0	0	0.0000 (6a)
Number of open flues	0	0	0	0	0.0000 (6b)
Number of intermittent fans	0	0	0	0	30.0000 (7a)
Number of passive vents	0	0	0	0	0.0000 (7b)
Number of fuelless gas fires	0	0	0	0	0.0000 (7c)

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =

Pressure test	30.0000 / (5) =	0.1633 (8)
Measured/design AP50		4.0000
Infiltration rate		0.3653 (18)
Number of sides sheltered	2	(19)

Shelter factor (20) = 1 - [0.075 x (19)] = 0.8500 (20)

Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.3105 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.3959	0.3881	0.3804	0.3415	0.3338	0.2950	0.2950	0.2872	0.3105	0.3357	0.3493	0.3648 (22b)
	0.5784	0.5753	0.5723	0.5583	0.5557	0.5435	0.5412	0.5482	0.5588	0.5610	0.5610	0.5666 (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 k2/m2K	A x K kJ/K
Opening Type 1 (Uw = 0.90)			15.7000	0.8687	13.6390		(27)
External Wall	51.2700	15.7000	35.5700	0.2400	8.5368		(29a)
Total net area of external elements Aum(A, m2)	51.2700		51.2700				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		22.1758		(32)
Wall to Corridor			10.8000	0.0000	0.0000		(33)
Party Wall			33.8900	0.0000	0.0000		(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K

Thermal bridges (Sum(L x Psi) calculated using Appendix K)

Total fabric heat loss (33) + (36) = 29.5764 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	34.6410	34.4587	34.2801	33.4410	33.2840	32.5532	32.5532	32.4178	32.8347	32.2840	33.6016	33.9336 (38)
Heat transfer coeff	64.2174	64.0351	63.8565	63.0174	62.8604	62.1296	62.1296	61.9942	62.4111	62.8604	63.1780	63.5100 (39)
Average = Sum(39)m / 12 =												63.0166 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.8845	0.8820	0.8796	0.8680	0.8658	0.8558	0.8558	0.8539	0.8597	0.8658	0.8702	0.8748 (40)
HLP (average)												0.8680 (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 2.3076 (42)
Average daily hot water use (litres/day) 93.6889 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	103.0578	99.3102	95.5627	91.8151	88.0676	84.3200	84.3200	88.0676	91.8151	95.5627	99.3102	103.0578 (44)
Energy conte	152.8317	133.6676	137.9330	120.2533	115.3859	99.5693	92.2656	105.8761	107.1406	124.2656	136.2967	148.0094 (45)
Energy content (annual)												Total = Sum(45)m = 1474.0912 (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	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)



FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Heat gains from water heating, kWh/month
32.4767 28.4044 29.3108 25.5538 24.5195 21.1585 19.6064 22.4987 22.7674 26.5332 28.9630 31.4520 (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	115.3778	115.3778	115.3778	115.3778	115.3778	115.3778	115.3778	115.3778	115.3778	115.3778	115.3778	115.3778 (66)
Lighting gains (calculated in Appendix L, equation 19 or 19a), also see Table 5	18.1417	16.1133	13.1042	9.9207	7.4159	6.2608	6.7650	8.7934	11.8025	14.9860	17.4909	18.6459 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	203.2876	205.3971	200.0813	188.7645	174.4790	161.0527	152.0832	149.9737	155.2895	166.6063	180.8918	194.3180 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5378	34.5378	34.5378	34.5378	34.5378	34.5378	34.5378	34.5378	34.5378	34.5378	34.5378	34.5378 (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)	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022 (71)
Water heating gains (Table 5)	43.6515	42.2684	39.3962	35.4914	32.9563	29.3868	26.3527	30.2401	31.6214	35.6629	40.2264	42.2742 (72)
Total internal gains	322.6942	321.3922	310.1950	291.7900	272.4646	254.3136	242.8142	246.6206	256.3267	274.8685	296.2224	312.8515 (73)

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	PF Specific data or Table 6c	Access factor Table 6d	Gains W
Southwest	8.2600	36.7938	0.4000	0.8000	0.7700	67.3966 (79)
Northwest	7.4400	11.2829	0.4000	0.8000	0.7700	18.6157 (81)

Solar gains	86.0123	152.6941	225.3469	306.7451	368.7077	377.0941	358.9593	311.0427	253.2693	173.1879	104.1490	72.8800 (83)
Total gains	408.7065	474.0863	535.5420	598.5351	641.1722	631.4078	601.7736	557.6633	509.5960	448.0565	400.3714	385.7315 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation factor for gains for living area, nil/m (see Table 9a)	78.5094	78.7329	78.9531	80.0044	80.2042	81.1476	81.1476	81.3248	80.7816	80.2042	79.8010	79.3838
tau	6.2340	6.2489	6.2635	6.3336	6.3469	6.4098	6.4098	6.4217	6.3854	6.3469	6.3201	6.2923
alpha	0.9985	0.9958	0.9861	0.9441	0.8209	0.6173	0.4527	0.5080	0.7823	0.9695	0.9962	0.9989 (86)
util living area	20.0969	20.2399	20.4587	20.7308	20.9205	20.9893	20.9987	20.9974	20.9563	20.7007	20.3466	20.0717 (87)
MIT	20.1807	20.1828	20.1849	20.1948	20.1966	20.2053	20.2053	20.2068	20.2019	20.1966	20.1929	20.1890 (88)
Th 2	0.9980	0.9944	0.9814	0.9262	0.7740	0.5460	0.3718	0.4222	0.7140	0.9561	0.9947	0.9986 (89)
MIT 2	19.3488	19.4930	19.7110	19.9801	20.1450	20.2005	20.2049	20.2061	20.1788	19.9581	19.6082	19.3306 (90)
Living area fraction	19.6874	19.8311	20.0494	20.3199	20.4960	20.5575	20.5642	20.5643	20.5307	20.2942	19.9424	0.4526 (91)
MIT	19.6874	19.8311	20.0494	20.3199	20.4960	20.5575	20.5642	20.5643	20.5307	20.2942	19.9424	19.6660 (92)
Temperature adjustment	19.6874	19.8311	20.0494	20.3199	20.4960	20.5575	20.5642	20.5643	20.5307	20.2942	19.9424	19.6660 (93)
adjusted MIT	19.6874	19.8311	20.0494	20.3199	20.4960	20.5575	20.5642	20.5643	20.5307	20.2942	19.9424	19.6660 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9976	0.9937	0.9805	0.9293	0.7924	0.5781	0.4085	0.4612	0.7436	0.9580	0.9941	0.9983 (94)
Useful gains	407.7289	471.0845	525.1095	556.2318	508.0823	365.0462	245.8187	257.1709	378.9499	429.2478	398.0224	385.0770 (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	988.1410	956.1133	865.2194	719.6519	552.9205	370.1369	246.2936	258.1604	401.3461	609.3828	811.3598	982.2483 (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	431.8266	325.9393	253.0418	117.6625	33.3596	0.0000	0.0000	0.0000	0.0000	134.0204	297.6029	444.2955 (98)
Space heating												2037.7486 (98)
Space heating per m2										(98) / (4) =		28.0682 (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	584.0179	459.7588	471.1561	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9651	0.9865	0.9788	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	563.6502	453.5515	461.1842	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	823.4794	787.1219	736.9254	0.0000	0.0000	0.0000	0.0000 (103)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000 (103a)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	187.0770	248.1764	205.1515	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												640.4049 (104)
Cooled fraction												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)



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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	Storey height		Volume
	(m ²)	(m)		(m ³)
Ground floor	72.6000 (1b)	x	2.5000 (2b)	= 181.5000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6000			(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	181.5000 (5)

	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					3	*	3 * 10 =	30.0000 (7a)				
Number of passive vents							0 * 10 =	0.0000 (7b)				
Number of flueless gas fires							0 * 40 =	0.0000 (7c)				
							Air changes per hour					
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =						30.0000 / (5) =	0.1653 (8)				
Pressure test							tes					
Measured/design AP50								5.0000				
Infiltration rate								0.4153 (18)				
Number of sides sheltered								2 (19)				
Shelter factor					(20) = 1 - [0.075 x (19)] =		0.8500 (20)					
Infiltration rate adjusted to include shelter factor					(21) = (18) x (20) =		0.3530 (21)					
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.0000	5.0000	4.8000	4.8000	4.8000	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 infiltrate ac	0.4501	0.4412	0.4324	0.3883	0.3795	0.3353	0.3353	0.3265	0.3530	0.3795	0.3971	0.4148 (22b)
Effective ac	0.4603	0.4593	0.5935	0.5794	0.5720	0.5562	0.5562	0.5533	0.5623	0.5795	0.5789	0.5866 (22b)

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/m ² K	R-value kJ/m ² K	A x R kJ/K					
TER Opening Type (Uw = 1.40)			15.7000	1.3258	20.8144		(29)					
External Wall	51.2700	15.7000	35.5700	0.1800	6.4026		(31)					
Total net area of external elements Aum(A, m ²)			51.2700				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		27.2170		(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)							4.6770 (36)					
Total fabric heat loss						(33) + (36) =	31.8940 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 36.0137	Feb 35.7782	Mar 35.5473	Apr 34.4628	May 34.2599	Jun 33.3153	Jul 33.3153	Aug 33.1404	Sep 33.6791	Oct 34.2599	Nov 34.6704	Dec 35.0995
Heat transfer coeff	67.9077	67.6722	67.4413	66.3568	66.1539	65.2093	65.2093	65.0344	65.5731	66.1539	66.5644	66.9935
Average = Sum(39)m / 12 =												66.3558
	Jan 0.9354	Feb 0.9321	Mar 0.9289	Apr 0.9140	May 0.9112	Jun 0.8982	Jul 0.8982	Aug 0.8958	Sep 0.9032	Oct 0.9112	Nov 0.9169	Dec 0.9228
HLP (average)												0.9140
Days in month	31	28	31	30	31	30	31	31	30	31	30	31

Assumed occupancy												2.3876	(42)
Average daily hot water use (litres/day)												89.0045	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Usily hot water use	97.9049	94.3447	90.7845	87.2244	83.6642	80.1040	80.1040	83.6642	87.2244	90.7845	94.3447	97.9049	(44)
Energy cost	145.1901	126.9842	131.0363	114.2407	109.6166	94.5908	87.6523	100.5823	101.7836	118.6189	129.4818	140.6089	(45)
Energy content (annual)										Total = Sum(45)m =		1400.3867	(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													
	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	(58)
Heat gains from water heating, kWh/month													
	30.8529	26.9841	27.8452	24.2761	23.2935	20.1005	18.6261	21.3737	21.6290	25.2065	27.5149	29.8794	(59)

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Space cooling	228.1761 (107)
Space cooling per m2	3.1429 (108)
Energy for space heating	27.7001 (99)
Energy for space cooling	3.1429 (108)
Total	30.8431 (109)
Target Fabric Energy Efficiency (TFEE)	35.5 (109)

8c. Space cooling requirement												
Calculated for June, July and August. See Table 10b												
Ext. temp.	Jan 4.9000	Feb 4.9000	Mar 6.5000	Apr 8.9000	May 11.7000	Jun 14.6000	Jul 16.6000	Aug 16.4000	Sep 14.1000	Oct 10.6000	Nov 7.1000	Dec 4.2000
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	612.9674	482.5488	494.2613	0.0000	0.0000	0.0000	0.0000
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9793	0.9921	0.9868	0.0000	0.0000	0.0000	0.0000
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	600.2634	478.7325	487.7286	0.0000	0.0000	0.0000	0.0000
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	988.6722	944.4515	872.8832	0.0000	0.0000	0.0000	0.0000
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
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	279.6543	346.4949	286.5550	0.0000	0.0000	0.0000	0.0000
Space cooling												912.7042
Cooled fraction												1.0000
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
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	69.3136	86.6237	71.6388	0.0000	0.0000	0.0000	0.0000

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															

Ground floor				Area	Storey height			Volume							
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6000			(m2)	x 2.5000 (2b)			= 181.5000 (1b) - (3b)		(4)					
Dwelling volume					(3a)+(3b)+(3c)+(3d)+(3e)...(3n)			= 181.5000 (5)							

2. Ventilation rate															

Number of chimneys				main heating	secondary heating			other		total		m3 per hour			
Number of open flues				0	0			0		= 0 * 40 = 0.0000 (6a)					
Number of intermittent fans				0	0			0		= 0 * 20 = 0.0000 (6b)					
Number of passive vents										= 0 * 10 = 0.0000 (7a)					
Number of fuelless gas fires										= 0 * 10 = 0.0000 (7b)					
										= 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							4.0000								
Number of sides sheltered							0.2000 (18)								
							2 (19)								
Shelter factor							(20) = 1 - [0.075 x (19)] =		0.8500 (20)						
Infiltration rate adjusted to include shelter factor							(21) = (18) x (20) =		0.1700 (21)						
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec				
Wind speed	4.6000	4.3000	4.4000	4.0000	4.0000	3.5000	3.6000	3.8000	3.7000	3.9000	4.3000 (22)				
Wind factor	1.1500	1.0750	1.1000	1.0000	1.0000	0.8750	0.9000	0.9250	0.9750	0.9750	1.0750 (22a)				
Adj infiltr rate	0.1955	0.1828	0.1870	0.1700	0.1700	0.1488	0.1530	0.1615	0.1573	0.1658	0.1658	0.1828 (22b)			
Balanced mechanical ventilation with heat recovery															
If mechanical ventilation:							0.5000 (23a)								
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =							76.5000 (23c)								
Effective ac	0.3130	0.3003	0.3045	0.2875	0.2875	0.2663	0.2705	0.2790	0.2748	0.2833	0.2833	0.3003 (25)			

3. Heat losses and heat loss parameter															

Element	Gross		Openings		NetArea		U-value		A x U		K-value		A x K		
	m2		m2		m2		W/m2K		W/K		kJ/m2K		kJ/K		
Opening Type 1 (Uw = 0.90)															
External Wall	51.2700		15.7000		35.5700		0.8687		13.6390		8.5368		(27)		
Total net area of external elements Aum(A, m2)	51.2700				51.2700								(29a)		
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =		22.1758		(31)				(31)		
Wall to Corridor					10.8000		0.0000		(33)				(32)		
Party Wall					33.8900		0.0000		0.0000				(32)		
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K											250.0000 (35)				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)											7.4006 (36)				
Total fabric heat loss									(33) + (36) =		29.5764 (37)				

Ventilation heat loss calculated monthly (38m) = 0.33 x (25)m x (5)															
(38m)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
	18.7471	17.9835	18.2380	17.2198	17.2198	15.9470	16.2016	16.7107	16.4562	16.9653	16.9653	17.9835 (38)			
Heat transfer coeff	48.3235	47.5599	47.8144	46.7962	46.7962	45.5234	45.7780	46.2871	46.0325	46.5417	46.5417	47.5599 (39)			
Average = Sum(39m) / 12 =													46.7962 (39)		
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec				
HLP	0.6656	0.6551	0.6586	0.6446	0.6446	0.6270	0.6306	0.6376	0.6341	0.6411	0.6411	0.6551 (40)			
HLP (average)													0.6446 (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							2.3076 (42)								
Average daily hot water use (litres/day)							93.6889 (43)								
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec				
Daily hot water use	103.0578	99.3102	95.5627	91.8151	88.0676	84.3200	84.3200	88.0676	91.8151	95.5627	99.3102	103.0578 (44)			
Energy conte	152.8317	133.6676	137.9330	120.2533	115.3859	99.5693	92.2656	105.8761	107.1406	124.8620	136.2967	148.0094 (45)			
Energy content (annual)							Total = Sum(45)m =		1474.0912 (45)						
Distribution loss (46)m = 0.15 x (45)m															
22.9248	20.0501	20.6899	18.0380	17.3079	14.9354	13.8398	15.8814	16.0711	18.7293	20.4445	22.2014 (46)				
Water storage loss:															
Store volume											3.0000 (47)				



FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF HEAT DEMAND 09 Jan 2014

b) If manufacturer declared loss factor is not known : Hot water storage loss factor from Table 2a (kWh/litre/day) Volume factor from Table 2a Temperature factor from Table 2b Enter (49) or (54) in (55) Total storage loss													0.0012 (51) 31.4200 (52) 1.0000 (53) 0.2173 (55)

If cylinder contains dedicated solar storage	6.7353	6.0835	6.7353	6.5180	6.7353	6.5180	6.7353	6.7353	6.5180	6.7353	6.5180	6.7353 (56)	
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	182.8294	160.7623	167.9307	149.2834	145.3836	128.5993	122.2633	135.8738	136.1706	154.8597	165.3267	178.0071 (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)	
Output from w/h	182.8294	160.7623	167.9307	149.2834	145.3836	128.5993	122.2633	135.8738	136.1706	154.8597	165.3267	178.0071 (64)	
RHI water heating demand	Total per year (kWh/year) = Sum(64)n =												1827.2899 (64)
Heat gains from water heating, kWh/month	74.8147	66.1202	69.8609	63.2083	62.3640	56.3308	54.6765	59.2020	58.8483	65.5148	68.5427	73.2113 (65)	
-----													1827 (64)
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 19 or L9a), also see Table 5	138.4534	138.4534	138.4534	138.4534	138.4534	138.4534	138.4534	138.4534	138.4534	138.4534	138.4534	138.4534 (66)	
Appliances gains (calculated in Appendix L, equation 113 or L13a), also see Table 5	45.3543	40.2833	32.7606	24.8019	18.5937	15.6520	16.9125	21.9835	29.5063	37.4650	43.7272	46.6149 (67)	
Cooking gains (calculated in Appendix L, equation 115 or L15a), also see Table 5	51.1529	51.1529	51.1529	51.1529	51.1529	51.1529	51.1529	51.1529	51.1529	51.1529	51.1529	51.1529 (68)	
Pumps, fans	303.4144	305.5629	298.6288	281.7380	260.4165	240.3772	226.9898	223.8413	231.7754	248.6661	269.9877	290.0269 (68)	
Losses e.g. evaporation (negative values) (Table 5)	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022 (71)	
Water heating gains (Table 5)	100.5574	98.3932	93.8990	87.7892	83.8225	78.2372	73.4899	79.5725	81.7337	88.0575	95.1981	98.4022 (72)	
Total internal gains	546.6301	542.5434	522.5924	491.6331	460.0827	431.5705	414.6962	422.7014	440.3194	471.4926	506.2170	532.3480 (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	
Southwest			8.2600		39.1209		0.4000		0.8000		0.7700	71.6593 (79)	
Northeast			7.4400		12.4928		0.4000		0.8000		0.7700	20.6118 (81)	
Solar gains	92.2710	147.3948	219.3352	311.8340	363.5298	399.1581	380.8651	336.3881	273.4049	182.8688	115.4434	80.0559 (83)	
Total gains	638.9011	689.9382	741.9276	803.4672	823.6125	830.7286	795.5612	759.0895	713.7243	654.3615	621.6604	612.4039 (84)	

7. Mean internal temperature (heating season)													
Temperature during heat periods in the living area from Table 9, Thl (C)													21.0000 (85)
Utilisation factor for gains for living area, n1/nm (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	104.3315	106.0607	105.4424	107.7366	107.7366	110.7488	110.1330	108.9216	109.5240	108.3259	108.3259	106.0067	
alpha	0.9554	0.0671	0.0295	0.1824	0.1824	0.3833	0.3422	0.2614	0.3016	0.2217	0.2217	0.0671	
util living area	0.9471	0.9093	0.8055	0.6182	0.4316	0.2521	0.1439	0.1646	0.3482	0.6275	0.8678	0.9550 (86)	
MIT	20.7889	20.8642	20.9524	20.9943	20.9997	21.0000	21.0000	21.0000	21.0000	20.9949	20.9264	20.7766 (87)	
util rest of house	20.3713	20.3807	20.3775	20.3900	20.3900	20.4057	20.4026	20.3963	20.3994	20.3932	20.3923	20.3807 (88)	
MIT 2	0.9352	0.8920	0.7771	0.5845	0.3970	0.2195	0.1095	0.1278	0.3095	0.5867	0.8432	0.9445 (89)	
MIT 2	20.1096	20.2181	20.3259	20.3848	20.3898	20.4057	20.4026	20.3963	20.3994	20.3888	20.3113	20.1015 (90)	
Living area fraction	0.9554	0.0671	0.0295	0.1824	0.1824	0.3833	0.3422	0.2614	0.3016	0.2217	0.2217	0.0671	
MIT 2	20.4171	20.5105	20.6095	20.6607	20.6659	20.6747	20.6730	20.6696	20.6712	20.6631	20.5897	20.4071 (92)	
Temperature adjustment												0.0000	
adjusted MIT	20.4171	20.5105	20.6095	20.6607	20.6659	20.6747	20.6730	20.6696	20.6712	20.6631	20.5897	20.4071 (93)	

8. Space heating requirement													

Utilisation	0.9362	0.8958	0.7880	0.5996	0.4127	0.2343	0.1250	0.1445	0.3271	0.6050	0.8509	0.9450 (94)	
Useful gains	598.1132	618.0558	584.6266	481.7266	339.8718	194.5983	99.4748	109.6796	233.4274	395.8721	528.9191	578.7914 (95)	
Ext temp.	5.4000	5.8000	7.8000	10.3000	13.4000	16.5000	18.5000	18.3000	15.6000	12.1000	8.3000	5.4000 (96)	
Heat loss rate W	725.6788	699.6309	612.4768	484.8394	340.0151	194.5991	99.4748	109.6796	233.4271	398.5427	571.9839	713.7344 (97)	
Month factor	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)	
Space heating kWh	94.8955	54.8178	20.7206	2.2412	0.1067	0.0000	0.0000	0.0000	0.0000	1.9869	30.9543	100.4512 (98)	
Space heating												306.1741 (98)	
RHI space heating demand												306 (98)	

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SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
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1. Overall dwelling dimensions

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	72.6000 (1b)	x 2.5000 (2b)	= 181.5000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 181.5000 (5)

2. Ventilation rate

	main		secondary		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								4.0000			
Number of sides sheltered								0.2000 (18)		2 (19)	
Shelter factor								(20) = 1 - [0.075 x (19)] =		0.8500 (20)	
Infiltration rate adjusted to include shelter factor								(21) = (18) x (20) =		0.1700 (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	4.7000 (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
Adj infiltr rate											1.1750 (22a)
	0.2168	0.2125	0.2083	0.1870	0.1828	0.1615	0.1615	0.1573	0.1700	0.1828	0.1913
Balanced mechanical ventilation with heat recovery											0.1998 (22b)
If mechanical ventilation:											0.5000 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =											76.5000 (23c)
Effective ac	0.3343	0.3300	0.3258	0.3045	0.3003	0.2790	0.2790	0.2748	0.2875	0.3003	0.3088
											0.3173 (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					
Opening Type 1 (Uw = 0.90)			15.7000	0.8687	13.6390		(27)					
External Wall	51.2700	15.7000	35.5700	0.2400	8.5368		(29a)					
Total net area of external elements Aum(A, m2)			31.2700				(30)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		22.1758		(31)					
Wall to Corridor			10.8000	0.0000	0.0000		(32)					
Party Wall			33.8900	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.4006 (36)					
Total fabric heat loss						(33) + (36) =	29.5764 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 20.0199	Feb 19.7654	Mar 19.5108	Apr 18.2380	May 17.9835	Jun 16.7107	Jul 16.7107	Aug 16.4562	Sep 17.2198	Oct 17.9835	Nov 18.4926	Dec 19.0017 (38)
Heat transfer coeff	49.5963	49.3417	49.0872	47.8144	47.5599	46.2871	46.2871	46.0325	46.7962	47.5599	48.0690	48.5781 (39)
Average = Sum(39)m / 12 =												47.7508 (39)
HLP	0.6831	0.6796	0.6761	0.6586	0.6551	0.6376	0.6376	0.6341	0.6446	0.6551	0.6621	0.6691 (40)
HLP (average)												0.6577 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

												2.3076 (42)
Assumed occupancy												93.6889 (43)
Average daily hot water use (litres/day)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	103.0578	99.3102	95.5627	91.8151	88.0676	84.3200	84.3200	88.0676	91.8151	95.5627	99.3102	103.0578 (44)
Energy content (annual)	152.8317	133.6676	137.9330	120.2533	115.3859	99.5693	92.2656	105.8761	107.1406	124.8620	136.2967	148.0094 (45)
Energy content (monthly)												
Distribution loss (46)m = 0.15 x (45)m												1474.0912 (45)
	22.9248	20.0501	20.6899	18.0380	17.3079	14.9354	13.8398	15.8814	16.0711	18.7293	20.4445	22.2014 (46)
Water storage loss:												
Store volume												3.0000 (47)

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b) If manufacturer declared loss factor is not known : Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0212 (51)
Volume factor from Table 2a												3.4200 (52)
Temperature factor from Table 2b												1.0000 (53)
Enter (49) or (54) in (55)												0.2173 (55)
Total storage loss												
	6.7353	6.0835	6.7353	6.5180	6.7353	6.5180	6.7353	6.7353	6.5180	6.7353	6.5180	6.7353 (56)
If cylinder contains dedicated solar storage												
	6.7353	6.0835	6.7353	6.5180	6.7353	6.5180	6.7353	6.7353	6.5180	6.7353	6.5180	6.7353 (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												
	182.8294	160.7623	167.9307	149.2834	145.3836	128.5993	122.2633	135.8738	136.1706	154.8597	165.3267	178.0071 (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												
	182.8294	160.7623	167.9307	149.2834	145.3836	128.5993	122.2633	135.8738	136.1706	154.8597	165.3267	178.0071 (64)
Total per year (kWh/year) = Sum(64)m =												1827.2899 (64)
Heat gains from water heating, kWh/month												
	74.8147	66.1202	69.8609	63.2083	62.3640	56.3308	54.6765	59.2020	58.8483	65.5148	68.5427	73.2113 (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	138.4534	138.4534	138.4534	138.4534	138.4534	138.4534	138.4534	138.4534	138.4534	138.4534	138.4534	138.4534 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	45.3543	40.2833	32.7606	24.8019	18.5397	15.6520	16.9125	21.9835	29.5063	37.4650	43.7272	46.6149 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	303.4144	306.5629	298.6288	281.7380	260.4165	240.3772	226.9898	223.8413	231.7754	248.6661	269.9877	290.0269 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	51.1529	51.1529	51.1529	51.1529	51.1529	51.1529	51.1529	51.1529	51.1529	51.1529	51.1529	51.1529 (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)												
	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022 (71)
Water heating gains (Table 5)												
	100.5574	98.3932	93.8990	87.7892	83.8225	78.2372	73.4899	79.5725	81.7337	88.0575	95.1981	98.4022 (72)
Total internal gains												
	546.6301	542.5434	522.5924	491.6331	460.0827	431.5705	414.6962	422.7014	440.3194	471.4926	506.2170	532.3480 (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
Southwest		8.2600	36.7938	0.4000	0.8000	0.7700	67.3966 (79)
Northwest		7.4400	11.2829	0.4000	0.8000	0.7700	18.6157 (81)
Solar gains	86.0123	152.6941	225.3461	306.7077	358.9593	311.0427	253.2693
Total gains	632.6424	695.2375	747.9393	798.3783	828.7904	808.6646	773.6555
							733.7441
							693.5886
							644.6806
							610.3660
							605.2280 (84)
							72.8800 (83)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, T_{hi} (°C)												21.0000 (85)
Utilisation factor for gains for living area, $n_{li,m}$ (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	101.6541	102.1785	102.7084	105.4424	106.0067	108.9216	108.9216	109.5240	107.7366	106.0067	104.8840	103.7848
alpha	7.7769	7.8119	7.8472	8.0295	8.0671	8.2614	8.2614	8.3016	8.1824	8.0671	7.9923	7.9190
util living area	0.9679	0.9363	0.8638	0.7088	0.5321	0.3663	0.2632	0.2886	0.4651	0.7441	0.9246	0.9740 (86)
MIT	20.6947	20.7970	20.9070	20.9820	20.9981	20.9999	21.0000	21.0000	20.9995	20.9788	20.8526	20.6787 (87)
Th 2	20.3557	20.3589	20.3620	20.3775	20.3963	20.3963	20.3963	20.3994	20.3900	20.3807	20.3744	20.3682 (88)
util rest of house												
	0.9604	0.9231	0.8408	0.6764	0.4972	0.3318	0.2271	0.2509	0.4242	0.7063	0.9075	0.9677 (89)
MIT 2	19.9650	20.1082	20.2550	20.3593	20.3791	20.3963	20.3963	20.3994	20.3897	20.3602	20.1994	19.9534 (90)
Living area fraction	20.2953	20.4199	20.5501	20.6411	20.6593	20.6695	20.6695	20.6713	20.6657	20.6402	20.4950	20.2817 (92)
Temperature adjustment	20.2953	20.4199	20.5501	20.6411	20.6593	20.6695	20.6695	20.6713	20.6657	20.6402	20.4950	20.2817 (93)

8. Space heating requirement

Utilisation	0.9596	0.9245	0.8479	0.6903	0.5130	0.3474	0.2435	0.2680	0.4427	0.7224	0.9110	0.9667 (94)
Useful gains	607.0924	642.7267	634.1537	551.1112	425.1339	280.9100	188.3664	196.6145	307.0326	465.7422	556.0640	585.0990 (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	793.3065	765.7811	689.6803	561.3961	426.1028	280.9395	188.3676	196.6171	307.2515	477.5100	643.8854	781.2177 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	138.5433	82.6926	41.3118	7.4052	0.7208	0.0000	0.0000	0.0000	0.0000	8.7552	63.2314	145.9123 (98)
Space heating												488.5725 (98)
Space heating per m2										(98) / (4) =		6.7296 (99)

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8c. Space cooling requirement	
Not applicable	

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Boilers	0.2500 (303a)
Fraction of heat from community Combined Heat and Power	0.7500 (303b)
Fraction of total space heat from community Boilers	0.2500 (304a)
Fraction of total space heat from community Combined Heat and Power	0.7500 (304b)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.0500 (306)
Space heating:	
Annual space heating requirement	488.5725 (98)
Space heat from Boilers = (98) x 0.25 x 1.00 x 1.05	128.2503 (307a)
Space heat from Combined Heat and Power = (98) x 0.75 x 1.00 x 1.05	384.7508 (307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	1827.2899 (64)
Water heat from Boilers = (64) x 0.25 x 1.00 x 1.05	479.6636 (310a)
Water heat from Combined Heat and Power = (64) x 0.75 x 1.00 x 1.05	1438.9908 (310b)
Electricity used for heat distribution	24.3166 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.8000)	
Mechanical ventilation fans (SFP = 0.8000)	177.1440 (330a)
Total electricity for the above, kWh/year	177.1440 (331)
Electricity for lighting (calculated in Appendix L)	320.3886 (332)
Total delivered energy for all uses	2929.1881 (338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating from Boilers	128.2503	4.2400	5.4378 (340a)
Space heating from Combined Heat and Power	384.7508	2.9700	11.4271 (340b)
Space heating - secondary	0.0000	0.0000	0.0000 (341)
Water heating from Boilers	479.6636	4.2400	20.3377 (342a)
Water heating from Combined Heat and Power	1438.9908	2.9700	42.7380 (342b)
Mechanical ventilation fans	177.1440	13.1900	23.3653 (349)
Pumps and fans for heating	0.0000	0.0000	0.0000 (349)
Energy for lighting	320.3886	13.1900	42.2593 (350)
Additional standing charges			120.0000 (351)
Total energy cost			265.5652 (355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):	
Energy cost factor (ECF)	0.4200 (356)
SAP value	0.9484 (357)
SAP rating (Section 12)	87 (358)
SAP band	B

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Boilers			95.0000 (367a)
Space heating from Boilers	639.9093	0.2160	138.2204 (367)
Electrical efficiency of CHP unit			38.3000 (361)
Heat efficiency of CHP unit			40.6000 (362)
Space heating from Combined Heat and Power	947.6622	0.2160	204.6950 (363)
less credit emissions for electricity	-362.9546	0.5190	-188.3734 (364)
Water heating from Combined Heat and Power	3544.3122	0.2160	765.5714 (365)
less credit emissions for electricity	-1357.4716	0.5190	-704.5278 (366)
Electrical energy for heat distribution	24.3166	0.5190	12.6203 (372)
Total CO2 associated with community systems			228.2060 (373)
(negative value allowed since DFEE <= TFEF)			
Space and water heating	177.1440	0.5190	91.9377 (378)
Pumps and fans	320.3886	0.5190	166.2817 (379)
Energy for lighting			486.4254 (383)
Total kg/year			6.7000 (384)
CO2 emissions per m2			94.4574 (384a)
EI value			94 (385)
EI rating			A
EI band			

Calculation of stars for heating and DHW

Space heating energy efficiency	0.25 x 4.240 x 1.05
0.15 x 2.970 x 1.05	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

= 3.452, stars = 5
Space heating environmental impact 0.25 × 0.216 × 1.05 / 0.9500
0.75 × (0.216 - 0.383 × 0.519) × 1.05 / 0.406
= 0.0931, stars = 5
Water heating energy efficiency
Water heating environmental impact

3.452, stars = 5
0.0931, stars = 5

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 (m2)	Storey height (m)	Volume (m3)
Ground floor	72.6000 (1b)	x 2.5000 (2b)	= 181.5000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 181.5000 (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)				
							Air changes per hour					
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =							0.0000 / 5 =	0.0000 (8)				
Pressure test								Yes				
Measured/design AP50								4.0000				
Infiltration rate								0.2000 (18)				
Number of sides sheltered								2 (19)				
Shelter factor						(20) = 1 -	[0.075 x (19)] =	0.8500 (20)				
Infiltration rate adjusted to include shelter factor							(21) = (18) x (20) =	0.1700 (21)				
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	4.6000	4.3000	4.4000	4.0000	4.0000	3.5000	3.6000	3.8000	3.7000	3.9000	3.9000	4.3000 (22)
Adj infiltr rate	1.1500	1.0750	1.1000	1.0000	1.0000	0.8750	0.9000	0.9500	0.9250	0.9750	0.9750	1.0750 (22a)
	0.1955	0.1828	0.1870	0.1700	0.1700	0.1488	0.1530	0.1615	0.1573	0.1658	0.1658	0.1828 (22b)
Balanced mechanical ventilation with heat recovery												0.5000 (23a)
If mechanical ventilation:												76.5000 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.3130	0.3003	0.3045	0.2875	0.2875	0.2663	0.2705	0.2790	0.2748	0.2833	0.2833	0.3003 (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					
Opening Type 1 (Uw = 0.90)			15.7000	0.8687	13.6390		(27)					
External Wall	51.2700	15.7000	35.5700	0.2400	8.5368		(29a)					
Total net area of external elements Aum(A, m2)			51.2700				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	22.1758		(32)					
Wall to Corridor			10.8000	0.0000	0.0000		(33)					
Party Wall			33.8900	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.4006 (36)					
Total fabric heat loss						(33) + (36) =	29.5764 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 18.7471	Feb 17.9835	Mar 18.2380	Apr 17.2198	May 17.2198	Jun 15.9470	Jul 16.2016	Aug 16.7107	Sep 16.4562	Oct 16.9653	Nov 16.9653	Dec 17.9835 (38)
Heat transfer coeff	48.3235	47.5599	47.8144	46.7962	46.7962	45.5234	45.7780	46.2871	46.0325	46.5417	46.5417	47.5599 (39)
Average = Sum(39)m / 12 =												46.7962 (39)
HLP	Jan 0.6656	Feb 0.6551	Mar 0.6586	Apr 0.6446	May 0.6446	Jun 0.6270	Jul 0.6306	Aug 0.6376	Sep 0.6341	Oct 0.6411	Nov 0.6411	Dec 0.6551 (40)
HLP (average)												0.6446 (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												2.3076 (42)
Average daily hot water use (litres/day)												93.6889 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	103.0578	99.3102	95.5627	91.8151	88.0676	84.3200	84.3200	88.0676	91.8151	95.5627	99.3102	103.0578 (44)
Energy content (annual)	152.8317	133.6676	137.9330	120.2533	115.3859	99.5693	92.2656	105.8761	107.1406	124.8620	136.2967	148.0094 (45)
Energy content (annual)										Total = Sum(45)m =		1474.0912 (45)
Distribution loss (46)m = 0.15 x (45)m												
	22.9248	20.0501	20.6899	18.0380	17.3079	14.9354	13.8398	15.8814	16.0711	18.7293	20.4445	22.2014 (46)
Water storage loss:												
Store volume												3.0000 (47)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



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

b) If manufacturer declared loss factor is not known : Hot water storage loss factor from Table 2 (kWh/litre/day)	0.0212 (51)
Volume factor from Table 2a	3.4200 (52)
Temperature factor from Table 2b	1.0000 (53)
Enter (49) or (54) in (55)	0.2173 (55)
Total storage loss	
6.7353 6.0835 6.7353 6.5180 6.7353 6.5180 6.7353 6.7353 6.5180 6.7353 6.5180 6.7353 (56)	
If cylinder contains dedicated solar storage	
6.7353 6.0835 6.7353 6.5180 6.7353 6.5180 6.7353 6.7353 6.5180 6.7353 6.5180 6.7353 (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	
182.8294 160.7623 167.9307 149.2834 145.3836 128.5993 122.2633 135.8738 136.1706 154.8597 165.3267 178.0071 (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)
Output from w/h	182.8294 160.7623 167.9307 149.2834 145.3836 128.5993 122.2633 135.8738 136.1706 154.8597 165.3267 178.0071 (64)
Heat gains from water heating, kWh/month	74.8147 66.1202 69.8609 63.2083 62.3640 56.3308 54.6765 59.2020 58.8483 65.5148 68.5427 73.2113 (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 138.4534 138.4534 138.4534 138.4534 138.4534 138.4534 138.4534 138.4534 138.4534 138.4534 138.4534 138.4534 (66)	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	
45.3543 40.2833 32.7606 24.8019 18.5397 15.6520 16.9125 21.9835 29.5063 37.4650 43.7272 46.6149 (67)	
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	
303.4144 306.5629 298.6288 281.7380 260.4165 240.3772 226.9898 223.8413 231.7754 248.6661 269.9877 290.0269 (68)	
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	
51.1529 51.1529 51.1529 51.1529 51.1529 51.1529 51.1529 51.1529 51.1529 51.1529 51.1529 51.1529 (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)	
-92.3022 -92.3022 -92.3022 -92.3022 -92.3022 -92.3022 -92.3022 -92.3022 -92.3022 -92.3022 -92.3022 -92.3022 (71)	
Water heating gains (Table 5)	
100.5574 98.3932 93.8990 87.7892 83.8225 78.2372 73.4899 79.5725 81.7337 88.0575 95.1981 98.4022 (72)	
Total internal gains	
546.6301 542.5434 522.5924 491.6331 460.0827 431.5705 414.6962 422.7014 440.3194 471.4926 506.2170 532.3480 (73)	

6. Solar gains	
[Jan]	Area m2 Solar flux Table 6a W/m2 g or Table 6b Specific data or Table 6c PF Access factor Table 6d Gains W
Southwest	8.2600 39.1209 0.4000 0.8000 0.7700 71.6593 (79)
Northwest	7.4400 12.4928 0.4000 0.8000 0.7700 20.6118 (81)
Solar gains	92.2710 147.3948 219.3352 311.8340 363.5298 399.1581 380.8651 336.3881 273.4049 182.8688 115.4434 80.0559 (83)
Total gains	638.9011 689.9382 741.9276 803.4672 823.6125 830.7286 795.5612 759.0895 713.7243 654.3615 621.6604 612.4039 (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 104.3315 106.0067 105.4424 107.7366 107.7366 110.7488 110.1330 108.9216 109.5240 108.3259 108.3259 106.0067 (86)	
alpha 7.9554 8.0671 8.0295 8.1824 8.1824 8.3833 8.3422 8.2614 8.3016 8.2217 8.2217 8.0671 (87)	
util living area	0.9471 0.9093 0.8055 0.6182 0.4316 0.2521 0.1439 0.1646 0.3482 0.6275 0.8678 0.9550 (88)
MIT	20.7889 20.8642 20.9524 20.9943 20.9997 21.0000 21.0000 21.0000 21.0000 20.9949 20.9264 20.7766 (87)
Th 2	20.3713 20.3807 20.3775 20.3900 20.4057 20.4026 20.3994 20.3988 20.3994 20.3932 20.3932 20.3807 (88)
util rest of house	0.9352 0.8920 0.7771 0.5845 0.3970 0.2195 0.1095 0.1278 0.3095 0.5867 0.8423 0.9445 (89)
MIT 2	20.1096 20.2181 20.3259 20.3848 20.3998 20.4057 20.4026 20.3994 20.3988 20.3932 20.3932 20.1015 (90)
Living area fraction	0.9352 0.8920 0.7771 0.5845 0.3970 0.2195 0.1095 0.1278 0.3095 0.5867 0.8423 0.9445 (89)
MIT	20.4171 20.5105 20.6095 20.6607 20.6659 20.6747 20.6730 20.6696 20.6712 20.6631 20.5897 20.4071 (92)
Temperature adjustment	
adjusted MIT	20.4171 20.5105 20.6095 20.6607 20.6659 20.6747 20.6730 20.6696 20.6712 20.6631 20.5897 20.4071 (93)

8. Space heating requirement	
Utilisation	0.9362 0.8958 0.7880 0.5996 0.4127 0.2343 0.1250 0.1445 0.3271 0.6050 0.8509 0.9450 (94)
Useful gains	598.1312 618.0568 584.6266 481.7266 339.8718 194.5983 99.4748 109.6796 233.4274 395.8721 528.9919 578.7194 (95)
Ext. temp.	5.4000 5.8000 7.8000 10.3000 13.4000 16.4000 18.5000 18.3000 15.6000 12.1000 8.3000 5.4000 (96)
Heat loss rate W	725.6788 699.6309 612.4768 484.8394 340.0151 194.5991 99.4748 109.6796 233.4274 395.8721 528.9919 578.7194 (97)
Month fracti	1.0000 1.0000 1.0000 1.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (97a)
Space heating kWh	94.8955 54.8178 20.7206 2.2412 0.1067 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (98)
Space heating	
Space heating per m2	(98) / (4) = 4.2173 (99)



FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



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

8c. Space cooling requirement	
Not applicable	

9b. Energy requirements	
Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Boilers	0.2500 (303a)
Fraction of heat from community Combined Heat and Power	0.7500 (303b)
Fraction of total space heat from community Boilers	0.2500 (304a)
Fraction of total space heat from community Combined Heat and Power	0.7500 (304b)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.0500 (306)
Space heating:	
Annual space heating requirement	306.1741 (98)
Space heat from Boilers = (98) x 0.25 x 1.00 x 1.05	80.3707 (307a)
Space heat from Combined Heat and Power = (98) x 0.75 x 1.00 x 1.05	241.1121 (307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	1438.998 (310a)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	1827.2899 (64)
Water heat from Boilers = (64) x 0.25 x 1.00 x 1.05	479.6636 (310a)
Water heat from Combined Heat and Power = (64) x 0.75 x 1.00 x 1.05	1438.998 (310b)
Electricity used for heat distribution	22.4014 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, GPF = 0.8000)	
Mechanical ventilation fans (SFP = 0.8000)	177.1440 (330a)
Total electricity for the above, kWh/year	177.1440 (331)
Electricity for lighting (calculated in Appendix L)	320.3886 (332)
Total delivered energy for all uses	2737.6697 (338)

10b. Fuel costs - using BDF prices (495)	
Fuel kWh/year Fuel price p/kWh Fuel cost £/year	
Space heating from Boilers	80.3707 4.4300 3.5604 (340a)
Space heating from Combined Heat and Power	241.1121 3.1000 7.4745 (340b)
Space heating - secondary	0.0000 0.0000 0.0000 (341)
Water heating from Boilers	479.6636 4.4300 21.2491 (342a)
Water heating from Combined Heat and Power	1438.9908 3.1000 44.6087 (342b)
Mechanical ventilation fans	177.1440 19.4400 34.4368 (349)
Pumps and fans for heating	0.0000 0.0000 0.0000 (349)
Energy for lighting	320.3886 19.4400 62.2835 (350)
Additional standing charges	95.0000 (351)
Total energy cost	268.6130 (355)

12b. Carbon dioxide emissions - Community heating scheme	
Energy kWh/year Emission factor kg CO2/kWh Emissions kg CO2/year	
Efficiency of heat source Boilers	
Space heating from Boilers	589.5098 0.2160 127.3341 (367a)
Electrical efficiency of CHP unit	
Heat efficiency of CHP unit	0.0000 0.0000 95.0000 (367a)
Space heating from Combined Heat and Power	593.8722 0.2160 128.2764 (363)
less credit emissions for electricity	-227.4530 0.5190 -118.0481 (364)
Water heating from Combined Heat and Power	3544.3122 0.2160 765.5714 (365)
less credit emissions for electricity	-1357.4716 0.5190 -704.5278 (366)
Electrical energy for heat distribution	22.4014 0.5190 11.6263 (372)
Total CO2 associated with community systems (negative value allowed since DFEE < TPEE)	210.2324 (373)
Space and water heating	
Pumps and fans	177.1440 0.5190 91.9377 (378)
Energy for lighting	320.3886 0.5190 166.2817 (379)
Total kg/year	468.4518 (383)

13b. Primary energy - Community heating scheme	
Energy kWh/year Primary energy factor kg CO2/kWh Primary energy kWh/year	
Efficiency of heat source Boilers	
Space heating from Boilers	589.5098 1.2200 719.2019 (367)
Electrical efficiency of CHP unit	
Heat efficiency of CHP unit	0.0000 0.0000 95.0000 (367a)
Space heating from Combined Heat and Power	593.8722 1.2200 724.5241 (363)
less credit emissions for electricity	-227.4530 3.0700 -698.2808 (364)
Water heating from Combined Heat and Power	3544.3122 1.2200 4324.0609 (365)
less credit emissions for electricity	-1357.4716 3.0700 -4167.4378 (366)
Electrical energy for heat distribution	22.4014 3.0700 68.7722 (372)
Total CO2 associated with community systems (negative value allowed since DFEE < TPEE)	970.8405 (373)
Space and water heating	
Pumps and fans	177.1440 3.0700 543.8321 (378)
Energy for lighting	320.3886 3.0700 983.5929 (379)
Primary energy kWh/year	2498.2655 (383)



FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



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

Primary energy kWh/m²/year 34.4114 (384)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating: B 87
Current environmental impact rating: A 94

(For testing purposes):

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

Recommended measures:
(none)

Typical annual savings
Energy efficiency impact

Recommended measures
(none)

Total Savings £0 0.00 kg/m²

Potential energy efficiency rating: B 87
Potential environmental impact rating: A 94

Fuel prices for cost data on this page from database revision number 495 TEST (29 Apr 2022)
Recommendation texts revision number 4.9c (22 Feb 2014)

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

	Current	Potential	Saving
Electricity	£97	£97	£0
Community scheme	£172	£172	£0
Space heating	£140	£140	£0
Water heating	£66	£66	£0
Lighting	£62	£62	£0
Total cost of fuels	£269	£269	£0
Total cost of uses	£268	£268	£0
Delivered energy	38 kWh/m ²	38 kWh/m ²	0 kWh/m ²
Carbon dioxide emissions	0.5 tonnes	0.5 tonnes	0.0 tonnes
CO ₂ emissions per m ²	6 kg/m ²	6 kg/m ²	0 kg/m ²
Primary energy	34 kWh/m ²	34 kWh/m ²	0 kWh/m ²

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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

No improvements selected / applicable

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

No improvements selected / applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



Property Reference	Flat Type T43 - MID				Issued on Date	01/06/2022
Assessment Reference	BE CLEAN DLF 1.05	Prop Type Ref	03rd Floor - 2B3P			
Property	Flat Type T43, London , N8					
SAP Rating	86 B	DER	8.12	TER	15.88	
Environmental	94 A	% DER<TER	48.87			
CO ₂ Emissions (t/year)	0.44	DFEE	32.72	TFEE	38.86	
General Requirements Compliance	Pass	% DFEE<TFEE	15.80			
Assessor Details	Mr. Michael Wride, Michael Wride, Tel: 02036 031 600, Michael@hodkinsonconsultancy.com				Assessor ID	R572-0001
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

Mid-floor flat, total floor area 63 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:Mains gas (c)
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 15.88 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 8.12 kgCO₂/m²OK

1b TFE and DFE
Target Fabric Energy Efficiency (TFEE) 38.9 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 32.7 kWh/m²/yrOK

2 Fabric U-values
Element Average Highest OK
External wall 0.24 (max. 0.30) 0.24 (max. 0.70) OK
Party wall 0.00 (max. 0.20) - OK
Floor 0 (no floor) - OK
Roof 0 (no roof) - OK
Openings 0.90 (max. 2.00) 0.90 (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: 4.00 (design value)
Maximum 10.0 OK

4 Heating efficiency
Main heating system: Community heating scheme -

Secondary heating system: None

5 Cylinder insulation
Hot water storage Nominal cylinder loss: 0.22 kWh/day
Permitted by DBSCG 0.35 OK
Primary pipework insulated: No primary pipework

6 Controls
Space heating controls: Charging system linked to use of community heating, programmer and TRVsOK

Hot water controls: No cylinderstat

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

8 Mechanical ventilation
Continuous supply and extract system
Specific fan power: 0.64
Maximum 1.5 OK
WWR efficiency: 90% OK
Minimum: 70% OK

9 Summertime temperature
Overheating risk (Thames Valley): Slight OK
Based on:
Overshading: Average
Windows facing North East: 8.26 m², No overhang
Windows facing North West: 4.96 m², No overhang
Air change rate: 4.00 ach
Blinds/curtains: None

10 Key Features
Party wall U-value 0.00 W/m²K
Party wall U-value 0.00 W/m²K
Window U-value 0.90 W/m²K
Community CHP, Mains gas

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 (m2)	Storey height (m)	Volume (m3)
Ground floor	63.2800 (1b)	x 2.5000 (2b)	= 158.2000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	63.2800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 158.2000 (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					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of fuelless 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 Aps0 4.0000
Infiltration rate 0.2000 (18)
Number of sides sheltered 2 (19)
Shelter factor (20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.1700 (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 infiltr rate	0.2168	0.2125	0.2083	0.1870	0.1828	0.1615	0.1615	0.1573	0.1700	0.1828	0.1913	0.1998 (22b)
Balanced mechanical ventilation with heat recovery												0.5000 (23a)
If mechanical ventilation:												63.0000 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.4018	0.3975	0.3933	0.3720	0.3678	0.3465	0.3465	0.3423	0.3550	0.3678	0.3763	0.3848 (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
Opening Type 1 (Uw = 0.90)							
External Wall	46.3100	13.2200	33.0900	0.8687	11.4846		(27)
Total net area of external elements Aum(A, m2)			46.3100	0.8400	7.9416		(29a)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	19.4262	(31)
Wall to Corridor				11.0700	0.0000	0.0000	(32)
Party Wall				12.7900	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TPA) in kJ/m2K 250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.6438 (36)
Total fabric heat loss (33) + (36) = 26.0700 (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 20.9738 20.7519 20.5300 19.4206 19.1988 18.0894 18.0894 17.8675 18.5331 19.1988 19.6425 20.0863 (38)
Heat transfer coeff 47.0437 46.8218 46.6000 45.4906 45.2687 44.1593 44.1593 43.9375 44.6031 45.2687 45.7125 46.1562 (39)
Average = Sum(39)m / 12 = 45.4351 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.7434	0.7399	0.7364	0.7189	0.7154	0.6978	0.6978	0.6943	0.7049	0.7154	0.7224	0.7294 (40)
HLP (average)												0.7180 (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 2.0727 (42)
Average daily hot water use (litres/day) 87.8173 (43)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
Daily hot water use 96.5990 93.0864 89.5737 86.0610 82.5483 79.0356 79.0356 82.5483 86.0610 89.5737 93.0864 96.5990 (44)
Energy conte 143.2536 125.2905 129.2886 112.7169 108.1546 93.3292 86.4832 99.2407 100.4260 117.0368 127.7548 138.7335 (45)
Energy content (annual) Total = Sum(45)m = 1381.7084 (45)
Distribution loss (46)m = 0.15 x (45)m
21.4880 18.7936 19.3933 16.9075 16.2232 13.9994 12.9725 14.8861 15.0639 17.5555 19.1632 20.8100 (46)
Water storage loss:
Store volume 3.0000 (47)

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													

										</			



FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Primary loss	4.3553	3.9338	4.3553	4.2148	4.3553	4.2148	4.3553	4.2148	4.3553	4.2148	4.3553	4.2148	4.3553	(57)
Total heat required for water heating calculated for each month	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	(59)
Solar input	163.7086	143.9710	150.4418	133.8079	130.3645	115.3895	109.7767	121.8964	122.1315	138.8026	148.0939	159.4145	159.4145	(62)
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Heat gains from water heating, kWh/month	163.7086	143.9710	150.4418	133.8079	130.3645	115.3895	109.7767	121.8964	122.1315	138.8026	148.0939	159.4145	159.4145	(64)
Total per year (kWh/year) = Sum(64)m =	67.3444	59.5321	62.9332	56.9859	56.2575	50.8618	49.4120	53.4418	53.1035	59.0631	61.7360	65.9166	65.9166	(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	103.6346	103.6346	103.6346	103.6346	103.6346	103.6346	103.6346	103.6346	103.6346	103.6346	103.6346	103.6346	103.6346	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	16.1988	14.3877	11.7008	8.8583	6.6217	5.5903	6.0405	7.8517	10.5385	13.3811	15.6177	16.6491	16.6491	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	181.1369	183.0166	178.2800	168.1963	155.4674	143.5041	135.5118	133.6322	138.3688	148.4525	161.1814	173.1447	168.1369	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.3635	33.3635	33.3635	33.3635	33.3635	33.3635	33.3635	33.3635	33.3635	33.3635	33.3635	33.3635	33.3635	(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	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-82.9077	-82.9077	-82.9077	-82.9077	-82.9077	-82.9077	-82.9077	-82.9077	-82.9077	-82.9077	-82.9077	-82.9077	-82.9077	(71)
Water heating gains (Table 5)	90.5166	88.5895	84.5876	79.1471	75.6149	70.6414	66.4140	71.8304	73.7548	79.3859	85.7444	88.5975	72.7348	(72)
Total internal gains	344.9428	343.0841	331.6588	313.2920	294.7943	276.8261	265.0567	270.4047	279.7526	298.3099	319.6339	335.4817	335.4817	(73)
6. Solar gains														
[Jan]	Area			Solar flux			g			FF			Access	Gains
	m2			Table 6a			Table 6b			Table 6c			Table 6d	
Northeast	8.2600			11.2829			0.6300			0.7000			28.4822 (75)	
Northwest	8.2600			11.2829			0.6300			0.7000			17.1031 (81)	
Solar gains	45.5854	92.7904	167.1787	274.5555	369.0565	393.4532	368.0674	293.4276	203.7099	113.3972	57.3582	37.2273	37.2273	(83)
Total gains	390.5282	435.8745	498.8375	587.8475	663.8508	670.2794	633.1242	563.8323	483.4624	411.7071	376.9921	372.7090	372.7090	(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, nlf, see (Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
tau	75.6689	75.8894	76.1067	77.1443	77.3416	78.2734	78.2734	78.4485	77.9118	77.3416	76.9435	76.5317		
alpha	0.0446	0.0593	6.0738	6.1430	6.1561	6.2182	6.2182	6.2299	6.1941	6.1561	6.1296	6.1021		
util living area	0.9976	0.9947	0.9821	0.9185	0.7464	0.5309	0.3985	0.4551	0.7531	0.9645	0.9945	0.9981	(86)	
MIT	20.1008	20.2267	20.4612	20.7678	20.9488	20.9946	20.9993	20.9983	20.9610	20.6985	20.3489	20.0798	(87)	
Th 2	20.1524	20.1547	20.1569	20.1673	20.1693	20.1784	20.1784	20.1801	20.1749	20.1693	20.1653	20.1612	(88)	
util rest of house	0.9968	0.9929	0.9763	0.8948	0.6943	0.4650	0.3171	0.3750	0.6620	0.9492	0.9924	0.9975	(89)	
MIT 2	18.9464	19.1316	19.4718	19.9036	20.1230	20.1750	20.1781	20.1794	20.1454	19.8209	19.3184	18.9225	(90)	
Living area fraction	0.9959	0.9959	0.9959	0.9959	0.9959	0.9959	0.9959	0.9959	0.9959	0.9959	0.9959	0.9959	(91)	
MIT fracti	19.4519	19.6111	19.9051	20.2800	20.4847	20.5339	20.5377	20.5380	20.5025	20.2052	19.7696	19.4292	(92)	
Temperature adjustment	19.4519	19.6111	19.9051	20.2800	20.4847	20.5339	20.5377	20.5380	20.5025	20.2052	19.7696	19.4292	(93)	
adjusted MIT	19.4519	19.6111	19.9051	20.2800	20.4847	20.5339	20.5377	20.5380	20.5025	20.2052	19.7696	19.4292	(93)	
8. Space heating requirement														
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
Utilisation	0.9959	0.9915	0.9742	0.8984	0.7148	0.4938	0.3489	0.4102	0.7116	0.9500	0.9911	0.9968	(94)	
Useful gains	388.9221	432.1709	485.9591	528.1405	474.5364	330.5954	220.8658	231.2605	344.0289	391.1344	373.6411	371.5312	(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	4.4000	(96)	
Heat loss rate W	879.3935	851.8616	774.0168	648.3652	499.1326	333.1419	221.0732	231.7986	361.1213	545.7555	723.5962	874.4618	(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	(98)	
Space heating kWh	365.3139	282.0321	214.3150	86.5618	18.2995	0.0000	0.0000	0.0000	0.0000	115.0381	251.9677	374.1804	(98)	
Space heating													(98) / (4) =	
Space heating per m2													26.9866 (99)	
8c. Space cooling requirement														
Not applicable														
9a. Energy requirements - Individual heating systems, including micro-CHP														

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Fraction of space heat from secondary/supplementary system (Table 1)								
Fraction of space heat from main system(s)								
Efficiency of main space heating system 1 (in %)								
Efficiency of secondary/supplementary heating system, %								
Space heating requirement								
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
Space heating requirement								
	365.3169	282.0321	214.3150	86.5618	18.2995	0.0000	0.0000	0.0000
Space heating efficiency (main heating system 1)								
	93.7350	93.7350	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000
Space heating fuel (main heating system)								
	390.7133	301.6386	229.2139	92.5794	19.5717	0.0000	0.0000	0.0000
Water heating requirement								
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Water heating requirement								
	163.7086	143.9710	150.4418	133.8079	130.3645	115.3895	109.7767	121.8964
Efficiency of water heater								
	93.7171	86.5768	85.7574	83.6866	80.9785	79.8000	79.8000	79.8000
Fuel for water heating, kWh/month								
	188.3993	166.2929	175.4273	159.8917	160.9865	144.5984	137.5648	152.7523
Annual totals kWh/year								
Space heating fuel - main system								
Space heating fuel - secondary								
Electricity for pumps and fans:								
central heating pump								
main heating flow fan								
Total electricity for the above, kWh/year								
Electricity for lighting (calculated in Appendix L)								
Total delivered energy for all uses								

12a. Carbon dioxide emissions - individual heating systems including micro-CHP	
	Energy
Space heating - main system 1	kWh/year
Space heating - secondary	1826.439595
Water heating (other fuel)	0.0000
Space and water heating	1958.5451
Pumps and fans	75.0000
Energy for lighting	286.0767
Total CO ₂ , kg/m ² /year	
Emissions per m ² for space and water heating	
Fuel factor (mains gas)	
Emissions per m ² for lighting	
Emissions per m ² for pumps and fans	
Target Carbon Dioxide Emission Rate (TER) = (12.9196 * 1.00) + 2.3463 + 0.6151, rounded to 2 d.p.	

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

1. Overall dwelling dimensions				

Ground floor	Area			
	(m ²)			
Ground floor area TPA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	63.2800			
Dwelling volume	63.2800			

2. Ventilation rate				

	main heating		secondary heating	
Number of chimneys	0	+	0	+
Number of open flues	0	+	0	+
Number of intermittent fans				
Number of passive vents				
Number of fuelless gas fires				
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =			
Pressure test				
Measured/design AF50				
Infiltration rate				
Number of sides sheltered				
Shelter factor				
Infiltration rate adjusted to include shelter factor				

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250
Adj infilt rate								
	0.3538	0.3468	0.3399	0.3052	0.2983	0.2636	0.2636	0.2566
Effective ac	0.5626	0.5601	0.5578	0.5466	0.5445	0.5347	0.5347	0.5322

3. Heat losses and heat loss parameter								
Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K				
Opening Type 1 (Uw = 0.90)								
External Wall	46.3100	13.2200	33.0900	0.2400				
Total net area of external elements Aum(A, m2)			46.3100					
Party Wall				0.8687				
Wall to Corridor			11.0700	(26) ... (30) + (32)				
Party Wall			12.7900	0.0000				
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								
Total fabric heat loss								
Ventilation heat loss calculated monthly (38m³ = 0.33 x (25m³ x 5)								
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
(38m³)	29.3697	29.2428	29.1185	28.5345	28.4252	27.9166	27.9166	27.8822
Heat transfer coeff								
	53.4296	55.3128	55.1885	54.6044	54.4952	53.9865	53.9865	53.8922
Average = Sum(39n) / 12 =								

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
HLP	0.8761	0.8741	0.8721	0.8629	0.8612	0.8531	0.8531	0.8511
HLP (average)								
Days in month								
	31	28	31	30	31	30	31	31

[illegible]

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Heat gains from water heating, kWh/month
30.4414 26.6242 27.4738 23.9523 22.9828 19.8324 18.3777 21.0887 21.3405 24.8703 27.1479 29.4809 (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	103.6346	103.6346	103.6346	103.6346	103.6346	103.6346	103.6346	103.6346	103.6346	103.6346	103.6346	103.6346 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	16.1988	14.3877	11.7008	8.8583	6.6217	5.5903	6.0405	7.8517	10.5385	13.3811	15.6177	16.6491 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	181.1369	183.0166	178.2800	168.1963	155.4674	143.5041	135.5118	133.6322	138.3688	148.4525	161.1814	173.1447 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.3635	33.3635	33.3635	33.3635	33.3635	33.3635	33.3635	33.3635	33.3635	33.3635	33.3635	33.3635 (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)	-82.9077	-82.9077	-82.9077	-82.9077	-82.9077	-82.9077	-82.9077	-82.9077	-82.9077	-82.9077	-82.9077	-82.9077 (71)
Water heating gains (Table 5)	40.9158	39.6194	36.9272	33.2671	30.8909	27.5451	24.7012	28.3450	29.6396	33.4278	37.7054	39.6248 (72)
Total internal gains	292.3420	291.1140	280.9984	264.4121	247.0704	230.7298	220.3439	223.9192	232.6373	249.3518	268.5949	283.5090 (73)

6. Solar gains												
[Jan]	Area		Solar flux		g		FF		Access		Gains	
	m2		Table 6a		Specific data		Specific data		factor		W	
	W/m2		or Table 6b		or Table 6c		or Table 6d		Table 6e			
Northeast	8.2600		11.2829		0.4000				0.8000		20.6674 (75)	
Northwest	4.9600		11.2829		0.4000				0.8000		12.4104 (81)	
Solar gains	33.0778	67.3309	121.3088	199.2239	267.7961	285.4990	267.0784	212.9180	147.8167	82.2837	41.6205	27.0130 (83)
Total gains	325.4199	358.4449	402.3072	463.6360	514.8665	516.2288	487.4223	436.8372	380.4540	331.6355	310.2153	310.5220 (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)												
tau	79.2654	79.4472	79.6261	80.4778	80.6391	81.3989	81.3989	81.5412	81.1046	80.6391	80.3134	79.9756
alpha	6.2844	6.2965	6.3084	6.3652	6.3759	6.4266	6.4266	6.4361	6.4070	6.3759	6.3542	6.3317
util living area	0.9991	0.9981	0.9935	0.9662	0.8575	0.6516	0.4849	0.5610	0.8573	0.9861	0.9980	0.9993 (86)
MIT	20.0616	20.1674	20.3738	20.6668	20.8977	20.9857	20.9981	20.9955	20.9252	20.6245	20.2940	20.0413 (87)
Th 2	20.1879	20.1896	20.1913	20.1991	20.2006	20.2075	20.2075	20.2088	20.2049	20.2006	20.1976	20.1945 (88)
util rest of house	0.9988	0.9974	0.9911	0.9541	0.8148	0.5784	0.3989	0.4680	0.7976	0.9793	0.9972	0.9991 (89)
MIT 2	19.3197	19.4267	19.6334	19.9257	20.1321	20.2010	20.2070	20.2075	20.1620	19.8898	19.5600	19.3050 (90)
Living area fraction									fLA = Living area / (4) =			0.4379 (91)
MIT	19.6446	19.7511	19.9576	20.2502	20.4673	20.5446	20.5534	20.5526	20.4962	20.2115	19.8814	19.6274 (92)
Temperature adjustment												0.0000
adjusted MIT	19.6446	19.7511	19.9576	20.2502	20.4673	20.5446	20.5534	20.5526	20.4962	20.2115	19.8814	19.6274 (93)

8. Space heating requirement												
Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	324.9404	357.3517	398.4077	442.7635	427.3686	315.0344	212.8360	222.3071	312.5314	324.8000	309.2270	310.1810 (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	850.6982	821.4536	742.7059	619.7727	477.7782	320.9300	213.4319	223.7912	346.5635	523.7804	699.3519	847.6958 (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	391.1639	311.8765	256.1578	127.4467	37.5048	0.0000	0.0000	0.0000	0.0000	148.0415	280.8899	399.9109 (98)
Space heating												1952.9919 (98)
Space heating per m2										(98) / (4) =		30.8627 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b												
Ext. temp.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	507.4734	399.5003	409.5817	0.0000	0.0000	0.0000	0.0000 (100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.9565	0.9820	0.9680	0.0000	0.0000	0.0000	0.0000 (101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	485.3736	392.3072	396.4944	0.0000	0.0000	0.0000	0.0000 (102)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	680.3688	645.1912	587.2531	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	140.3965	188.1457	141.9245	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												470.4667 (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)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Space cooling kWh
0.0000 0.0000 0.0000 0.0000 0.0000 35.0991 47.0364 35.4811 0.0000 0.0000 0.0000 0.0000 0.0000 (107)
Space cooling
117.6167 (107)
Space cooling per m2
1.8587 (108)
Energy for space heating
30.8627 (99)
Energy for space cooling
1.8587 (108)
Total
32.7214 (109)
Dwelling Fabric Energy Efficiency (DFEE)
32.7 (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		Storey height			Volume	
						(m2)		(m)			(m3)	
Ground floor						63.2800	(1b)	x	2.5000	(2b)	=	158.2000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)												
Dwelling volume										(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	158.2000 (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												2 * 10 = 20.0000 (7a)
Number of passive vents												0 * 10 = 0.0000 (7b)
Number of fuelless gas fires												0 * 40 = 0.0000 (7c)
												Air changes per hour
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =											20.0000 / (5) =	0.1264 (8)
Pressure test												Yes
Measured/design AP50												5.0000
Infiltration rate												0.3764 (18)
Number of sides sheltered												2 (19)
Shelter factor											(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor											(21) = (18) x (20) =	0.3200 (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 infiltr rate	0.4079	0.3999	0.3919	0.3520	0.3440	0.3040	0.3040	0.2960	0.3200	0.3440	0.3600	0.3760 (22b)
Effective ac	0.5832	0.5800	0.5768	0.5619	0.5592	0.5462	0.5462	0.5438	0.5512	0.5592	0.5648	0.5707 (25)

3. Heat losses and heat loss parameter												

Element	Gross		Openings		NetArea		U-value		A x U		K-value	
	m2		m2		m2		W/m2K		W/K		k3/m2K	
TER Open type (Uw = 1.40)					13.2200		1.3258		17.5265		(27)	
External Wall	46.3100		13.2200		33.0900		0.1800		5.9562		(29a)	
Total net area of external elements Aum(A, m2)	46.3100				46.3100						(31)	
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =		23.4827				(33)	
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K											250.0000 (35)	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)											4.1448 (36)	
Total fabric heat loss									(33) + (36) =		27.6275 (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	30.4471	30.2784	30.1131	29.3364	29.1911	28.5147	28.5147	28.3895	28.7753	29.1911	29.4851	29.7924 (38)
Average = Sum(39)m / 12 =	58.0746	57.9059	57.7406	56.9640	56.8186	56.1422	56.1422	56.0170	56.4028	56.8186	57.1126	57.4199 (39)
	58.0746	57.9059	57.7406	56.9640	56.8186	56.1422	56.1422	56.0170	56.4028	56.8186	57.1126	57.4199 (39)
HLP	0.9177	0.9151	0.9125	0.9002	0.8979	0.8872	0.8872	0.8852	0.8913	0.8979	0.9025	0.9074 (40)
HLP (average)												0.9002 (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											2.0727 (42)	
Average daily hot water use (litres/day)											83.4265 (43)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	91.7691	88.4320	85.0950	81.7579	78.4209	75.0838	75.0838	78.4209	81.7579	85.0950	88.4320	91.7691 (44)
Energy conte	136.0909	119.0260	122.8242	107.0811	102.7468	88.6627	82.1590	94.2787	95.4047	111.8530	121.3671	131.7988 (45)
Energy content (annual)											Total = Sum(45)m = 1312.6229 (45)	
Distribution loss (46)m = 0.15 x (45)m												
Water storage loss:											0.0000	
Water storage loss:											0.0000	
Water storage loss:											0.0000	
If cylinder contains dedicated solar storage											0.0000	
Primary loss											0.0000	
Heat gains from water heating, kWh/month	28.9193	25.2930	26.1001	22.7547	21.8337	18.8408	17.4588	20.0342	20.2735	23.6268	25.7905	28.0068 (59)



FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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	103.6346	103.6346	103.6346	103.6346	103.6346	103.6346	103.6346	103.6346	103.6346	103.6346	103.6346	103.6346 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	16.1988	14.3877	11.7008	8.8583	6.6217	5.5903	6.0405	7.8517	10.5385	13.3811	15.6177	16.6491 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	181.1369	183.0166	178.2800	168.1963	155.4674	143.5041	135.5118	133.6322	138.3688	148.4525	161.1814	173.1447 (68)
Pumps, fans	33.3635	33.3635	33.3635	33.3635	33.3635	33.3635	33.3635	33.3635	33.3635	33.3635	33.3635	33.3635 (69)
Losses e.g. evaporation (negative values) (Table 5)	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)
Water heating gains (Table 5)	-82.9077	-82.9077	-82.9077	-82.9077	-82.9077	-82.9077	-82.9077	-82.9077	-82.9077	-82.9077	-82.9077	-82.9077 (71)
Total internal gains	38.8701	37.6384	35.0808	31.6038	29.3464	26.1678	23.4661	26.9277	28.1576	31.7565	35.8201	37.6436 (72)
	290.2962	289.1331	279.1520	262.7487	245.5258	229.3526	219.1089	222.5020	231.1554	247.6804	266.7096	281.5277 (73)
6. Solar gains												
[Jan]	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	Area											
	m2	Solar flux										
		Table 6a										
		W/m2										
Northeast	8.2600	11.2829	0.6300	0.7000	0.7700	0.7700	0.7700	0.7700	0.7700	0.7700	0.7700	0.7700 (75)
Northwest	4.9600	11.2829	0.6300	0.7000	0.7700	0.7700	0.7700	0.7700	0.7700	0.7700	0.7700	0.7700 (81)
Solar gains	45.5854	92.7904	167.1787	274.5555	369.0565	393.4532	368.0674	293.4276	203.7099	113.3972	57.3582	37.2273 (83)
Total gains	335.8816	381.9234	446.3307	537.3042	614.5823	622.8058	587.1763	515.9296	434.8652	361.0776	324.0678	318.7550 (84)
7. Mean internal temperature (heating season)												
Temperature during heating periods in the living area from Table 9, Thl (C)												
Utilisation factor for gains for living area, nil,m (see Table 9a)												
tau	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
alpha	75.6689	75.8894	76.1067	77.1443	78.2734	78.2734	78.2734	78.4485	77.9118	77.3416	76.9435	76.5317
util living area	6.0446	6.0593	6.0738	6.1430	6.1561	6.2182	6.2182	6.2299	6.1941	6.1561	6.1296	6.1021
	0.9989	0.9973	0.9896	0.9426	0.7878	0.5688	0.4196	0.4961	0.8090	0.9807	0.9976	0.9992 (86)
MIT	20.0170	20.1451	20.3864	20.7157	20.9312	20.9921	20.9990	20.9973	20.9418	20.6316	20.2686	19.9967 (87)
Th 2	20.1524	20.1547	20.1569	20.1673	20.1693	20.1784	20.1784	20.1801	20.1749	20.1693	20.1653	20.1612 (88)
util rest of house	0.9986	0.9965	0.9861	0.9240	0.7374	0.4994	0.4095	0.7414	0.9714	0.9966	0.9990 (89)	
MIT 2	19.2455	19.3752	19.6164	19.9413	20.1257	20.1750	20.1781	20.1793	20.1434	19.8691	19.5076	19.2326 (90)
Living area fraction	19.5833	19.7123	19.9536	20.2804	20.4784	20.5328	20.5376	20.5375	20.4930	20.2030	19.8408	19.5672 (91)
Temperature adjustment												0.0000
adjusted MIT	19.5833	19.7123	19.9536	20.2804	20.4784	20.5328	20.5376	20.5375	20.4930	20.2030	19.8408	19.5672 (93)
8. Space heating requirement												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9983	0.9959	0.9850	0.9268	0.7570	0.5297	0.3759	0.4475	0.7692	0.9719	0.9961	0.9987 (94)
Unmet gains	335.2938	390.5442	439.6401	497.9977	465.2613	329.8830	220.7467	230.8956	334.5002	350.9319	322.8009	318.3470 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	14.1000	10.6000	7.1000	4.2000	2.9000 (96)
Heat loss rate W	5.7445	857.7124	776.8182	648.2745	498.7774	333.0806	221.0641	231.7712	360.5818	545.6314	727.6614	882.3819 (97)
Month fraction	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	410.8968	320.7975	250.8605	108.1993	24.9360	0.0000	0.0000	0.0000	0.0000	144.8564	291.4996	419.6420 (98)
Space heating per m2											(98) / (4) =	31.1582 (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	14.1000	10.6000	7.1000	4.2000	2.9000
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	527.7370	415.4525	425.7290	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9738	0.9994	0.9791	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	513.9360	411.0496	416.8152	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	805.1718	761.9953	679.9380	0.0000	0.0000	0.0000	0.0000 (103)
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	209.6898	261.1035	195.7634	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												
Cooled fraction												
Intermittency factor (Table 10b)												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Space cooling
Space cooling per m2
Energy for space heating
Energy for space cooling
Total
Target Fabric Energy Efficiency (TFEE)

166.6392 (107)
2.6334 (108)
31.1582 (99)
2.6334 (108)
33.7915 (109)
38.9 (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 (m2)	Storey height (m)	Volume (m3)
Ground floor	63.2800 (1b)	2.5000 (2b)	158.2000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	63.2800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	158.2000 (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	(7a)				
Number of intermittent fans							0 * 10 =		0.0000	(7b)				
Number of passive vents							0 * 10 =		0.0000	(7b)				
Number of flueless gas fires							0 * 40 =		0.0000	(7c)				
Air changes per hour														
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	0.0000 / (5) =								0.0000	(8)				
Pressure test									Yes					
Measured/design AP50									4.0000					
Infiltration rate									0.2000	(18)				
Number of sides sheltered									2	(19)				
Shelter factor									(20) = 1 - [0.075 x (19)] =	0.8500	(20)			
Infiltration rate adjusted to include shelter factor									(21) = (18) x (20) =	0.1700	(21)			
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(22)	
Wind factor	4.6000	4.3000	4.4000	4.0000	4.0000	3.5000	3.6000	3.8000	3.7000	3.9000	3.9000	4.3000	(22a)	
Adj infiltr rate	1.1500	1.0750	1.1000	1.0000	1.0000	0.8750	0.9000	0.9500	0.9250	0.9750	0.9750	1.0750	(22b)	
	0.1955	0.1828	0.1870	0.1700	0.1700	0.1488	0.1530	0.1615	0.1573	0.1658	0.1658	0.1828	(22b)	
Balanced mechanical ventilation with heat recovery														
If mechanical ventilation:													0.5000	(23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =													63.0000	(23c)
Effective ac	0.3805	0.3678	0.3720	0.3550	0.3550	0.3338	0.3380	0.3465	0.3423	0.3508	0.3508	0.3678	(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						
Opening Type 1 (Uw = 0.90)													
External Wall	46.3100	13.2200	33.2200	0.8687	11.4846		(27)						
Total net area of external elements Aum(A, m2)			33.0900	0.2400	7.9416		(29a)						
Fabric heat loss, W/K = Sum (A x U)			46.3100				(31)						
Wall to Corridor				(26) ... (30) + (32) =	19.4262		(32)						
Party Wall			11.0700	0.0000	0.0000		(33)						
			12.7900	0.0000	0.0000		(32)						
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)						
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							6.6438 (36)						
Total fabric heat loss						(33) + (36) =	26.0700 (37)						
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 19.8644	Feb 19.1988	Mar 19.4206	Apr 18.5331	May 18.5331	Jun 17.4238	Jul 17.6456	Aug 18.0894	Sep 17.8675	Oct 18.3113	Nov 18.3113	Dec 19.1988	(38)
Heat transfer coeff	45.9343	45.2687	45.4906	44.6031	44.6031	43.4937	43.7156	44.1593	43.9375	44.3812	44.3812	45.2687	(39)
Average = Sum(39)m / 12 =												44.6031	(39)
HLP	Jan 0.7259	Feb 0.7154	Mar 0.7189	Apr 0.7049	May 0.7049	Jun 0.6873	Jul 0.6908	Aug 0.6978	Sep 0.6943	Oct 0.7013	Nov 0.7013	Dec 0.7154	(40)
HLP (average)												0.7049	(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												2.0727 (42)	
Average daily hot water use (litres/day)												87.8173 (43)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	96.5990	93.0864	89.5737	86.0610	82.5483	79.0356	79.0356	82.5483	86.0610	89.5737	93.0864	96.5990	(44)
Energy content	143.2536	125.2905	129.2886	112.7169	108.1546	93.3292	86.4832	99.2407	100.4260	117.0368	127.7548	138.7335	(45)
Energy content (annual)												Total = Sum(45)m =	1381.7084 (45)
Distribution loss (46)m = 0.15 x (45)m													
	21.4880	18.7936	19.3933	16.9075	16.2232	13.9994	12.9725	14.8861	15.0639	17.5555	19.1632	20.8100	(46)
Water storage loss:													
Store volume													3.0000 (47)

[illegible]

5. Internal gains (see Table 5 and 5a)												
Metabolic gains (Table 5)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Lighting m	124.3616	124.3616	124.3616	124.3616	124.3616	124.3616	124.3616	124.3616	124.3616	124.3616	124.3616	124.3616 (66)
(66) m	Calculated in Appendix L, equation L18 or L19, also see Table 5											
	40.4971	35.9692	29.2521	22.1457	16.5542	13.9757	15.1013	19.6292	26.3463	33.4527	39.0462	41.6227 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	270.3537	273.1591	266.0895	251.0392	232.0409	214.1852	202.2565	199.4510	206.5206	221.5709	240.5692	258.4249 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	49.5088	49.5088	49.5088	49.5088	49.5088	49.5088	49.5088	49.5088	49.5088	49.5088	49.5088	49.5088 (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)												
	-82.9077	-82.9077	-82.9077	-82.9077	-82.9077	-82.9077	-82.9077	-82.9077	-82.9077	-82.9077	-82.9077	-82.9077 (71)
Water heating gains (Table 5)												
	96.2769	94.2483	90.0358	84.3089	80.5908	75.3555	70.9057	76.6071	78.6329	84.5603	91.2535	94.2568 (72)
Total internal gains (calculated in Appendix L, equation L20 or L20a), also see Table 5												
	498.0903	494.3392	476.3401	448.4565	420.1486	394.4791	379.2261	386.6501	402.4625	430.5466	461.8296	485.2675 (73)

[Jan]		Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W					

Northeast		8.2600	12.4928	0.4000	0.8000	0.7700	22.8835 (75)					
Northwest		4.9600	12.4928	0.4000	0.8000	0.7700	13.7412 (81)					

Total gains	36.6247	67.2716	122.0694	207.9417	269.1767	307.0673	288.3539	235.7071	164.5965	89.9542	47.6682	30.5869 (83)
Total gains	534.7150	561.6109	598.4085	656.3982	689.3252	701.5464	667.5801	622.3572	567.0590	520.5008	509.4977	515.8539 (84)

Temperature during heating periods in the living area from Table 9, T_{hi} (°C)													21,000 (85)
Utilization factor for gains for living area, n_{iL} (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
t_{au}	0.9580	0.9747	0.9823	0.9833	0.9833	1.0133	1.0363	0.9913	1.0139	0.9519	0.9159	0.9274	
α	7.3779	7.4716	7.6012	7.5682	7.5682	7.7358	7.7016	7.6342	7.6677	7.6011	7.6011	7.4716	
util living area	0.9680	0.9509	0.8830	0.7081	0.4906	0.2852	0.1637	0.1916	0.4181	0.7341	0.9232	0.9723	(86)
MIT	20.6800	20.7517	20.8839	20.9798	20.9987	21.0000	21.0000	21.0000	20.9997	20.9792	20.8493	20.6702	(87)
T_{hi}	20.3180	20.3273	20.3242	20.3365	20.3365	20.3520	20.3489	20.3427	20.3458	20.3396	20.3396	20.3273	(88)
util rest of house	0.9597	0.9391	0.8588	0.6696	0.4483	0.2450	0.1211	0.1449	0.3676	0.6876	0.9036	0.9560	(89)
MIT	20.1922	20.1939	20.1925	20.3172	20.3356	20.3520	20.3489	20.3427	20.3457	20.3271	20.1972	20.1646	
T_{hi}	20.3180	20.3180	20.3180	20.3180	20.3180	20.3180	20.3180	20.3180	20.3180	20.3180	20.3180	20.3180	
Living area fraction	0.9137	0.9137	0.9137	0.9137	0.9137	0.9137	0.9137	0.9137	0.9137	0.9137	0.9137	0.9137	
adjusted MIT	20.2487	20.3404	20.4953	20.6074	20.6260	20.6358	20.6340	20.6306	20.6321	20.6093	20.4644	20.2413	(90)
adjusted MIT	20.2487	20.3404	20.4953	20.6074	20.6260	20.6358	20.6340	20.6306	20.6321	20.6093	20.4644	20.2413	(91)

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

4. Water heating energy requirements (KWh/year)												

Assumed occupancy										2,0727 (42)		
Average daily hot water use (litres/day)										87.8173 (43)		

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use												
	96.5990	93.0864	89.5737	86.0610	82.5483	79.0356	79.0356	82.5483	86.0610	89.5737	93.0864	96.5990 (44)
Energy costs	143.2536	125.2905	129.2886	112.7169	108.1546	93.3292	86.4832	99.2407	100.4260	117.0368	127.7548	138.7335 (45)
Energy content (annual)												Total = Sum(43)m = 1381.7084 (45)
Distribution loss (46)m = 0.15 x (45)m												1381.7084 (45)
Water storage loss:	21.4880	18.7936	19.3933	16.9075	16.2232	13.9994	12.9725	14.8861	15.0639	17.5555	19.1632	20.8100 (46)
Store volume												3.0000 (47)

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FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Boilers	0.2500 (303a)
Fraction of heat from community Combined Heat and Power	0.7500 (303b)
Fraction of total space heat from community Boilers	0.2500 (304a)
Fraction of total space heat from community Combined Heat and Power	0.7500 (304b)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.0500 (306)
Space heating:	
Annual space heating requirement	677.3656 (98)
Space heat from Boilers = (98) x 0.25 x 1.00 x 1.05	177.8085 (307a)
Space heat from Combined Heat and Power = (98) x 0.75 x 1.00 x 1.05	533.4254 (307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	1734.9070 (64)
Water heat from Boilers = (64) x 0.25 x 1.00 x 1.05	455.4131 (310a)
Water heat from Combined Heat and Power = (64) x 0.75 x 1.00 x 1.05	1366.2393 (310b)
Electricity used for heat distribution	25.3289 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.8000)	
mechanical ventilation fans (SFP = 0.8000)	154.4032 (330a)
Total electricity for the above, kWh/year	154.4032 (331)
Electricity for lighting (calculated in Appendix I)	286.0767 (332)
Total delivered energy for all uses	2973.3661 (338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating from Boilers	177.8085	4.2400	7.5391 (340a)
Space heating from Combined Heat and Power	533.4254	2.9700	15.8427 (340b)
Space heating - secondary	0.0000	0.0000	0.0000 (341)
Water heating from Boilers	455.4131	4.2400	19.3095 (342a)
Water heating from Combined Heat and Power	1366.2393	2.9700	40.5773 (342b)
Mechanical ventilation fans	154.4032	13.1900	20.3658 (349)
Pumps and fans for heating	0.0000	0.0000	0.0000 (349)
Energy for lighting	286.0767	13.1900	37.7335 (350)
Additional standing charges			120.0000 (351)
Total energy cost			261.3679 (355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):	0.4200 (356)
Energy cost factor (ECF)	1.0138 (357)
SAP value	85.8575
SAP rating (Section 12)	86 (358)
SAP band	B

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Boilers			95.0000 (367a)
Space heating from Boilers	666.5490	0.2160	143.9746 (367)
Electrical efficiency of CHP unit			38.3000 (361)
Heat efficiency of CHP unit			40.6000 (362)
Space heating from Combined Heat and Power	1313.8557	0.2160	283.7928 (363)
less credit emissions for electricity	-503.2067	0.5190	-261.1663 (364)
Water heating from Combined Heat and Power	3368.1213	0.2160	726.8662 (365)
less credit emissions for electricity	-1288.8415	0.5190	-668.9087 (366)
Electrical energy for heat distribution	25.3289	0.5190	13.1457 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			237.7063 (373)
Space and water heating			237.7063 (376)
Pumps and fans	154.4032	0.5190	80.1353 (378)
Energy for lighting	286.0767	0.5190	148.4738 (379)
Total kg/year			466.3153 (383)
CO2 emissions per m2			7.3700 (384)
EI value			94.2392 (384a)
EI rating			94 (385)
EI band			A

Calculation of stars for heating and DHW

Space heating energy efficiency	0.25 x 4.240 x 1.05
0.75 x 2.970 x 1.05	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

= 3.452, stars = 5
Space heating environmental impact 0.25 x 0.216 x 1.05 / 0.9500
0.75 x (0.216 + 0.383 x 0.519) x 1.05 / 0.406
= 0.0931, stars = 5
Water heating energy efficiency
Water heating environmental impact

3.452, stars = 5
0.0931, stars = 5

HODKINSON

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						
Total floor area TFA = (la)+(lb)+(lc)+(ld)+(le)...(ln)	63.2800	63.2800	(1b)	x	2.5000	(2b) = 158.2000
Dwelling volume						(1b) - (3b) (4) 158.2000
						(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 158.2000

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

Infiltration due to chimneys, flues and fans	= (6a)+(5b)+(7a)+(7b)+(7c) =		Air changes per hour	
Pressure test			0.0000 / 5) =	0.0000 (8)
Measured/design AP50				Yes
Infiltration rate				4.0000
Number of sides sheltered				0.2000 (18)
				2 (19)
Shelter factor		(20) = 1 -	[0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor		(21) = (18) x (20) =		0.1700 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.6000	4.3000	4.4000	4.0000	4.0000	3.5000	3.6000	3.8000	3.7000	3.9000	3.9000	4.3000 (22)
Wind factor	1.1500	1.0750	1.1000	1.0000	1.0000	0.8750	0.9000	0.9500	0.9250	0.9750	0.9750	1.0750 (22a)
Aadj infiltr rate	0.1955	0.1828	0.1870	0.1700	0.1700	0.1488	0.1530	0.1615	0.1573	0.1658	0.1658	0.1828 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.5000 (23a)
												63.0000 (23c)
Effective ac	0.3805	0.3678	0.3720	0.3550	0.3550	0.3338	0.3380	0.3465	0.3423	0.3508	0.3508	0.3678 (25)

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
Opening Type 1 (Uw = 0.90)			13.2200	0.8687	11.4846		(27)
External Wall	46.3100	13.2200	33.0900	0.2400	7.9416		(29a)
Total net area of external elements $\sum(A, m^2)$			46.3100				(31)
Fabric heat loss, $W/K = \sum(A \times U)$			(26) ... (30) + (32) =		19.4262		(33)
Wall to Corridor			11.0700	0.0000	0.0000		(32)
Party Wall			12.7900	0.0000	0.0000		(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000	(35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	6.6438	(36)
Total fabric heat loss	(33) + (36) =	26.0700 (37)

Ventilation heat loss calculated monthly (38m) = 0.33 x (25m) x (5)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38m)	19.8644	19.1988	19.4206	18.5331	18.5331	17.4238	17.6456	18.0894	17.8675	18.3113	18.3113	19.1988 (38)
Heat transfer coeff	45.9343	45.2687	45.4906	44.6031	44.6031	43.4937	43.7156	44.1593	43.9375	44.3812	44.3812	45.2687 (39)
Average = Sum(38m) / 12 =												44.6031 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.7259	0.7154	0.7189	0.7049	0.7049	0.6873	0.6908	0.6978	0.6943	0.7013	0.7013	0.7154 (40)
HLP (average)												0.7049 (40)
Days in month	31	28	31	30	31	30	31	31	31	30	31	31 (41)

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b) If manufacturer declared loss factor is not known :											0.0212 (51)
Hot water storage loss factor from Table 2 (kWh/litre/day)											3.4000 (52)
Volume factor from Table 2a											1.0000 (53)
Temperature factor from Table 2b											0.2173 (55)
Enter (49) or (54) in (55)											
Total storage loss											6.7353 (56)
If cylinder contains dedicated solar storage											6.7353 (57)
Primary loss											23.2624 (59)
Total heat required for water heating calculated for each month											
Solar input											168.7312 (62)
Output from w/h											168.7312 (64)
Heat gains from water heating, kWh/month											1734.9070 (65)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66m)	124.3616	124.3616	124.3616	124.3616	124.3616	124.3616	124.3616	124.3616	124.3616	124.3616	124.3616	124.3616 (66)
Lighting gains (calculated in Appendix L, equation 19 or 19a), also see Table 5	40.4971	35.9692	29.2527	22.4577	16.5362	13.9757	15.1013	19.6292	26.3463	33.4527	39.0442	41.6227 (67)
Appliances gains (calculated in Appendix L, equation 13b or 13a), also see Table 5	270.3537	273.1591	266.0895	251.0392	232.0409	214.1852	202.2565	199.4510	206.5206	221.5709	240.5692	258.4249 (68)
Cooking gains (calculated in Appendix L, equation 13b or 13a), also see Table 5	49.5088	49.5088	49.5088	49.5088	49.5088	49.5088	49.5088	49.5088	49.5088	49.5088	49.5088	49.5088 (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)	-82.9077	-82.9077	-82.9077	-82.9077	-82.9077	-82.9077	-82.9077	-82.9077	-82.9077	-82.9077	-82.9077	-82.9077 (71)
Water heating gains (Table 5)	96.7679	94.2483	90.0358	84.3089	80.5908	75.3555	70.9057	76.6071	78.6329	84.5603	91.2535	94.2568 (72)
Total internal gains	428.6993	494.3392	476.3401	448.4655	420.1486	394.4791	379.2261	386.6501	402.4625	430.5466	461.8296	485.2671 (73)

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	PF Specific data or Table 6c	Access factor Table 6d	Gains W
Northeast	8.2600	12.4928	0.4000	0.8000	0.7700	22.8835 (75)
Northwest	4.9600	12.4928	0.4000	0.8000	0.7700	13.7412 (81)

Solar gains	36.6247	67.2716	122.0684	207.9417	269.1767	307.0673	288.3539	235.7071	164.5965	89.9542	47.6682	30.5869 (83)
Total gains	534.7150	561.6109	598.4085	656.3982	689.3252	701.5464	667.5801	622.3572	567.0590	520.5008	509.4977	515.8539 (84)

Temperature during heating periods in the living area from Table 9. Th1 (C)	21.0000 (85)
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	Utilisation factor for giraffes for living areas, nil./m. ² (see Table 9a)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	95.6680	97.0477	96.6012	98.5233	98.5233	101.0363	100.5235	99.5134	100.0159	99.0159	99.0159	97.0477
alpha	7.3779	7.4716	7.4401	7.5682	7.5682	7.7358	7.7016	7.6342	7.6677	7.6011	7.6011	7.4716
util living area	0.9870	0.9509	0.8830	0.7081	0.4906	0.2852	0.1637	0.1916	0.1186	0.7341	0.9232	0.9723 (86)
MIT	20.6800	20.7517	20.8839	20.9798	20.9987	21.0000	21.0000	21.0000	20.9997	20.9792	20.8493	20.6702 (87)
T ₂	20.3180	20.3273	20.3242	20.3365	20.3365	20.3520	20.3489	20.3427	20.3458	20.3396	20.3493	20.3273 (88)
util rest of house	0.9597	0.9391	0.8588	0.6696	0.4483	0.2450	0.1211	0.1429	0.3676	0.6872	0.9036	0.9650 (89)
MIT 2	19.9127	20.0199	20.1925	20.3172	20.3356	20.3520	20.3489	20.3427	20.3457	20.3212	20.1646	19.9072 (90)
Living area fraction	0.9597	0.9391	0.8588	0.6696	0.4483	0.2450	0.1211	0.1429	0.3676	0.6872	0.9036	0.9650 (91)
MIT	20.2487	20.3404	20.4953	20.6074	20.6260	20.6358	20.6340	20.6306	20.6321	20.6093	20.4644	20.2413 (92)
Temperature adjustment	20.3404	20.3404	20.4953	20.6074	20.6260	20.6358	20.6340	20.6306	20.6321	20.6093	20.4644	20.2413 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilization	9,988	9,934	6,863	6,885	4,668	2,262	0,137	0,164	0,387	0,707	9,076	9,639 (94)
Useful gains	512,684	527,559	517,784	44,976	321,757	184,251	91,257	220,987	447,892	462,440	497,324 (95)	497,324 (95)
Ext temp.	5,400	5,800	7,800	10,300	13,400	16,400	18,300	18,300	15,600	12,100	8,300	5,400 (96)
Heat loss rate	682,0633	658,2333	577,514	459,749	322,308	184,2295	93,297	022,9156	221,0972	377,6528	539,8719	671,8464 (97)
Month Fracti	1,0000	1,0000	1,0000	1,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	1,0000	1,0000 (97a)
Space heating	126,0298	87,8064	44,4394	7,0303	0,4055	0,0000	0,0000	0,0000	0,0000	0,1860	55,7481	129,9128 (98)
Space heating												458,5383 (98)
Space heating per m ²									(98) / (4) =			

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



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

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)
Fraction of space heat from community system
Fraction of heat from community Boilers
Fraction of heat from community Combined Heat and Power
Fraction of total space heat from community Boilers
Fraction of total space heat from community Combined Heat and Power
Factor for control and charging method (Table 4c(3)) for community space heating
Factor for control and charging method (Table 4c(3)) for community water heating
Distribution loss factor (Table 12c) for community heating system
Space heating:
Annual space heating requirement
Space heat from Boilers = (98) x 0.25 x 1.00 x 1.05
Space heat from Combined Heat and Power = (98) x 0.75 x 1.00 x 1.05
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)
Space heating fuel for secondary/supplementary system
Water heating
Annual water heating requirement
Water heat from Boilers = (64) x 0.25 x 1.00 x 1.05
Water heat from Combined Heat and Power = (64) x 0.75 x 1.00 x 1.05
Electricity used for heat distribution
Annual totals kWh/year
Electricity for pumps and fans:
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.8000)
mechanical ventilation fans (SFP = 0.8000)
Total electricity for the above, kWh/year
Electricity for lighting (calculated in Appendix I)
Total delivered energy for all uses

10b. Fuel costs - using BDEF prices (495)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating from Boilers	120.3716	4.4300	5.3325 (340a)
Space heating from Combined Heat and Power	361.1147	3.1000	11.1946 (340b)
Space heating - secondary	0.0000	0.0000	0.0000 (341)
Water heating from Boilers	455.4131	4.4300	20.1748 (342a)
Water heating from Combined Heat and Power	1366.2393	3.1000	42.3534 (342b)
Mechanical ventilation fans	154.4032	19.4400	30.0160 (349)
Pumps and fans for heating	0.0000	0.0000	0.0000 (349)
Energy for lighting	286.0767	19.4400	55.6133 (350)
Additional standing charges			95.0000 (351)
Total energy cost			259.6845 (355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Boilers			95.0000 (367a)
Space heating from Boilers	606.0891	0.2160	130.9152 (367)
Electrical efficiency of CHP unit			38.3000 (361)
Heat efficiency of CHP unit			40.6000 (362)
Space heating from Combined Heat and Power	889.4451	0.2160	192.1201 (363)
less credit emissions for electricity	-340.6575	0.5190	-176.8012 (364)
Water heating from Combined Heat and Power	3365.1213	0.2160	726.8662 (365)
less credit emissions for electricity	-1288.8415	0.5190	-668.9087 (366)
Electrical energy for heat distribution	23.0314	0.5190	11.9533 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			216.1449 (373)
Space and water heating			216.1449 (376)
Pumps and fans	154.4032	0.5190	80.1353 (378)
Energy for lighting	286.0767	0.5190	148.4738 (379)
Total kg/year			444.7540 (383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Efficiency of heat source Boilers			95.0000 (367a)
Space heating from Boilers	606.0891	1.2200	739.4287 (367)
Electrical efficiency of CHP unit			38.3000 (361)
Heat efficiency of CHP unit			40.6000 (362)
Space heating from Combined Heat and Power	889.4451	1.2200	1085.1230 (363)
less credit emissions for electricity	-340.6575	3.0700	-1045.8184 (364)
Water heating from Combined Heat and Power	3365.1213	1.2200	4105.4480 (365)
less credit emissions for electricity	-1288.8415	3.0700	-3995.7433 (366)
Electrical energy for heat distribution	23.0314	3.0700	70.7064 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			998.1444 (373)
Space and water heating			998.1444 (376)
Pumps and fans	154.4032	3.0700	474.0178 (378)
Energy for lighting	286.0767	3.0700	878.2554 (379)
Primary energy kWh/year			2350.4376 (383)



FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



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

Primary energy kWh/m²/year

37.1431 (384)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating: B 86
Current environmental impact rating: A 94

(For testing purposes):

A	Not considered
B	Not considered
C	Not considered
D	Not considered
E	Low energy lighting
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
O	Not applicable
P	Not considered
R	Not considered
S	Not considered
T	Not considered
U	Solar photovoltaic panels
A2	Not considered
A3	Not considered
T2	Not considered
W	Not considered
X	Not considered
V	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
L2	Not considered
Q3	Not considered
Q3	Not considered

Recommended measures: (none)	SAP change	Cost change	CO2 change
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Recommended measures (none)	Typical annual savings	Energy efficiency	Environmental impact
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Recommended measures (none)	Total Savings	£0	0.00 kg/m ²
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Potential energy efficiency rating: B 86
Potential environmental impact rating: A 94

Fuel prices for cost data on this page from database revision number 495 TEST (29 Apr 2022)
Recommendation texts revision number 4.9c (22 Feb 2014)

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

	Current	Potential	Saving
Electricity	£86	£86	£0
Community scheme	£174	£174	£0
Space heating	£142	£142	£0
Water heating	£63	£63	£0
Lighting	£56	£56	£0
Total cost of fuels	£260	£260	£0
Total cost of uses	£261	£261	£0
Delivered energy	43 kWh/m ²	43 kWh/m ²	0 kWh/m ²
Carbon dioxide emissions	0.4 tonnes	0.4 tonnes	0.0 tonnes
CO2 emissions per m ²	7 kg/m ²	7 kg/m ²	0 kg/m ²
Primary energy	37 kWh/m ²	37 kWh/m ²	0 kWh/m ²



FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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

No improvements selected / applicable

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

No improvements selected / applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



Property Reference	Flat Type T22 - TOP				Issued on Date	01/06/2022
Assessment Reference	BE CLEAN DLF 1.05	Prop Type Ref	13th Floor - 1B2P			
Property	Flat Type T22, London , N8					
SAP Rating	84 B	DER	9.38	TER	19.68	
Environmental	94 A	% DER<TER	52.33			
CO ₂ Emissions (t/year)	0.41	DFEE	42.41	TFEE	53.10	
General Requirements Compliance	Pass	% DFEE<TFEE	20.13			
Assessor Details	Mr. Michael Wride, Michael Wride, Tel: 02036 031 600, Michael@hodkinsonconsultancy.com				Assessor ID	R572-0001
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

Top-floor flat, total floor area 50 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:Mains gas (c)
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 19.68 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 9.38 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)53.1 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)42.4 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.24 (max. 0.30)	0.24 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor (no floor)			
Roof	0.14 (max. 0.20)	0.14 (max. 0.35)	OK
Openings	0.90 (max. 2.00)	0.90 (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: 4.00 (design value)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Community heating scheme -
Secondary heating system: None

5 Cylinder insulation

Hot water storage: Nominal cylinder loss: 0.22 kWh/day
Permitted by DBSCG 0.35 OK
Primary pipework insulated: No primary pipework

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and TRVsOK

Hot water controls:

No cylinderstat

7 Low energy lights

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

8 Mechanical ventilation

Continuous supply and extract system
Specific fan power: 0.64
Maximum 1.5 OK
WWR efficiency: 90%
Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): Slight OK
Based on:
Overshading: Average
Windows facing South East: 2.48 m², No overhang
Windows facing South West: 11.56 m², No overhang
Air change rate: 4.00 ach
Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Party wall U-value 0.00 W/m²K
Party wall U-value 0.00 W/m²K
Window U-value 0.90 W/m²K
Community CHP, Mains gas

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

Ventilation heat loss calculated monthly (38m) = 0.33 x (25m) x (5)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38m)	15,8780	15,7172	15,5564	14,7524	14,5916	13,7875	13,7875	13,6267	14,1092	14,5916	14,9132	15,2348 (38)
Heat transfer coeff	53.4320	53,2712	53,1104	52,3064	52,1456	51,3416	51,3416	51,1808	51,6632	52,1456	52,4672	52,7888 (39)
Average = Sum(38m) / 12 =												52,2662 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0623	1.0591	1.0559	1.0399	1.0367	1.0207	1.0207	1.0375	1.0271	1.0367	1.0431	1.0495 (40)
HLP (average)												1.0391 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

Assumed occupancy												1.6989	(42)	
Average daily hot water use (litres/day)												78.4734	(43)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Daily hot water use	86.3208	83.1818	80.0429	76.9039	73.7650	70.6261	70.6261	73.7650	76.9039	80.0429	83.1818	86.3208	(44)	
Energy content	128.0112	111.9594	115.5321	100.7237	96.6667	83.3988	77.2812	88.6814	89.7405	104.5839	114.1615	123.9720	(45)	
Energy content (annual)												Total = Sum(45) =	1234.6923	(45)
Distribution loss (46) = 0.15 x (45)	19.1917	16.7939	17.3298	15.1085	14.4970	12.5098	11.5922	13.3022	13.4611	15.6876	17.1242	18.5958	(46)	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilization	0.9867	0.9691	0.8427	0.8247	0.6922	0.4985	0.3489	0.3810	0.4078	0.8725	0.9708	0.9899 (94)
Useful gains	408,224	477,302	516,143	507,926	433,973	303,567	204,326	213,709	323,937	414,728	402,962	385,296 (96)
Ext. temp.	4.3000	4.9000	6.5000	8.9000	13.7500	14.6000	16.6000	16.7000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	813.9209	792.3138	720.4655	599.4824	460.0464	307.0425	204.7200	214.3457	333.9069	508.6362	671.4480	807.2918 (97)
Month fraction	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97)
Space heating kWh	301.8379	211.6876	152.0158	65.9180	19.4889	0.0000	0.0000	0.0000	0.0000	69.8864	193.1403	313.9622 (98)
Space heating per m ²												128.0261 (98)
										(98) / (94)		139.30

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)
Fraction of space heat from community system
Fraction of heat from community Boilers
Fraction of heat from community Combined Heat and Power
Fraction of total space heat from community Boilers
Fraction of total space heat from community Combined Heat and Power
Factor for control and charging method (Table 4c(3)) for community space heating
Factor for control and charging method (Table 4c(3)) for community water heating
Distribution loss factor (Table 12c) for community heating system
Space heating:
Annual space heating requirement
Space heat from Boilers = (98) x 0.25 x 1.00 x 1.05
Space heat from Combined Heat and Power = (98) x 0.75 x 1.00 x 1.05
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)
Space heating fuel for secondary/supplementary system
Water heating
Annual water heating requirement
Water heat from Boilers = (64) x 0.25 x 1.00 x 1.05
Water heat from Combined Heat and Power = (64) x 0.75 x 1.00 x 1.05
Electricity used for heat distribution
Annual totals kWh/year
Electricity for pumps and fans:
(BalancedWithHeatRecovery; Database: in-use factor = 1.2500, SFP = 0.8000)
mechanical ventilation fans (SFP = 0.8000)
Total electricity for the above, kWh/year
Electricity for lighting (calculated in Appendix L)
Total delivered energy for all uses

0.0000 (301)
1.0000 (302)
0.2500 (303a)
0.7500 (303b)
0.2500 (304a)
0.7500 (304b)
1.0000 (305)
1.0000 (305a)
1.0500 (306)

1328.0261 (98)
348.6069 (307a)
1045.8206 (307b)
0.0000 (308)
0.0000 (309)

1587.8909 (64)
416.8214 (310a)
1250.4641 (310b)
30.6171 (313)

122.7320 (330a)
122.7320 (331)
233.0362 (332)
3417.4811 (338)

12b. Carbon dioxide emissions - Community heating scheme

Energy
kWh/year
Space heating from Boilers
Electrical efficiency of CHP unit
Heat efficiency of CHP unit
Space heating from Combined Heat and Power
less credit emissions for electricity
Water heating from Combined Heat and Power
less credit emissions for electricity
Electrical energy for heat distribution
Total CO2 associated with community systems
(negative value allowed since DFEE <= TFE)
Space and water heating
Pumps and fans
Energy for lighting
Total CO2, kg/year
Dwelling Carbon Dioxide Emission Rate (DER)

Emission factor
kg CO2/kWh
Emissions
kg CO2/year
95.0000 (367a)
174.0342 (367)
38.3000 (361)
40.6000 (362)
556.3971 (363)
-512.0322 (364)
665.2715 (365)
-612.2254 (366)
15.8903 (372)
287.3356 (373)
287.3356 (376)
63.6979 (378)
120.9458 (379)
471.9793 (383)
9.3800 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES
DER
Total Floor Area
Assumed number of occupants
CO2 emission factor in Table 12 for electricity displaced from grid
CO2 emissions from appliances, equation (L14)
CO2 emissions from cooking, equation (L16)
Total CO2 emissions
Residual CO2 emissions offset from biofuel CHP
Additional allowable electricity generation, kWh/m²/year
Resulting CO2 emissions offset from additional allowable electricity generation
Net CO2 emissions

9.3800 ZC1
50.3000 Apr
1.6989 N
0.5190 EF
17.4373 ZC2
3.1764 ZC3
29.9937 ZC4
0.0000 ZC5
0.0000 ZC6
0.0000 ZC7
29.9937 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

Ground floor
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)
Dwelling volume
Storey height
Volume
(3a)+(3b)+(3c)+(3d)+(3e)...(3n)

2. Ventilation rate

Number of chimneys
Number of open flues
Number of intermittent fans
Number of passive vents
Number of flueless gas fires
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =
Pressure test
Measured/design APS0
Infiltration rate
Number of sides sheltered
Shelter factor
Infiltration rate adjusted to include shelter factor
Air changes per hour
Yes
5.0000
0.4090 (18)
3 (19)
(20) = 1 - (0.075 x (19)) =
(21) = (18) x (20) =

Wind speed
Wind factor
Adj infiltr rate
Effective ac
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec

3. Heat losses and heat loss parameter

Element
Gross
m2
Openings
m2
NetArea
m2
U-value
W/m2K
A x U
W/K
K-value
kJ/m2K
A x K
kJ/K
TER Opening Type (Uw = 1.40)
External Wall
Roof
Total net area of external elements Aum(A, m2)
Fabric heat loss, W/K = Sum (A x U)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K
Thermal bridges (Sum(L x Psi) calculated using Appendix K)
Total fabric heat loss
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)
(38)m
Heat transfer coeff
Average = Sum(39)m / 12 =

HLP
HLP (average)
Days in month
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec

4. Water heating energy requirements (kWh/year)

Assumed occupancy
Average daily hot water use (litres/day)
Daily hot water use
Energy conte
Energy content (annual)
Distribution loss (46)m = 0.15 x (45)m
Water storage loss:
Store volume
a) If manufacturer declared loss factor is known (kWh/day):
Temperature factor from Table 2b
Enter (49) or (54) in (55)
Total storage loss
1.6989 (42)
74.5497 (43)
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
82.0047
121.6106
106.3614
109.7555
95.6875
91.8144
79.2289
73.4172
84.2473
85.2335
99.3547
108.4534
117.7734 (44)
Total = Sum(45)m = 1172.9577 (45)
18.2416
15.9542
16.4633
14.3531
13.7722
11.8843
11.0126
12.6371
12.7880
14.9032
16.2680
17.6660 (46)
3.0000 (47)
0.2602 (48)
0.5400 (49)
0.1405 (55)
4.3553
3.9338
4.3553
4.2148
4.3553
4.2148
4.3553
4.2148
4.3553
4.2148
4.3553 (56)



1	cylinder contains dedicated solar storage													
	4.3553	4.3538	4.3553	4.2148	4.3553	4.2148	4.3553	4.3553	4.2148	4.3553	4.2148	4.3553	4.2148	4.3553 (57)
2	Primary loss	23.2624	21.0112	23.2624	23.2120	23.2624	23.2624	23.2624	23.2624	23.2624	23.2624	23.2624	23.2624	23.2624 (59)
3	Total heat required for water heating calculated for each month													
4		149.2283	131.3064	137.3731	122.4143	149.2283	105.9556	101.0349	111.8650	111.9802	126.9724	135.1802	145.3911	162.2138
5	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	
6	Solar input (sum of months) = Sum(6)/3m = 0.0000 (63)													
7	Output from w/h	149.2283	131.3064	137.3731	122.4143	149.2283	105.9556	101.0349	111.8650	111.9802	126.9724	135.1802	145.3911	162.2138
8	Total per year (KWh/year) = Sum(6)/4m = 1498.1333 (64)													
9	Heat gains from water heating, KWh/month													
10		62.2627	52.8787	53.1975	52.6224	47.7250	46.5054	50.1064	49.7282	55.1296	57.4422	61.2338	63.6464	66.1336 (65)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66m)	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468 (66)
Lighting gains	(calculated in Appendix L, equation L3 or L9a), also see Table 5											
	13.1955	13.1955	13.1955	13.1955	13.1955	13.1955	13.1955	13.1955	13.1955	13.1955	13.1955	13.1955 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	148.0131	149.5490	145.6785	137.4388	127.0376	117.2620	110.7313	109.1954	113.0658	121.3055	131.7067	141.4824 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	31.4947	31.4947	31.4947	31.4947	31.4947	31.4947	31.4947	31.4947	31.4947	31.4947	31.4947	31.4947 (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)												
	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575 (71)
Water heating gains (Table 5)												
	84.0453	82.3232	78.7471	73.8854	70.7291	66.2847	62.5072	63.4273	69.0669	74.0889	79.7808	82.3304 (72)
Total internal gains												
	295.3379	295.6763	285.4411	270.0242	254.6467	239.5846	229.6431	234.6246	242.2014	257.7886	275.9636	288.5890 (73)

[Jan]	Area		Solar flux		g	FF	Access		Gains			
	m2		Table 6a		Specific data	Specific data	factor		W			
			W/m2		or Table 6b	or Table 6c	Table 6d					

Southeast	2.227938		36.7938		0.6300	0.7000	0.7000		24.9632 (77)			
Southwest	10.3500		36.7938		0.6300	0.7000	0.7700		116.3824 (79)			

Solar gains	141.3455	240.7638	329.4235	408.1717	457.8813	437.5889	401.0218	266.0952	169.2994	120.9623 (83)		
Total gains	438.0834	535.8401	614.8646	678.1959	711.8830	693.4647	677.2320	635.4444	598.8974	523.8838	444.9930	409.8213 (84)

Temperature during heating periods in the living area (see Table 9), T _l (°C)												21.0000 (85)
Utilisation factor for gains for living area, n _{l,m} (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	4.3919	4.4955	4.5975	4.6988	4.7175	53.6042	53.6042	53.6847	53.4375	53.1735	52.9885	52.7964
alpha	4.4928	4.4997	4.5065	4.5081	4.5449	4.5736	4.5736	4.5790	4.5625	4.5449	4.5326	4.5198
util living area												
	0.9908	0.9774	0.9477	0.8785	0.7520	0.5765	0.4245	0.4630	0.6888	0.9095	0.9802	0.9930 (86)
MIT	19.7708	20.0088	20.3114	20.6362	20.8627	20.9686	20.9937	20.9907	20.9300	20.6247	20.1290	19.7230 (87)
Th 2	19.8209	19.8230	19.8250	19.8344	19.8361	19.8444	19.8444	19.8459	19.8412	19.8361	19.8296	19.8288 (88)
util rest of house												
	0.9878	0.9703	0.9316	0.8428	0.6869	0.4828	0.3157	0.3509	0.5967	0.8742	0.9727	0.9907 (89)
MIT	18.2154	18.5688	18.9972	19.4411	19.7152	19.8258	19.8423	19.8426	19.8161	19.4405	18.7325	18.1637 (90)
Living area fraction									f _l = Living area			0.5592 (91)
adjusted MIT	19.0897	19.3741	19.7321	20.1095	20.3569	20.4649	20.4862	20.4847	20.4291	20.1028	19.5223	19.0348 (92)
temperature adjustment											0.0000	
adjusted MIT	19.0897	19.3741	19.7321	20.1095	20.3569	20.4649	20.4862	20.4847	20.4291	20.1028	19.5223	19.0348 (93)

[illegible]

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	2059.3890 (211)

[illegible]

	Energy kWh/year	Emission factor kg CO ₂ /kWh	Emissions kg CO ₂ /year
Space heating - main system 1	2059.3890	0.2160	444.8280 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (0.00)
Water heating (other fuel)	1782.7035	0.2160	385.0640 (263)
Space and water heating			829.8920 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	233.0362	0.5190	120.9458 (268)
Total CO ₂ , kg/m ² /year			899.7682 (272)
Emissions per m ² for space and water heating			16.4988 (272a)
Fuel factor (main gas)			1.0000
Emissions per m ² for lighting			2.4045 (272b)
Emissions per m ² for pumps and fans			0.7739 (272c)
Target Carbon Dioxide Emission Rate (TER) = (16.4988 * 1.00) + 2.4045 + 0.7739, rounded to 2 d.p.			19.6800 (273)

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1. Overall dwelling dimensions

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	50.3000 (1b)	2.5000 (2b)	125.7500 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.3000		125.7500 (4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	125.7500 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	0	0	0	0 * 40 = 0.0000 (6a)
Number of open flues	0	0	0	0	0 * 20 = 0.0000 (6b)
Number of intermittent fans	0	0	0	0	2 * 10 = 20.0000 (7a)
Number of passive vents	0	0	0	0	0 * 10 = 0.0000 (7b)
Number of fuelless gas fires	0	0	0	0	0 * 40 = 0.0000 (7c)

Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1595 (8)
Pressure test		Yes	4.0000
Measured/design AP50		Yes	0.3590 (18)
Infiltration rate		Yes	3 (19)
Number of sides sheltered			
Shelter factor	(20) = 1 - [0.075 x (19)] =		0.7750 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =		0.2783 (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 infiltr rate												
Effective ac	0.3548	0.3478	0.3409	0.3061	0.2991	0.2643	0.2643	0.2574	0.2783	0.2991	0.3130	0.3270 (22b)
	0.5629	0.5605	0.5581	0.5468	0.5447	0.5349	0.5349	0.5331	0.5387	0.5447	0.5490	0.5535 (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
Opening Type 1 (Uw = 0.90)			14.0400	0.8687	12.1969		(27)
External Wall	43.5100	14.0400	29.4700	0.2400	7.0728		(29a)
Roof	50.3000		50.3000	0.1400	7.0420		(30)
Total net area of external elements Aum(A, m2)			93.8100				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...	(30) + (32) =	26.3117	(33)
Wall to Corridor			4.0900	0.0000	0.0000		(32)
Party Wall			13.2900	0.0000	0.0000		(32)
Wall to stairs/lift			28.2200	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							11.2423 (36)
Total fabric heat loss							37.5540 (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	23.3604	23.2590	23.1596	22.6927	22.6053	22.1987	22.1987	22.1234	22.3553	22.6053	22.7820	22.9668 (38)
Average = Sum(39)m / 12 =	60.9144	60.8130	60.7136	60.2467	60.1593	59.7527	59.7527	59.6774	59.9093	60.1593	60.3361	60.5208 (39)
												60.2463 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.2110	1.2090	1.2070	1.1977	1.1960	1.1879	1.1879	1.1864	1.1910	1.1960	1.1995	1.2032 (40)
HLP (average)												1.1977 (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												1.6989 (42)
Average daily hot water use (litres/day)												78.4734 (43)
Daily hot water use	86.3208	83.1818	80.0429	76.9039	73.7650	70.6261	70.6261	73.7650	76.9039	80.0429	83.1818	86.3208 (44)
Energy conte	128.0112	111.9594	115.5321	100.7237	96.6467	83.3988	77.2812	88.6814	89.7405	104.5839	114.1615	128.0112 (45)
Energy content (annual)												Total = Sum(45)m = 1234.6923 (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 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage												

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Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Heat gains from water heating, kWh/month	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)
	27.2024	23.7914	24.5506	21.4038	20.5374	17.7222	16.4223	18.8448	19.0699	22.2241	24.2593	26.3440 (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	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.1955	11.7201	9.5314	7.2159	5.3940	4.5538	4.9206	6.3959	8.5846	10.9001	12.7221	13.5622 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	148.0131	149.5490	145.6785	137.4388	127.0376	117.2620	110.7313	109.1954	113.0658	121.3055	131.7067	141.4824 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.4947	31.4947	31.4947	31.4947	31.4947	31.4947	31.4947	31.4947	31.4947	31.4947	31.4947	31.4947 (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)	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575 (71)
Water heating gains (Table 5)	36.5623	35.4038	32.9981	29.7275	27.6041	24.6142	22.0729	25.3290	26.4859	29.8711	33.6935	35.4087 (72)
Total internal gains	246.2549	245.1570	236.6921	222.8662	208.5197	194.9141	186.2088	189.4043	196.6204	210.5608	226.6063	238.9373 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
South-east	2.4800	36.7938	0.4000	0.8000	0.7700	20.2353 (77)
South-west	11.5600	36.7938	0.4000	0.8000	0.7700	94.3227 (79)
Solar gains	114.5580	195.1346	266.9917	330.8157	370.5411	367.8616
Total gains	360.8129	440.2916	503.6838	553.6819	579.0608	562.7756
						540.8666
						514.4252
						485.7159
						426.2261
						363.8204
						336.9750 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th 1 (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	8.8229	4.8293	4.8356	4.8653	4.8709	4.8792	4.9022	4.9022	4.8870	4.8709	4.8596	4.8478	
util living area	0.9956	0.9883	0.9701	0.9212	0.8151	0.6429	0.4787	0.5219	0.7570	0.9451	0.9901	0.9968 (86)	
MIT	19.7849	19.9952	20.2761	20.5948	20.8380	20.9618	20.9926	20.9888	20.9154	20.5874	20.1147	19.7410 (87)	
Th 2	19.9112	19.9128	19.9144	19.9218	19.9232	19.9297	19.9297	19.9309	19.9272	19.9232	19.9204	19.9174 (88)	
util rest of house	0.9942	0.9845	0.9602	0.8953	0.7585	0.5502	0.3661	0.4066	0.6718	0.9212	0.9863	0.9958 (89)	
MIT 2	19.8176	19.8270	19.8301	19.8102	19.8205	19.8133	19.8279	19.8280	19.8849	19.6117	19.1530	18.7789 (90)	
Living area fraction									fLA = Living area /	(4) =	0.5592 (91)		
MIT	19.3585	19.5685	19.8473	20.1608	20.3895	20.4997	20.5233	20.5212	20.4612	20.1574	19.6908	19.3170 (92)	
Temperature adjustment												0.0000	
adjusted MIT	19.3585	19.5685	19.8473	20.1608	20.3895	20.4997	20.5233	20.5212	20.4612	20.1574	19.6908	19.3170 (93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	358.3707	432.8006	483.2909	499.2755	454.3513	338.2940	232.1989	242.4527	348.0969	395.2212	358.4521	335.2903 (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	917.2821	892.0325	810.3606	678.4285	522.7549	352.5228	234.4291	245.9439	381.0941	574.9645	759.6805	914.8902 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	415.8300	308.6038	243.3399	128.9901	50.8923	0.0000	0.0000	0.0000	0.0000	133.7290	288.8844	431.2223 (98)
Space heating												2001.4919 (98)
Space heating per m2										(98) / (4) =		39.7911 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b												
Ext. temp.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (100)
Useful 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 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (103)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (103a)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	149.3377	202.1837	175.7173	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												527.2388 (104)
Cooled fraction												1.0000 (105)
												fc = cooled area / (4) =

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Intermittency factor (Table 10b)												
0.0000	0.0000	0.0000	0.0000	0.2500	0.2500	0.2500	0.0000	0.0000	0.0000	0.0000	0.0000	(106)
Space cooling kWh												
0.0000	0.0000	0.0000	0.0000	37.3344	50.5459	43.9293	0.0000	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling												131.8097 (107)
Space cooling per m2												2.6205 (108)
Energy for space heating												39.7911 (99)
Energy for space cooling												2.6205 (108)
Total												42.4116 (109)
Dwelling Fabric Energy Efficiency (DFEE)												42.4 (109)

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1. Overall dwelling dimensions												
	Area (m2)	Storey height (m)	Volume (m3)									
Ground floor	50.3000	2.5000	125.7500									
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.3000											(1b) - (3b)
Dwelling volume												(4)
												(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 125.7500 (5)

2. Ventilation rate													
	main heating	secondary heating	other	total	m3 per hour								
Number of chimneys	0	0	0	0	0 * 40 =	0.0000	(6a)						
Number of open flues	0	0	0	0	0 * 20 =	0.0000	(6b)						
Number of intermittent fans					2 * 10 =	20.0000	(7a)						
Number of passive vents					0 * 10 =	0.0000	(7b)						
Number of flueless gas fires					0 * 40 =	0.0000	(7c)						
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					20.0000 / (5) =	0.1590	(8)						
Pressure test					Yes	5.0000							
Measured/design AP50						0.4090	(18)						
Infiltration rate						3	(19)						
Number of sides sheltered													
Shelter factor					(20) = 1 - [0.075 x (19)] =	0.7750	(20)						
Infiltration rate adjusted to include shelter factor					(21) = (18) x (20) =	0.3170	(21)						
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Adj infiltr rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Effective ac	0.4042	0.3963	0.3883	0.3487	0.3408	0.3012	0.3012	0.2932	0.3170	0.3408	0.3566	0.3725	(22b)
	0.5817	0.5785	0.5754	0.5608	0.5581	0.5453	0.5453	0.5430	0.5502	0.5581	0.5636	0.5694	(25)

3. Heat losses and heat loss parameter													
Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K						
TER Opening Type (Uw = 1.40)													
External Wall	43.5100	12.5700	12.5700	1.3258	16.6648								(27)
Roof	50.3000		30.9400	0.1800	5.5692								(28a)
Total net area of external elements Aum(A, m2)			93.8100										(31)
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	28.7730								(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K													250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)													13.7603 (36)
Total fabric heat loss													(33) + (36) = 42.5333 (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	24.1384	24.0068	23.8778	23.2718	23.1584	22.6306	22.6306	22.5329	22.8339	23.1584	23.3878	23.6276	(38)
Average = Sum(39)m / 12 =	66.6717	66.5401	66.4111	65.8051	65.6917	65.1639	65.1639	65.0661	65.3672	65.6917	65.9211	66.1608	(39)
	66.5401												65.8045 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.3255	1.3229	1.3203	1.3083	1.3060	1.2955	1.2955	1.2936	1.2995	1.3060	1.3106	1.3153	(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													1.6989 (42)
Average daily hot water use (litres/day)													74.5497 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	82.0047	79.0227	76.0407	73.0587	70.0768	67.0948	67.0948	70.0768	73.0587	76.0407	79.0227	82.0047	(44)
Energy content (annual)	121.6106	106.3614	109.7555	95.6875	91.8144	79.2289	73.4172	84.2473	85.2335	99.3547	108.4534	117.7734	(45)
Distribution loss (46)m = 0.15 x (45)m													
Water storage loss:													
Total storage loss:													
If cylinder contains dedicated solar storage													
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Heat gains from water heating, kWh/month													0.0000 (59)

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25.8423 22.6018 23.3230 20.3336 19.5106 16.8361 15.6012 17.9025 18.1164 21.1129 23.0464 25.0268 (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	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468	84.9468 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.1955	11.7201	9.5314	7.2159	5.3940	4.5538	4.9206	6.3959	8.5846	10.9001	12.7221	13.5622 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	148.0131	149.5490	145.6785	137.4388	127.0376	117.2620	110.7313	109.1954	113.0658	121.3055	131.7067	141.4824 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.4947	31.4947	31.4947	31.4947	31.4947	31.4947	31.4947	31.4947	31.4947	31.4947	31.4947	31.4947 (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)	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575 (71)
Water heating gains (Table 5)	34.7342	33.6336	31.3482	28.2411	26.2239	23.3835	20.9693	24.0626	25.1616	28.3775	32.0088	33.6382 (72)
Total internal gains	244.4268	243.3868	235.0422	221.3799	207.1395	193.6834	185.1052	188.1379	195.2961	209.0672	224.9216	237.1669 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W						

Southeast	2.2200	36.7938	0.6300	0.7000	0.7700	24.9632 (77)						
Southwest	10.3500	36.7938	0.6300	0.7000	0.7700	116.3824 (77)						

Solar gains	141.3455	240.7638	329.4235	408.1717	457.1863	453.8801	437.5889	401.0218	356.6960	266.0952	169.2994	120.9623 (83)
Total gains	385.7724	484.1505	564.4657	629.5515	664.3258	647.5635	622.6941	589.1597	551.9920	475.1625	394.2210	358.1292 (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	52.3919	52.4955	52.5975	53.0819	53.1735	53.6042	53.6042	53.6847	53.4375	53.1735	52.9885	52.7964
alpha	4.4928	4.4997	4.5065	4.5388	4.5449	4.5736	4.5736	4.5790	4.5625	4.5449	4.5326	4.5198
util living area	0.9944	0.9844	0.9606	0.9009	0.7837	0.6105	0.4532	0.4965	0.7290	0.9325	0.9874	0.9959 (86)
MIT	19.6796	19.9235	20.2381	20.5843	20.8361	20.9605	20.9918	20.9877	20.9116	20.5641	20.0439	19.6318 (87)
Th 2	19.8209	19.8230	19.8250	19.8344	19.8361	19.8444	19.8444	19.8459	19.8412	19.8361	19.8326	19.8288 (88)
util rest of house	0.9925	0.9794	0.9479	0.8696	0.7210	0.5139	0.3379	0.3777	0.6375	0.9038	0.9825	0.9946 (89)
MIT 2	19.6414	18.8839	19.1914	19.5221	19.7354	19.8281	19.8425	19.8428	19.7987	19.5143	19.0126	18.6002 (90)
Living area fraction	19.2220	19.4653	19.7767	20.1161	20.3509	20.4614	20.4852	20.4831	20.4211	20.1014	19.5893	19.1772 (92)
Temperature adjustment	adjusted MIT	19.2220	19.4653	19.7767	20.1161	20.3509	20.4614	20.4852	20.4831	20.4211	20.1014	19.5893
adjusted MIT	19.2220	19.4653	19.7767	20.1161	20.3509	20.4614	20.4852	20.4831	20.4211	20.1014	19.5893	19.1772 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	382.4061	473.2439	534.6953	552.7494	498.5434	367.1641	250.7112	261.8214	378.5593	433.0431	386.7985	355.8217 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.4000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	994.8750	969.1762	881.7231	738.0775	568.2949	381.9515	253.1778	265.6698	413.1904	624.1621	823.3103	990.9017 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	455.6768	333.2665	258.1887	133.4362	51.8951	0.0000	0.0000	0.0000	0.0000	142.1925	314.2885	472.4996 (98)
Space heating												2161.4439 (98)
Space heating per m2										(98) / (4) =		42.9711 (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	16.4000	16.4000	14.1000	10.6000	7.1000	4.2000
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	612.5405	482.2127	494.3026	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9174	0.9566	0.9446	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	561.9365	461.3032	467.0872	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	821.1665	790.8801	752.6286	0.0000	0.0000	0.0000	0.0000 (103)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000 (103a)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	186.6456	245.2052	212.4428	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												644.2936 (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												

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 46.6614 61.3013 53.1107 0.0000 0.0000 0.0000 0.0000 (107)

Space cooling 161.0734 (107)
Space cooling per m2 3.2023 (108)
Energy for space heating 42.9711 (99)
Energy for space cooling 3.2023 (108)
Total 46.1733 (109)
Target Fabric Energy Efficiency (TFEE) 53.1 (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		Storey height		Volume							
	m2		m		m3							
Ground floor	50.3000 (1b)		x	2.5000 (2b)	=	125.7500 (1b) - (3b)						
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.3000											
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)		=	125.7500 (5)						

2. Ventilation rate												

	main heating		secondary heating		other		total		m3 per hour			
	0		0		0		0		0.0000 (6a)			
Number of chimneys	0		0		0		0		0.0000 (6b)			
Number of open flues	0		0		0		0		0.0000 (7a)			
Number of intermittent fans	0		0		0		0		0.0000 (7b)			
Number of passive vents	0		0		0		0		0.0000 (7c)			
Number of fuelless gas fires	0		0		0		0		0.0000 (7c)			

Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =						Air changes per hour		0.0000 / (5) = 0.0000 (8)			
Pressure test									Yes			
Measured/design AP50									4.0000			
Infiltration rate									0.2000 (18)			
Number of sides sheltered									3 (19)			

Shelter factor					(20) = 1 - [0.075 x (19)] =		0.7750 (20)					
Infiltration rate adjusted to include shelter factor					(21) = (18) x (20) =		0.1550 (21)					

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	4.6000	4.3000	4.4000	4.0000	4.0000	3.5000	3.6000	3.8000	3.7000	3.9000	3.9000	4.3000 (22)
Adj infiltr rate	1.1500	1.0750	1.1000	1.0000	1.0000	0.8750	0.9000	0.9500	0.9250	0.9750	0.9750	1.0750 (22a)
Balanced mechanical ventilation with heat recovery	0.1783	0.1666	0.1705	0.1550	0.1550	0.1356	0.1395	0.1473	0.1434	0.1511	0.1511	0.1666 (22b)
If mechanical ventilation:												
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.3633	0.3516	0.3555	0.3400	0.3400	0.3206	0.3245	0.3323	0.3284	0.3361	0.3361	0.3516 (25)

3. Heat losses and heat loss parameter												

Element	Gross		Openings		NetArea		U-value		A x U		K-value	
	m2		m2		m2		W/m2K		W/K		kJ/m2K	
Opening Type 1 (Uw = 0.90)												
External Wall	43.5100		14.0400		29.4700		0.8687		12.1969		279.278 (27)	
Roof	50.3000				50.3000		0.1400		7.0420		31.278 (29a)	
Total net area of external elements Aum(A, m2)					93.8100						(30)	
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =		26.3117		(33)		(31)	
Wall to Corridor					4.0900		0.0000		0.0000		(32)	
Party Wall					13.2900		0.0000		0.0000		(32)	
Wall to stairs/lift					28.2200		0.0000		0.0000		(32)	
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K											250.0000 (35)	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)											11.2423 (36)	
Total fabric heat loss									(33) + (36) =		37.5540 (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	15.0740	14.5916	14.7524	14.1092	14.1092	13.3051	13.4659	13.7875	13.6267	13.9483	13.9483	14.5916 (38)
Average = Sum(39)m / 12 =	52.1456	52.3064	51.6632	51.6632	50.8591	51.0199	51.3416	51.1808	51.5024	51.5024	52.1456 (39)	51.6632 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0463	1.0367	1.0399	1.0271	1.0271	1.0111	1.0143	1.0207	1.0175	1.0239	1.0239	1.0367 (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												
Average daily hot water use (litres/day)												
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	86.3208	83.1818	80.0429	76.9039	73.7650	70.6261	70.6261	73.7650	76.9039	80.0429	83.1818	86.3208 (44)
Energy conte	128.0112	111.9594	115.5321	100.7237	96.6467	83.3988	77.2812	88.6814	89.7405	104.5839	114.1615	123.9702 (45)
Energy content (annual)	Total = Sum(45)m = 1234.6923 (45)											
Distribution loss (46)m = 0.15 x (45)m	19.2017	16.7939	17.3298	15.1085	14.4970	12.5098	11.5922	13.3022	13.4611	15.6876	17.1242	18.5958 (46)



FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF HEAT DEMAND 09 Jan 2014

Water storage loss:													3.0000 (47)
Store volume													
b) If manufacturer declared loss factor is not known :													
Hot water storage loss factor from Table 2 (kWh/litre/day)													
Volume factor from Table 2a													
Temperature factor from Table 2b													
Enter (49) or (54) in (55)													
Total storage loss													
6.7353 6.0835 6.7353 6.5180 6.7353 6.5180 6.7353 6.7353 6.5180 6.7353 6.5180 6.7353 (56)													
If cylinder contains dedicated solar storage													
6.7353 6.0835 6.7353 6.5180 6.7353 6.5180 6.7353 6.7353 6.5180 6.7353 6.5180 6.7353 (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													
158.089 139.0541 145.5298 129.7537 126.6444 112.4288 107.2789 118.6790 118.7705 134.5816 143.1915 153.9697 (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)													
Output from w/h 158.089 139.0541 145.5298 129.7537 126.6444 112.4288 107.2789 118.6790 118.7705 134.5816 143.1915 153.9697 (64)													
RHI water heating demand													
Heat gains from water heating, kWh/month													
66.5619 58.9023 62.4126 56.7146 56.1332 50.9541 49.6942 53.4847 53.0627 58.7723 61.1827 65.2188 (65)													
1589 (64)													
Solar input (sum of months) = Sum(63)m = 0.0000 (63)													
Total per year (kWh/year) = Sum(64)m = 1587.8909 (64)													
65.2188 (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 101.9362 101.9362 101.9362 101.9362 101.9362 101.9362 101.9362 101.9362 101.9362 101.9362 101.9362 (66)													
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
32.9885 29.3041 32.4286 18.0398 13.4849 11.3845 12.3014 15.9898 21.4615 27.2503 31.8052 33.9055 (67)													
Appliances gains (calculated in Appendix L, equation L10 or L13a), also see Table 5													
220.9151 223.2075 217.4037 205.1326 189.6084 175.0179 165.2075 162.9781 168.7549 181.0530 196.5772 211.1677 (68)													
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
46.8926 46.8926 46.8926 46.8926 46.8926 46.8926 46.8926 46.8926 46.8926 46.8926 46.8926 46.8926 (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)													
-67.9575 -67.9575 -67.9575 -67.9575 -67.9575 -67.9575 -67.9575 -67.9575 -67.9575 -67.9575 -67.9575 -67.9575 (71)													
Water heating gains (Table 5)													
89.4649 87.6522 83.8879 78.7703 75.4478 70.7696 66.7932 71.8880 73.6982 78.9950 84.9760 87.6597 (72)													
Total internal gains 424.2399 421.0312 406.0184 382.8139 359.4125 338.0433 325.2365 331.7273 344.7860 368.1697 394.2296 413.6043 (73)													

6. Solar gains													

(Jan) Area m2 Solar flux Table 6a g Specific data or Table 6b FF Specific data or Table 6c Access factor Table 6d Gains W													
Southeast 2.4800 39.1209 0.4000 0.8000 0.7700 21.5151 (77)													
Southwest 11.5600 39.1209 0.4000 0.8000 0.7700 106.2883 (78)													
Solar gains 121.8034 186.1838 256.0467 331.1262 360.4193 384.7329 371.5402 346.3019 307.2698 224.7829 150.6267 106.8164 (83)													
Total gains 546.0433 607.2150 662.0650 713.9401 719.8317 722.7762 696.7766 678.0292 652.0557 592.9526 544.8563 520.4266 (84)													

7. Mean internal temperature (heating season)													

Temperature during heating periods in the living area from Table 9, Th1 (C)													
Utilisation factor for gains for living area, n1, m (see Table 9a)													
tau 66.3726 66.9866 66.7807 67.6121 67.6121 68.6810 68.4645 68.0356 68.2494 67.8232 67.8232 66.9866													
alpha 5.4248 5.4658 5.4520 5.5075 5.5075 5.5787 5.5643 5.5357 5.5500 5.5215 5.5215 5.4658													
util living area 0.9605 0.9336 0.8622 0.7216 0.5365 0.3233 0.1830 0.2044 0.4218 0.7210 0.9125 0.9668 (86)													
MIT 20.4357 20.5697 20.7721 20.9282 20.9877 20.9994 21.0000 21.0000 20.9974 20.9410 20.7002 20.4084 (87)													
Th 2 20.0449 20.0529 20.0502 20.0608 20.0608 20.0741 20.0714 20.0661 20.0688 20.0633 20.0633 20.0529 (88)													
util rest of house 0.9495 0.9169 0.8309 0.6722 0.4737 0.2584 0.1151 0.1337 0.3501 0.6611 0.8878 0.9574 (89)													
MIT 2 19.4149 19.5321 19.7972 19.9927 20.0521 20.0739 20.0714 20.0661 20.0675 20.0126 19.7216 19.3101 (90)													
Living area fraction 19.9536 20.1124 20.3424 20.5158 20.5753 20.5915 20.5907 20.5884 20.5875 20.5318 20.2689 19.9425 (91)													
Temperature adjustment 0.0000													
adjusted MIT 19.9536 20.1124 20.3424 20.5158 20.5753 20.5915 20.5907 20.5884 20.5875 20.5318 20.2689 19.9425 (93)													

8. Space heating requirement													

Utilisation 0.9483 0.9180 0.8411 0.6968 0.5084 0.2947 0.1531 0.1733 0.3902 0.6920 0.8938 0.9559 (94)													
Useful gains 517.9318 557.4490 556.8801 497.4739 365.9863 213.0101 106.6656 177.4823 254.4118 410.3010 486.9706 497.4994 (95)													
Ext. temp. 5.4000 5.8000 7.8000 10.3000 13.4000 16.4000 18.3000 18.3000 15.6000 12.1000 8.3000 5.4000 (96)													
Heat loss rate W 765.9247 746.3282 656.0465 527.7825 370.6994 213.1757 106.6682 117.4882 255.2646 434.2587 616.4266 757.3875 (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 (98)													
Space heating kWh 184.5812 126.9268 73.7798 21.8221 3.5065 0.0000 0.0000 0.0000 0.0000 17.8245 93.2083 193.3400 (98)													
Space heating RHI space heating demand 715.0433 715.0433 715.0433 715.0433 715.0433 715.0433 715.0433 715.0433 715.0433 715.0433 715.0433 715.0433 (99)													

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF HEAT DEMAND 09 Jan 2014

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 (m2)	Storey height (m)	Volume (m3)
Ground floor	50.3000 (1b)	x 2.5000 (2b)	= 125.7500 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.3000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 125.7500 (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)					
							Air changes per hour					
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =						0.0000	(5) = 0.0000 (8)					
Pressure test							Yes					
Measured/design AP50							4.0000					
Infiltration rate							0.2000 (18)					
Number of sides sheltered							3 (19)					
Shelter factor						(20) = 1 - [0.075 x (19)] =	0.7750 (20)					
Infiltration rate adjusted to include shelter factor						(21) = (18) x (20) =	0.1550 (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 infiltr rate	0.1976	0.1938	0.1899	0.1705	0.1666	0.1473	0.1473	0.1434	0.1550	0.1666	0.1744	0.1821 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.3826	0.3788	0.3749	0.3555	0.3516	0.3323	0.3323	0.3284	0.3400	0.3516	0.3594	0.3671 (25)
	63.0000 (23c)											

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					
Opening Type 1 (Uw = 0.90)			14.0400	0.8687	12.1969		(27)					
External Wall	43.5100	14.0400	29.4700	0.2400	7.0728		(29a)					
Roof	50.3000		50.3000	0.1400	7.0420		(30)					
Total net area of external elements Aum(A, m ²)			93.8100				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		26.3117		(33)					
Wall to Corridor			4.0900	0.0000	0.0000		(32)					
Party Wall			13.2900	0.0000	0.0000		(32)					
Wall to stairs/lift			28.2200	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							11.2423 (36)					
Total fabric heat loss						(33) + (36) =	37.5540 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 15.8780	Feb 15.7172	Mar 15.5564	Apr 14.7524	May 14.5916	Jun 13.7875	Jul 13.7875	Aug 13.6267	Sep 14.1092	Oct 14.5916	Nov 14.9132	Dec 15.2348 (38)
Heat transfer coeff	53.4320	53.2712	53.1104	52.3064	52.1456	51.3416	51.3416	51.1808	51.6632	52.1456	52.4672	52.7888 (39)
Average = Sum(39)m / 12 =												52.2662 (39)
HLP	Jan 1.0623	Feb 1.0591	Mar 1.0559	Apr 1.0399	May 1.0367	Jun 1.0207	Jul 1.0207	Aug 1.0175	Sep 1.0271	Oct 1.0367	Nov 1.0431	Dec 1.0495 (40)
HLP (average)												1.0391 (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													1.6989 (42)
Average daily hot water use (litres/day)													78.4734 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	86.3208	83.1818	80.0429	76.9039	73.7650	70.6261	70.6261	73.7650	76.9039	80.0429	83.1818	86.3208 (44)	
Energy conte	128.0112	111.9594	115.5321	100.7237	96.6467	83.3988	77.2812	88.6814	89.7405	104.5839	114.1615	123.9720 (45)	
Energy content (annual)													Total = Sum(45)m = 1234.6923 (45)
Distribution loss (46)m = 0.15 x (45)m	19.2017	16.7939	17.3298	15.1085	14.4970	12.5098	11.5922	13.3022	13.4611	15.6876	17.1242	18.5958 (46)	



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[illegible]

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
(66m)	101.9362	101.9362	101.9362	101.9362	101.9362	101.9362	101.9362	101.9362	101.9362	101.9362	101.9362	101.9362 (66)
Lighting gains (calculated in Appendix L, equation 19 or 19a), also see Table 5	22.487	29.1033	22.487	22.487	13.4849	11.3845	12.1014	15.9898	21.4615	27.2503	31.8052	33.9055 (67)
Appliances gains (calculated in Appendix L, equation 113 or 113a), also see Table 5	220.9151	223.2075	217.4307	205.1326	189.6084	175.0179	165.2075	162.9781	168.7549	181.0330	196.5772	211.1677 (68)
Cooking gains (calculated in Appendix L, equation 115 or 115a), also see Table 5	46.8926	46.8926	46.8926	46.8926	46.8926	46.8926	46.8926	46.8926	46.8926	46.8926	46.8926	46.8926 (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)	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575 (71)
Water heating gains (Table 5)	89.6449	87.6222	83.8879	78.7103	75.4478	70.7696	66.7932	71.8880	73.6982	78.9950	84.7960	87.6597 (72)
Total internal gains	424.2399	421.0312	406.0184	382.7839	359.4125	338.0433	325.2635	331.7273	344.7680	368.1697	394.2296	413.4703 (73)

6. Solar gains

[Jan		Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6c	FF Specific data or Table 6c	Access factor Table 6d	Gains W					
Southeast		2.4800	36.7938	0.4000	0.8000	0.7700	20.2353 (77)					
Southwest		11.5600	36.7938	0.4000	0.8000	0.7700	94.3227 (77)					
Total gains	114.5580	195.1346	266.9917	330.8157	370.5411	367.8616	354.6578	289.0955	215.6683	137.2141	98.3278 (83)	
Total gains	538.7979	616.1658	673.0101	713.6296	729.9536	705.9049	679.8943	656.7481	633.8815	583.8350	531.4437	511.6420 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living areas from Table 9, T_{li} (C)												21.0000 (85)
Utilisation factor for gains for living area, $n_{li,m}$ (see Table 9)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	0.5353	0.5312	0.5787	0.6765	0.6656	0.6836	0.6866	0.6121	0.6466	0.6658	0.6658	0.6104
alpha	0.5353	0.5312	0.5846	0.4520	0.4546	0.5337	0.5337	0.5500	0.5075	0.5075	0.4384	0.4114
util living area	0.9723	0.9457	0.8942	0.7902	0.6387	0.4618	0.3318	0.3577	0.5518	0.8125	0.9442	0.9778 (86)
MIT	0.20309	0.4780	0.6803	0.8685	0.9643	0.9951	0.9994	0.9990	0.9872	0.8705	0.5668	0.2648 (87)
Tn 2	0.0318	0.0344	0.0370	0.0502	0.0529	0.0661	0.0661	0.0668	0.0608	0.0529	0.0476	0.0243 (88)
util rest of house	0.9648	0.9321	0.8698	0.7490	0.5819	0.3962	0.2616	0.2857	0.4811	0.7659	0.9279	0.9191 (89)
MIT 2	0.19319	0.3896	0.6054	0.9143	0.9226	0.9632	0.9659	0.9824	0.9524	0.8274	0.5822	0.2592 (90)
Living area fraction	0.19319	0.3896	0.6054	0.9143	0.9226	0.9632	0.9659	0.9824	0.9524	0.8274	0.5822	0.2592 (91)
adjusted MIT	19.7894	19.9983	0.2330	0.4479	0.5492	0.5844	0.5879	0.5889	0.5752	0.4538	0.2090	19.7503 (92)
Temperature adjustment	19.7894	19.9983	0.2330	0.4479	0.5492	0.5844	0.5879	0.5889	0.5752	0.4538	0.2090	19.7503 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilization	0.9626	0.9316	0.8752	0.7669	0.6122	0.4328	0.3009	0.3260	0.5203	0.7867	0.9291	0.9693 (94)
Useful gains	518,624.74	573,992.97	589,025.29	547,312.52	446,855.55	305,536.30	254,599.24	214,091.91	329,778.33	459,330.69	493,746.88	495,958.58 (95)
Useful loss rate	61.3000	4.3000	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												
	827.6305	804.3045	729.3661	604.0291	461.4481	307.2470	204.7463	214.3885	334.5284	513.8333	682.5479	820.8791 (97)
Month factor	1.0000	1.0000	1.0000	1.0000	1.0000	0.9000	0.8000	0.8000	0.8000	1.0000	1.0000	1.0000 (98)
Space heating kWh	229.8983	154.7665	104.4157	40.8362	10.8569	0.0000	0.0000	0.0000	0.0000	40.5706	135.9368	241.7409 (98)
Space heating per m2												259.0219 (98)
											(98) / (4) =	19.0660 (99)



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8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community Boilers	1.0000 (302)
Fraction of heat from community Boilers	0.2500 (303a)
Fraction of heat from community Combined Heat and Power	0.7500 (303b)
Fraction of total space heat from community Boilers	0.2500 (304a)
Fraction of total space heat from community Combined Heat and Power	0.7500 (304b)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.0500 (306)
Space heating:	
Annual space heating requirement	959.0219 (398)
Space heat from Boilers (98) $\times 0.25 \times 1.00 \times 1.05$	351.7433 (397a)
Space heat from Combined Heat and Power = (98) $\times 0.75 \times 1.00 \times 1.05$	755.2298 (397b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix B)	0.0000 (398)
Operating fuel for secondary/supplementary system	0.0000 (399)

Water heating

Annual water heating requirement	1587.8909 (64)
Water heat from Boilers = (64) x 0.25 x 1.00 x 1.05	416.8214 (310a)
Water heat from Combined Heat and Power = (64) x 0.75 x 1.00 x 1.05	1250.4641 (310b)
Electricity used for heat distribution	26.7626 (313)
Annual totals kWh/year	

Electricity for pumps and fans:

(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.8000)
mechanical ventilation SFP (GPD = 0.8000)

Total electricity for the above, kWh/year

Electricity for lighting (calculated in Appendix L)

Total delivered energy for all uses

10b. Fuel costs - using Table 12 prices

	Fuel	Fuel price p/kWh	Fuel cost £/year
Space heating from Boilers	251.7433	4.2400	10.6739 (340a)
Space heating from Combined Heat and Power	755.2888	2.9700	22.4303 (340b)
Space heating - secondary	0.0000	0.0000	0.0000 (341)
Water heating from Boilers	416.8214	4.2400	17.6732 (342a)
Water heating from Combined Heat and Power	1250.4641	2.9700	37.1388 (342b)
Mechanical ventilation fans	122.7320	13.1900	16.1884 (349)
Pumps and fans for heating	0.0000	0.0000	0.0000 (349)
Energy for lighting	233.0362	13.1900	30.7375 (350)
Additional standing charges			120.0000 (351)
Total energy cost			£84,842.1 (355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):
Energy cost factor (ECF)

Energy cost factor (ECF)
SAP value

SAP rating (Section 12)
SAP band

SAP band

12b. Carbon dioxide emissions - Community heating schemes

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Boilers			95.0000 (367a)
Space heating from Boilers	703.7522	0.2160	152.0105 (367)
Electrical efficiency of CHP unit			38.3000 (361)
Heat efficiency of CHP unit			40.6000 (362)
Space heating from Combined Heat and Power	1860.1719	0.2160	401.7971 (363)
less credit emissions for electricity	-712.4458	0.5190	-369.7594 (364)
Water heating from Combined Heat and Power	3079.9609	0.2160	665.2715 (365)
less credit emissions for electricity	-1179.6250	0.5190	-612.2254 (366)
Electrical energy for heat distribution	26.7426	0.5190	13.8794 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <- DFEE)			250.9738 (373)
Space and water heating			250.9738 (376)
Pumps and fans	122.7320	0.5190	63.6979 (378)
Energy for lighting	233.0362	0.5190	120.9458 (379)
Total kg/year			435.6175 (383)
CO2 emissions per m2			8.6600 (384)
EI value			93.8748 (384a)
EI rating			94 (385)
EI band			A

Calculation of stars for heating and DHW

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

Space heating energy efficiency
0.75 x 2.970 x 1.05
= 3.452, stars = 5
Space heating environmental impact
0.75 x (0.216 - 0.383 x 0.519) x 1.05 / 0.406
= 0.0931, stars = 5
Water heating energy efficiency
Water heating environmental impact

0.25 x 4.240 x 1.05

3.452, stars = 5
0.0931, stars = 5

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 (m2)	Storey height (m)	Volume (m3)
Ground floor	50.3000 (1b)	x 2.5000 (2b)	= 125.7500 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.3000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 125.7500 (5)

2. Ventilation rate

	main		secondary		other	total	m3 per hour					
	heating	main	heating	secondary								
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)					
							Air changes per hour					
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =						0.0000 / (5) =	0.0000 (8)					
Pressure test						Yes						
Measured/design AP50							4.0000					
Infiltration rate							0.2000 (18)					
Number of sides sheltered							3 (19)					
Shelter factor						(20) = 1 - (0.075 x (19)) =	0.7750 (20)					
Infiltration rate adjusted to include shelter factor						(21) = (18) x (20) =	0.1550 (21)					
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	4.6000	4.3000	4.4000	4.0000	4.0000	3.5000	3.6000	3.8000	3.7000	3.9000	3.9000	4.3000 (22)
Adj infiltr rate	1.1500	1.0750	1.1000	1.0000	1.0000	0.8750	0.9000	0.9500	0.9250	0.9750	0.9750	1.0750 (22a)
	0.1783	0.1666	0.1705	0.1550	0.1550	0.1356	0.1395	0.1473	0.1434	0.1511	0.1511	0.1666 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.3633	0.3516	0.3555	0.3400	0.3400	0.3206	0.3245	0.3323	0.3284	0.3361	0.3361	0.3516 (25)
												63.0000 (23c)

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					
Opening Type 1 (Uw = 0.90)							(27)					
External Wall	43.5100	14.0400	14.0400	0.8687	12.1969		(29a)					
Roof	50.3000		50.3000	0.2400	7.0728		(30)					
Total net area of external elements Aum(A, m2)			93.8100	0.1400	7.0420		(31)					
Fabric heat loss, W/K = Sum (A x U)			(26)...	(30) + (32) =	26.3117		(33)					
Wall to Corridor			4.0900	0.0000	0.0000		(32)					
Party Wall			13.2900	0.0000	0.0000		(32)					
Wall to stairs/lift			28.2200	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							11.2423 (36)					
Total fabric heat loss						(33) + (36) =	37.5540 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 15.0740	Feb 14.5916	Mar 14.7524	Apr 14.1092	May 14.1092	Jun 13.3051	Jul 13.4659	Aug 13.7875	Sep 13.6267	Oct 13.9483	Nov 13.9483	Dec 14.5916 (38)
Heat transfer coeff	52.6280	52.1456	52.3064	51.6632	51.6632	50.8591	51.0199	51.3416	51.1808	51.5024	51.5024	52.1456 (39)
Average = Sum(39)m / 12 =												51.6632 (39)
HLP	Jan 1.0463	Feb 1.0367	Mar 1.0399	Apr 1.0271	May 1.0271	Jun 1.0111	Jul 1.0143	Aug 1.0207	Sep 1.0175	Oct 1.0239	Nov 1.0239	Dec 1.0367 (40)
HLP (average)												1.0271 (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												1.6989 (42)
Average daily hot water use (litres/day)												78.4734 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	86.3208	83.1818	80.0429	76.9039	73.7650	70.6261	70.6261	73.7650	76.9039	80.0429	83.1818	86.3208 (44)
Energy conte	128.0112	111.9594	115.5321	100.7237	96.6467	83.3988	77.2812	88.6814	89.7405	104.5839	114.1615	123.9720 (45)
Energy content (annual)												Total = Sum(45)m = 1234.6923 (45)
Distribution loss (46)m = 0.15 x (45)m	19.2017	16.7939	17.3298	15.1085	14.4970	12.5098	11.5922	13.3022	13.4611	15.6876	17.1242	18.5958 (46)



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

Water storage loss:												
Store volume											3,000 (47)	
b) If manufacturer declared loss factor is not known :												
Hot water storage loss factor from Table 2 (kWh/litre/day)											0.0212 (51)	
Volume factor from Table 2a											3.4002 (52)	
Temperature factor from Table 2b											1.0000 (53)	
Enter (49) or (54) in (55)											0.2173 (55)	
Total storage loss												
	6.7353	6.0835	6.7353	6.5180	6.7353	6.5180	6.7353	6.5180	6.7353	6.5180	6.7353 (56)	
If cylinder contains dedicated solar storage	6.7353	6.0835	6.7353	6.5180	6.7353	6.5180	6.7353	6.5180	6.7353	6.5180	6.7353 (57)	
Primary loss	23,210.12	21,012	23,262.4	22,5120	23,262.4	22,5120	23,262.4	22,5120	23,262.4	22,5120	23,262.4 (59)	
Total heat required for water heating calculated for each month												
	158.0089	139.0541	145.5298	129.7537	126.6444	112.4288	107.2789	118.6790	118.7705	134.5816	143.1915	153.9697 (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 (sum of months) = Sum(63)m =												
Output from w/h	158.0089	139.0541	145.5298	129.7537	126.6444	112.4288	107.2789	118.6790	118.7705	134.5816	143.1915	153.9697 (64)
Total per year (kwh/year) = Sum(64)m =												
												1587.8909 (64)
Heat gains from water heating, kWh/month												
	66,5619	58,9023	62,4126	56,7146	56,1332	50,9541	49,6942	53,4847	53,0627	58,7723	61,1827	65,2188 (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	101.9362	101.9362	101.9362	101.9362	101.9362	101.9362	101.9362	101.9362	101.9362	101.9362	101.9362	101.9362 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	32.2937	32.2937	32.2937	32.2937	32.2937	32.2937	12.3014	15.9988	21.4615	27.2503	31.8052	33.9055 (67)
Appliances gains (calculated in Appendix L, equation L10 or L13a), also see Table 5	220.9151	223.2075	217.4307	205.1326	189.6084	175.0179	165.2705	162.9781	168.7549	181.0530	196.5772	211.1677 (68)
Cooking gains (calculated in Appendix L, equation L11 or L15a), also see Table 5	46.8926	46.8926	46.8926	46.8926	46.8926	46.8926	46.8926	46.8926	46.8926	46.8926	46.8926	46.8926 (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.e. evaporation (negative values) (Table 5)	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575	-67.9575 (71)
Water heating gains (Table 5)	89.6449	87.6522	83.8878	78.7703	75.4478	70.7696	66.7932	71.7880	73.6982	78.9950	84.9760	87.6549 (72)
Total internal	424.2399	421.0312	406.0184	382.8139	359.1253	338.0433	325.2365	331.7273	344.7686	368.1967	394.2296	413.6943 (73)

6. Solar gains

[Jan		Area	Solar flux	g	FF	Access	Gains					
		m2	Table 6a	Specific data	Specific data	factor	W					
			W/m2	or Table 6b	or Table 6c	Table 6d						
-----	-----	-----	-----	-----	-----	-----	-----					
Southeast		2.4800	39.1209	0.4000	0.8000	0.7700	21.5151 (77)					
Southwest		11.5600	39.1209	0.4000	0.8000	0.7700	100.2883 (79)					
-----	-----	-----	-----	-----	-----	-----	-----					
Solar gains	121.8034	186.1838	256.0467	331.1262	360.4193	371.5402	346.3019	307.2698	224.7829	150.6267	106.8164 (83)	
Total gains	546.0433	607.2150	662.0650	713.9401	713.9137	722.7762	696.7766	678.0292	652.0557	592.9526	544.8563	520.4206 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th (C)													21.0000 (85)
Utilisation factor for gains for living area, n _{l,rm} (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	66.7276	66.9866	66.7807	67.6121	67.6121	68.6810	68.4643	68.0356	68.2494	67.8232	67.8232	66.9866	
util living area	0.4636	0.4820	0.5075	0.5075	0.5075	0.5237	0.5237	0.5237	0.5000	0.4535	0.4535	0.4636	
adjusted MIT	0.9605	0.9336	0.8622	0.7216	0.5365	0.3233	0.1830	0.2044	0.4218	0.7210	0.9125	0.9668 (66)	
MIT	20.4357	20.5697	20.7721	20.9282	20.9877	20.9994	21.0000	21.0000	20.9974	20.9410	20.7002	20.4284 (87)	
util rest of house	20.0449	20.0529	20.0502	20.0608	20.0608	20.0741	20.0714	20.0661	20.0688	20.0635	20.0635	20.0589 (88)	
MIT	0.9495	0.9169	0.8309	0.7222	0.4737	0.2584	0.1151	0.1337	0.3501	0.6161	0.8878	0.9574 (89)	
utiling area fraction	19.3419	19.5321	19.7972	19.9922	20.0321	20.0739	20.0714	20.0661	20.0675	20.0626	19.7612	19.1305 (90)	
adjusted MIT	19.9536	20.1124	20.3424	20.5158	20.5753	20.5915	20.5907	20.5884	20.5875	20.5318	20.2689	19.9245 (92)	
Temperature adjustment	19.9536	20.1124	20.3424	20.5158	20.5753	20.5915	20.5907	20.5884	20.5875	20.5318	20.2689	19.9245 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9483	0.9180	0.8611	0.6968	0.5084	0.2947	0.1531	0.1733	0.3902	0.6920	0.8938	0.9559 (94)
Uplift gains	517,483.33	557,449.00	556,880.01	497,473.19	365,986.63	213,012.42	151,177.66	184,411.8	313,486.5	410,310.0	497,448.0	497,448.0 (95)
Ext temp.	5.0480	0.8400	0.7800	10.3000	10.3000	16.4000	18.5000	18.5000	15.6000	12.6000	8.9000	5.4000 (96)
Rest less rate %												
Heat	765,924.77	746,328.02	656,046.65	527,782.55	370,699.94	213,175.77	106,668.22	117,488.2	255,266.64	434,258.7	616,426.6	757,3875 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000 (97a)
Space heating kWh												
	184,581.2	126,926.8	73,779.8	21,822.1	3,506.5	0.0000	0.0000	0.0000	0.0000	17,824.5	293,193.3	208,393.0 (98)
Space heating												
Space heating per m ²												
										(98) / (4) =	14.25	715,043.1 (98)



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

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (302)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Boilers	0.2500 (303a)
Fraction of heat from community Combined Heat and Power	0.7500 (303b)
Fraction of total space heat from community Boilers	0.2500 (304a)
Fraction of total space heat from community Combined Heat and Power	0.7500 (304b)
Factor for control and charging method (Table 4c(3)) for community space heating	0.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.0500 (306)
Space heating:	
Annual space heating requirement	715,043 (98)
Space heat from Boilers = (98) x 0.25 x 1.00 x 1.05	187,698 (307a)
Space heat from Combined Heat and Power = (98) x 0.75 x 1.00 x 1.05	563,095 (307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)

Water heating

Annual water heating requirement	1587.8909 (64)
Water heat from Boilers = $(64) \times 0.25 \times 1.00 \times 1.05$	416.8214 (310a)
Water heat from Combined Heat and Power = $(64) \times 0.75 \times 1.00 \times 1.05$	1250.4641 (310b)
Electricity used for heat distribution	24.1808 (313)
Annual totals kWh/year	

Electricity for pumps and fans:

(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.8000)			
mechanical ventilation fans (SFP = 0.8000)		122.7320	(330a)
Total electricity for the above, kWh/year		122.7320	(331)
Electricity for lighting (calculated in Appendix L)		233.0362	(332)
Total delivered energy for all uses		2773.8490	(338)

10b. Fuel costs - using BEDF prices (495)

	Fuel	Fuel price	Fuel cost
	kWh/year	£/kWh	£/year
Space heating from Boilers	187,698	4.4300	8,3151 (340a)
Space heating from Combined Heat and Power	563,0965	3.1000	17,4560 (340b)
Space heating - secondary	0.0000	0.0000	0.0000 (341)
Water heating from Boilers	416,8214	4.4300	18,4652 (342a)
Water heating from Combined Heat and Power	1250.4641	3.1000	38,7644 (342b)
Mechanical ventilation fans	122.7320	19.4600	23,8591 (349)
Pumps and fans for heating	0.0000	0.0000	0.0000 (349)
Energy for Lighting	233.0362	19.4600	45,3022 (350)
Additional standing charges			95,0000 (351)
Total energy cost			247,1620 (353)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Boilers			95,000 (367a)
Space heating from Boilers			137,4488 (367)
Electrical efficiency of CHP unit	636.3370	0.2160	38,3000 (361)
Heat efficiency of CHP unit			40,6000 (362)
Space heating from Combined Heat and Power less credit emissions for electricity	1386.9371 -531.1969	0.2160 0.5190	299,5784 (363) 75,6912 (364)
Water heating from Combined Heat and Power less credit emissions for electricity	3079.9609 -1179.6250	0.2160 0.5190	665,2715 (365) -612,2256 (366)
Electrical energy for heat distribution	24,3808	0.5190	12,5498 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TPFE)			226,9320 (373)
Space and water heating			226,9320 (376)
Pumps and fans	122,7320	0.5190	63,9979 (378)
Energy for Lighting	233,0362	0.5190	120,9458 (379)
Total			411,5757 (383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO ₂ /kWh	Primary energy kWh/year
Efficiency of heat source Boilers			95.0000 (367a)
Space heating from Boilers	636.3370	1.2200	776.3312 (367)
Electrical efficiency of CHP unit			38.3000 (361)
Heat efficiency of CHP unit		1.2200	40.6000 (362)
Space heating from Combined Heat and Power	1386.931	1.2200	1692.0633 (363)
Less credit emissions for electricity	-151.9969	0.3070	-1630.7745 (364)
Space heating from Combined Heat and Power	1234.9341	1.2200	1531.2883 (365)
Less credit emissions for electricity	-1179.6250	0.3070	-3621.4488 (366)
Electrical energy for heat distribution	24.1808	0.3070	74.2351 (372)
Total CO ₂ associated with community systems (negative value allowed since DFEE <= FFEE)			1047.9585 (373)
Space and water heating			1047.3585 (376)
Pumps and fans	122.7320	0.3070	376.7812 (378)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



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

Energy for lighting 233.0362 3.0700 715.4211 (379)
Primary energy kWh/year 2140.1669 (383)
Primary energy kWh/m²/year 42.5480 (384)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating: B 84
Current environmental impact rating: A 94

(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 Not applicable
O Not considered
P Not considered
R Not considered
S Not considered
T Not considered
U Solar photovoltaic panels Not applicable
A2 Not considered
A3 Not considered
T2 Not considered
W Not considered
X Not considered
Y Not considered
J2 Not considered
Q2 Not considered
21 Not considered
22 Not considered
23 Not considered
24 Not considered
25 Not considered
V2 Wind turbine Not applicable
L2 Not considered
Q3 Not considered
O3 Not considered

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

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

Potential energy efficiency rating: B 84
Potential environmental impact rating: A 94

Fuel prices for cost data on this page from database revision number 495 TEST (29 Apr 2022)
Recommendation texts revision number 4.9c (22 Feb 2014)

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

	Current	Potential	Saving
Electricity	£69	£69	£0
Community scheme	£178	£178	£0
Space heating	£145	£145	£0
Water heating	£57	£57	£0
Lighting	£45	£45	£0
Total cost of fuels	£247	£247	£0
Total cost of uses	£247	£247	£0
Delivered energy	55 kWh/m ²	55 kWh/m ²	0 kWh/m ²
Carbon dioxide emissions	0.4 tonnes	0.4 tonnes	0.0 tonnes
CO2 emissions per m ²	8 kg/m ²	8 kg/m ²	0 kg/m ²
Primary energy	43 kWh/m ²	43 kWh/m ²	0 kWh/m ²

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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

No improvements selected / applicable

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

No improvements selected / applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



Property Reference	Flat Type T25 - MID				Issued on Date	01/06/2022
Assessment Reference	BE CLEAN DLF 1.05		Prop Type Ref	03rd Floor - 1B-MAN		
Property	Flat Type T25, London , N8					
SAP Rating	85 B	DER	8.39	TER	17.40	
Environmental	95 A	% DER<TER	51.79			
CO ₂ Emissions (t/year)	0.30	DFEE	26.54	TFEE	33.17	
General Requirements Compliance	Pass	% DFEE<TFEE	20.00			
Assessor Details	Mr. Michael Wride, Michael Wride, Tel: 02036 031 600, Michael@hodkinsonconsultancy.com				Assessor ID	R572-0001
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

Mid-floor flat, total floor area 39 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:Mains gas (c)
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 17.40 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 8.39 kgCO₂/m²OK

1b TFE and DFE
Target Fabric Energy Efficiency (TFEE)33.2 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)26.5 kWh/m²/yrOK

2 Fabric U-values			
Element	Average	Highest	
External wall	0.24 (max. 0.30)	0.24 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	0.90 (max. 2.00)	0.90 (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: 4.00 (design value)
Maximum 10.0 OK

4 Heating efficiency
Main heating system: Community heating scheme -

Secondary heating system: None

5 Cylinder insulation
Hot water storage
Permitted by DBSCG 0.35
Primary pipework insulated: No primary pipework

6 Controls
Space heating controls: Charging system linked to use of community heating, programmer and TRVsOK

Hot water controls: No cylinderstat

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

8 Mechanical ventilation
Continuous supply and extract system
Specific fan power: 0.64
Maximum 1.5 OK
WWR efficiency: 90%
Minimum: 70% OK

9 Summertime temperature
Overheating risk (Thames Valley): Slight OK
Based on:
Overshading: Average
Windows facing North East: 8.26 m², No overhang
Air change rate: 4.00 ach
Blinds/curtains: None

10 Key features
Party wall U-value 0.00 W/m²K
Party wall U-value 0.00 W/m²K
Window U-value 0.90 W/m²K
Community CHP, Mains gas

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	39.1800 (1b)	x 2.5000 (2b)	= 97.9500 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	39.1800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 97.9500 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) = 0.0000 / (5) = 0.0000 (8)
Pressure test
Measured/design AP50
Infiltration rate
Number of sides sheltered
Shelter factor
Infiltration rate adjusted to include shelter factor
(20) = 1 - [0.075 x (19)] = 0.7750 (20)
(21) = (18) x (20) = 0.1550 (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 infiltr rate	0.1976	0.1938	0.1899	0.1705	0.1666	0.1473	0.1473	0.1434	0.1550	0.1666	0.1744	0.1821 (22b)
Balanced mechanical ventilation with heat recovery												0.5000 (23a)
If mechanical ventilation:												63.0000 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.3826	0.3788	0.3749	0.3555	0.3516	0.3323	0.3323	0.3284	0.3400	0.3516	0.3594	0.3671 (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
Opening Type 1 (Uw = 0.90)							(27)
External Wall	18.5500	8.2600	10.2900	0.8687	7.1757	2.4696	(29a)
Total net area of external elements Aum(A, m ²)			18.5500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	9.6453		(33)
Wall to Corridor			15.4500	0.0000	0.0000		(32)
Party Wall			35.1000	0.0000	0.0000		(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K
Thermal bridges (Sum(L x Psi) calculated using Appendix K)
Total fabric heat loss (33) + (36) = 13.0051 (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	12.3678	12.2425	12.1173	11.4910	11.3658	10.7395	10.7395	10.6142	10.9900	11.3658	11.6163	11.8668 (38)
Heat transfer coeff	25.3729	25.2476	25.1223	24.4961	24.3708	23.7446	23.7446	23.6193	23.9951	24.3708	24.6213	24.8718 (39)
Average = Sum(39)m / 12 =												24.4648 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.6476	0.6444	0.6412	0.6252	0.6220	0.6060	0.6060	0.6028	0.6124	0.6220	0.6284	0.6348 (40)
HLP (average)												0.6244 (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												
Average daily hot water use (litres/day)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	77.6797	74.8550	72.0303	69.2055	66.3808	63.5561	63.5561	66.3808	69.2055	72.0303	74.8550	77.6797 (44)
Energy conte	115.1967	100.7518	103.9668	90.6408	86.9720	75.0502	69.5451	79.8040	80.7571	94.1146	102.7335	111.5619 (45)
Energy content (annual)										Total = Sum(45)m =		1111.0945 (45)
Distribution loss (46)m = 0.15 x (45)m												
	17.2795	15.1128	15.5950	13.5961	13.0458	11.2575	10.4318	11.9706	12.1136	14.1172	15.4100	16.7343 (46)
Water storage loss:												
Store volume												3.0000 (47)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

b) If manufacturer declared loss factor is not known : Hot water storage loss factor from Table 2 (kWh/litre/day)	0.0212 (51)
Volume factor from Table 2a	3.4200 (52)
Temperature factor from Table 2b	1.0000 (53)
Enter (49) or (54) in (55)	0.2173 (55)
Total storage loss	
6.7353 6.0835 6.7353 6.5180 6.7353 6.5180 6.7353 6.7353 6.5180 6.7353 6.5180 6.7353 (56)	
If cylinder contains dedicated solar storage	
6.7353 6.0835 6.7353 6.5180 6.7353 6.5180 6.7353 6.5180 6.7353 6.5180 6.7353 (57)	
Primary loss	23.2624 21.0112 23.2624 22.5120 23.2624 22.5120 23.2624 22.5120 23.2624 22.5120 23.2624 (59)
Total heat required for water heating calculated for each month	
145.1944 127.8465 133.9645 119.6708 116.9697 104.0803 99.5428 109.8017 109.7871 124.1123 131.7635 141.5596 (62)	
Solar input	0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (63)
Solar input (sum of months) = Sum(63)m =	0.0000 (63)
Output from w/h	
145.1944 127.8465 133.9645 119.6708 116.9697 104.0803 99.5428 109.8017 109.7871 124.1123 131.7635 141.5596 (64)	
Total per year (kWh/year) = Sum(64)m =	1464.2931 (64)
Heat gains from water heating, kWh/month	
62.3011 55.1757 58.5671 53.3621 52.9163 48.1782 47.1219 50.5330 50.0758 55.2913 57.3829 61.0925 (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) 69.2358 69.2358 69.2358 69.2358 69.2358 69.2358 69.2358 69.2358 69.2358 69.2358 69.2358 (66)	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	
10.6778 9.4839 7.7128 5.8391 4.3648 3.6850 3.9817 5.1756 6.9467 8.8204 10.2947 10.9746 (67)	
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	
119.4768 120.7166 117.3923 110.9412 102.5453 94.6544 89.3827 88.1429 91.2672 97.9183 106.3142 114.2051 (68)	
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	
29.9236 29.9236 29.9236 29.9236 29.9236 29.9236 29.9236 29.9236 29.9236 29.9236 29.9236 29.9236 (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)	
-55.3886 -55.3886 -55.3886 -55.3886 -55.3886 -55.3886 -55.3886 -55.3886 -55.3886 -55.3886 -55.3886 -55.3886 (71)	
Water heating gains (Table 5)	
83.7380 82.1067 78.7193 74.1140 71.1241 66.9142 63.3359 67.9207 69.5497 74.3162 79.6985 82.1135 (72)	
Total internal gains	257.6633 256.0780 247.7952 234.6650 221.8050 209.0243 200.4711 205.0099 211.5343 224.8257 240.0781 251.0640 (73)

6. Solar gains	
[Jan]	
Area m2	
Solar flux Table 6a W/m2	
Specific data or Table 6b	
Specific data or Table 6c	
Access factor Table 6d	
Gains W	
Northeast	8.2600 11.2829 0.4000 0.8000 0.7700 20.6674 (75)

Solar gains	20.6674 42.0691 75.7951 124.4773 167.3219 178.3829 166.8735 133.0335 92.3575 51.4117 26.0049 16.8780 (83)
Total gains	278.3307 298.1470 323.5902 359.1423 389.1269 387.4071 367.3446 338.0434 303.8917 276.2374 266.0830 267.9420 (84)

7. Mean internal temperature (heating season)	
Temperature during heating periods in the living area from Table 9, Thl (C)	
Utilisation factor for gains for living area, nil,m (see Table 9a)	
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	
tau 107.2340 107.7660 108.3033 111.0722 111.6430 114.5877 114.5877 115.1953 113.3914 111.6430 110.5071 109.3941	
alpha 8.1489 8.1844 8.2202 8.4048 8.4429 8.6392 8.6392 8.6797 8.5594 8.4429 8.3671 8.2929	
util living area 0.9886 0.9776 0.9365 0.7909 0.5799 0.3922 0.2844 0.3214 0.5434 0.8518 0.9701 0.9908 (86)	
MIT 20.6080 20.6963 20.8382 20.9673 20.9974 20.9989 21.0000 21.0000 20.9989 20.9818 20.7772 20.5970 (87)	
Th 2 20.3874 20.3902 20.3931 20.4074 20.4102 20.4246 20.4246 20.4274 20.4188 20.4102 20.4045 20.3988 (88)	
util rest of house 0.9855 0.9719 0.9221 0.7603 0.5440 0.3570 0.2472 0.2814 0.4983 0.8193 0.9616 0.9884 (89)	
MIT 2 19.8700 19.9984 20.1971 20.3731 20.4080 20.4245 20.4246 20.4274 20.4181 20.3607 20.1263 19.8638 (90)	
Living area fraction 20.2437 20.3518 20.5218 20.6740 20.7064 20.7159 20.7160 20.7174 20.7122 20.6600 20.4559 20.2351 (92)	
MIT 20.2437 20.3518 20.5218 20.6740 20.7064 20.7159 20.7160 20.7174 20.7122 20.6600 20.4559 20.2351 (93)	
Temperature adjustment	
adjusted MIT	

8. Space heating requirement	
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	
Utilisation 0.9847 0.9715 0.9254 0.7744 0.5621 0.3748 0.2660 0.3017 0.5211 0.8336 0.9624 0.9876 (94)	
Useful gains 274.0674 289.6432 299.4453 278.1164 218.7297 145.2003 97.7307 101.9711 158.3681 230.2715 256.0723 264.6113 (95)	
Ext temp. 4.3000 4.9000 6.5000 8.9000 11.7000 14.6000 16.4000 16.4000 14.6000 10.6000 7.1000 4.2000 (96)	
Heat loss rate W 404.5370 390.1214 352.2595 288.4167 219.4941 145.2192 97.7315 101.9732 158.6596 245.1708 328.8398 398.8221 (97)	
Month fracti 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 (97a)	
Space heating kWh 97.0694 67.5213 39.2938 7.4162 0.5687 0.0000 0.0000 0.0000 0.0000 11.0851 52.3926 99.8529 (98)	
Space heating 375.2000 (98)	
Space heating per m2 (98) / (4) = 9.5763 (99)	

8c. Space cooling requirement

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Not applicable

9b. Energy requirements	
Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Boilers	0.2500 (303a)
Fraction of heat from community Combined Heat and Power	0.7500 (303b)
Fraction of total space heat from community Boilers	0.2500 (304a)
Fraction of total space heat from community Combined Heat and Power	0.7500 (304b)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.0500 (306)
Space heating:	
Annual space heating requirement	375.2000 (98)
Space heat from Boilers = (98) x 0.25 x 1.00 x 1.05	98.4900 (307a)
Space heat from Combined Heat and Power = (98) x 0.75 x 1.00 x 1.05	295.4700 (307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)

Water heating	
Annual water heating requirement	1464.2931 (64)
Water heat from Boilers = (64) x 0.25 x 1.00 x 1.05	384.3770 (310a)
Water heat from Combined Heat and Power = (64) x 0.75 x 1.00 x 1.05	1153.1309 (310b)
Electricity used for heat distribution	19.3147 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(Balanced)HeatRecovery, Database: in-use factor = 1.2500, SFP = 0.8000)	
mechanical ventilation fans (SFP = 0.8000)	95.5992 (330a)
Total electricity for the above, kWh/year	95.5992 (331)
Electricity for lighting (calculated in Appendix L)	188.5731 (332)
Total delivered energy for all uses	2215.6402 (338)

12b. Carbon dioxide emissions - Community heating scheme	
Energy kWh/year	508.2810
Emission factor kg CO2/kWh	0.2160
Emissions kg CO2/year	95.0000 (367a)
Space heating from Boilers	109.7887 (367)
Electrical efficiency of CHP unit	38.3000 (361)
Heat efficiency of CHP unit	40.6000 (362)
Space heating from Combined Heat and Power	157.1959 (363)
less credit emissions for electricity	-144.6617 (364)
Water heating from Combined Heat and Power	613.4883 (365)
less credit emissions for electricity	-564.5712 (366)
Electrical energy for heat distribution	10.0243 (372)
Total CO2 associated with community systems (negative value allowed since DPSE <= TPSE)	181.2644 (373)
Space and water heating	181.2644 (376)
Pumps and fans	49.6160 (378)
Energy for lighting	97.8695 (379)
Total CO2, kg/year	328.7498 (383)
Dwelling Carbon Dioxide Emission Rate (DER)	8.3900 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES	
DER	
Total Floor Area	8.3900 2C1
Assumed number of occupants	1.3847
CO2 emission factor in Table 12 for electricity displaced from grid	0.5190
CO2 emissions from appliances, equation (L14)	18.0703 2C2
CO2 emissions from cooking, equation (L16)	3.8855 2C3
Total CO2 emissions	30.3458 2C4
Residual CO2 emissions offset from biofuel CHP	0.0000 2C5
Additional allowable electricity generation, kWh/m²/year	0.0000 2C6
Resulting CO2 emissions offset from additional allowable electricity generation	0.0000 2C7
Net CO2 emissions	30.3458 2C8

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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													

Ground floor				Area	Storey height			Volume					
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	39.1800			(m2)	39.1800 (1b)	x	2.5000 (2b)	=	97.9500 (1b) - (3b)				
Dwelling volume					(3a)+(3b)+(3c)+(3d)+(3e)...(3n)			=	97.9500 (5)				

2. Ventilation rate													

Number of chimneys			main heating	secondary heating	other		total		m3 per hour				
Number of open flues			0	+	0	+	0	=	0 * 40 =	0.0000 (6a)			
Number of intermittent fans			0	+	0	+	0	=	0 * 20 =	0.0000 (6b)			
Number of passive vents			0		0		0		2 * 10 =	20.0000 (7a)			
Number of fuelless gas fires			0		0		0		0 * 10 =	0.0000 (7b)			
			0		0		0		0 * 40 =	0.0000 (7c)			
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =			20.0000		/ (5) =		0.2042 (8)					
Pressure test								Yes		5.0000			
Measured/design AFS0								Infiltration rate		0.4542 (18)			
Number of sides sheltered								(20) = 1 - [0.075 x (19)] =		0.7750 (20)			
Shelter factor								(21) = (18) x (20) =		0.3520 (21)			
Infiltration rate adjusted to include shelter factor													
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Adj infiltr rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Effective ac	0.4488	0.4400	0.4312	0.3872	0.3784	0.3344	0.3344	0.3256	0.3520	0.3784	0.3960	0.4136	(22b)
	0.6007	0.5968	0.5930	0.5750	0.5716	0.5559	0.5559	0.5530	0.5619	0.5716	0.5784	0.5855	(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/m2K				
TER Opening Type (Uw = 1.40)			18.5500	8.2600	8.2600	1.3258	10.9508			(27)			
External Wall					10.2900	0.1800	1.8522			(29a)			
Total net area of external elements Aum(A, m2)					18.5500					(31)			
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =		12.8030	(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000		(35)			
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								1.7898		(36)			
Total fabric heat loss								(33) + (36) =		14.5928 (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	19.4170	19.2906	19.1667	18.5847	18.4758	17.9689	17.9689	17.8751	18.1642	18.4758	18.6961	18.9264	(38)
Heat transfer coeff	34.0097	33.8833	33.7594	33.1775	33.0686	32.5617	32.5617	32.4678	32.7569	33.0686	33.2888	33.5191	(39)
Average = Sum(39)m / 12 =							33.1769	(39)					
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	0.8680	0.8648	0.8616	0.8468	0.8440	0.8311	0.8311	0.8287	0.8361	0.8440	0.8496	0.8555	(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							1.3847	(42)					
Average daily hot water use (litres/day)							67.0870	(43)					
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	73.7957	71.1122	68.4287	65.7453	63.0618	60.3783	60.3783	63.0618	65.7453	68.4287	71.1122	73.7957	(44)
Energy content (annual)	109.4369	95.7142	98.7685	86.1088	82.6234	71.2977	66.0678	75.8138	76.7192	89.4089	97.5968	105.9838	(45)
Distribution loss (46)m = 0.15 x (45)m							Total = Sum(45)m =	1055.5398 (45)					
Water storage loss:	16.4155	14.3571	14.8153	12.9163	12.3935	10.6947	9.9102	11.3721	11.5079	13.4113	14.6395	15.8976	(46)
Store volume							3.0000	(47)					
a) If manufacturer declared loss factor is known (kWh/day):							0.2602	(48)					
Temperature factor from Table 2b							0.5400	(49)					
Enter (49) or (54) in (55)							0.1405	(55)					
Total storage loss	4.3553	3.9338	4.3553	4.2148	4.3553	4.2148	4.3553	4.3553	4.2148	4.3553	4.2148	4.3553	(56)
If cylinder contains dedicated solar storage													



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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Primary loss	4.3553	3.9338	4.3553	4.2148	4.3553	4.2148	4.3553	4.3553	4.2148	4.3553	4.2148	4.3553	(57)	
Total heat required for water heating calculated for each month	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	(59)	
Solar input	137.0546	120.6592	126.3862	112.8355	110.2411	98.0245	93.6855	103.4315	103.4460	117.0266	124.3236	133.6015	(62)	
Output from w/h	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)	
Heat gains from water heating, kWh/month	137.0546	120.6592	126.3862	112.8355	110.2411	98.0245	93.6855	103.4315	103.4460	117.0266	124.3236	133.6015	(64)	
Total per year (kWh/year) = Sum(64)m =	58.4819	51.7810	54.9347	50.0126	49.5664	45.0879	44.0617	47.3022	46.8906	51.8226	53.8324	57.3337	(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	69.2358	69.2358	69.2358	69.2358	69.2358	69.2358	69.2358	69.2358	69.2358	69.2358	69.2358	69.2358	(66)	
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	10.6778	9.4839	7.7128	5.8391	4.3648	3.6850	3.9817	5.1756	6.9467	8.8204	10.2947	10.9746	(67)	
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	119.4768	120.7166	117.5923	110.9412	102.5453	94.6544	89.3827	88.1429	91.2672	97.9183	106.3142	114.2051	(68)	
Pumps, fans	29.9236	29.9236	29.9236	29.9236	29.9236	29.9236	29.9236	29.9236	29.9236	29.9236	29.9236	29.9236	(69)	
Losses e.g. evaporation (negative values) (Table 5)	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)	
Water heating gains (Table 5)	-55.3886	-55.3886	-55.3886	-55.3886	-55.3886	-55.3886	-55.3886	-55.3886	-55.3886	-55.3886	-55.3886	-55.3886	(71)	
Total internal gains	78.6047	77.0550	73.8369	69.4619	66.6215	62.6221	59.2227	63.5783	65.1258	69.6540	74.7672	77.0615	(72)	
	255.5300	254.0262	245.9128	233.0130	220.3024	207.7322	199.3579	203.6675	210.1104	223.1635	238.1468	249.0119	(73)	
6. Solar gains														
[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	g	Specific data or Table 6c	FF	Access factor Table 6d	Gains W						
Northeast	8.2600	11.2829	0.6300	0.7000	0.7700	28.4822	(75)							
Solar gains	28.4822	57.9764	104.4551	171.5453	230.5905	245.8339	229.9725	183.3368	127.2802	70.8518	35.8380	23.2600	(83)	
Total gains	284.0123	312.0027	350.3679	404.5582	450.8929	453.5660	429.3304	387.0043	337.3905	294.0153	273.9848	272.2720	(84)	
7. Mean internal temperature (heating season)														
Temperature during heating periods in the living area from Table 9, Th1 (C)														
Utilisation factor for gains for living area, nil/m (see Table 9a)														
tau	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
alpha	80.0016	80.3001	80.5948	82.0085	82.2785	83.5593	83.5593	83.8009	83.0613	82.2785	81.7341	81.1726		
util living area	6.3334	6.3533	6.3730	6.4672	6.4852	6.5706	6.5706	6.5867	6.5374	6.4852	6.4489	6.4115		
MIT	0.9938	0.9875	0.9631	0.8627	0.6628	0.4580	0.3335	0.3855	0.6530	0.9240	0.9858	0.9951	(86)	
Th 2	20.2780	20.3997	20.6153	20.8670	20.9780	20.9983	20.9998	20.9996	20.9855	20.8166	20.5116	20.2599	(87)	
util rest of house	20.1948	20.1975	20.2002	20.2130	20.2153	20.2265	20.2265	20.2285	20.2222	20.2153	20.2105	20.2095	(88)	
MIT 1	0.9919	0.9838	0.9526	0.8315	0.6131	0.4033	0.2750	0.3211	0.5862	0.8978	0.9809	0.9936	(89)	
MIT 2	19.2367	19.4147	19.7231	20.0683	20.1362	20.2254	20.2264	20.2284	20.2119	20.0146	19.5878	19.2188	(90)	
Living area fraction	FLA =	living area / (4) =												
MIT	19.7640	19.9135	20.1749	20.4727	20.5921	20.6168	20.6181	20.6189	20.6036	20.4207	20.0556	19.7640	(92)	
Temperature adjustment	adjusted MIT	19.7640	19.9135	20.1749	20.4727	20.5921	20.6168	20.6181	20.6189	20.6036	20.4207	20.0556	19.7640	(93)
8. Space heating requirement														
Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Useful gains	0.9906	0.9822	0.9522	0.8424	0.6374	0.4310	0.3047	0.3537	0.6195	0.9054	0.9798	0.9925	(94)	
Ext temp.	281.3449	266.4471	333.6142	340.8010	287.3826	193.4680	130.7976	136.8834	209.0259	266.1977	268.4373	270.2299	(95)	
Heat loss rate W	4.3000	4.9000	6.9000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)	
Month fracti	525.9267	508.7071	461.6563	383.9532	294.0489	195.9165	130.3464	136.9780	213.0384	324.7570	431.2757	521.0885	(97)	
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	(98)	
Space heating per m2	181.9688	135.9187	95.2633	31.0695	4.9597	0.0000	0.0000	0.0000	0.0000	43.5681	117.2437	186.6388	(98)	
	(98) / (4) =													
8c. Space cooling requirement														
Not applicable														
9a. Energy requirements - Individual heating systems, including micro-CHP														

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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													852.0114 (211)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	181.9688	135.9187	95.2633	31.0695	4.9597	0.0000	0.0000	0.0000	0.0000	43.5681	117.2437	186.6388	(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)	194.6191	145.3676	101.8859	33.2294	5.3045	0.0000	0.0000	0.0000	0.0000	46.5969	125.3943	199.6137	(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	137.0546	120.6592	126.3862	112.8355	110.2411	98.0245	93.6855	103.4315	103.4460	117.0266	124.3236	133.6015	(64)
Water heating requirement	137.0546	120.6592	126.3862	112.8355	110.2411	98.0245	93.6855	103.4315	103.4460	117.0266	124.3236	133.6015	(216)
Efficiency of water heater	85.5708	85.1320	84.0721	81.8904	80.2083	79.8000	79.8000	79.8000	79.8000	82.4444	84.6580	85.7057	(217)
Fuel for water heating, kWh/month	160.1191	141.7319	150.3306	137.7885	137.4435	122.8377	117.4004	129.6134	129.6316	141.9460	146.8539	155.8840	(219)
Water heating fuel used	160.1191	141.7319	150.3306	137.7885	137.4435	122.8377	117.4004	129.6134	129.6316	141.9460	146.8539	155.8840	(219)
Annual totals kWh/year	852.0114	852.0114	852.0114	852.0114	852.0114	852.0114	852.0114	852.0114	852.0114	852.0114	852.0114	852.0114	(211)
Space heating fuel - main system	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Space heating fuel - secondary	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
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)													188.5731 (232)
Total delivered energy for all uses													2787.2111 (238)

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

	Energy		Emission factor		Emissions								
	kWh/year		kg CO2/kWh		kg CO2/year								
Space heating - main system 1	852.0114		0.2160		184.0345 (261)								
Space heating - secondary	0.0000		0.0000		0.0000 (263)								
Water heating (other fuel)	1671.6267		0.2160		361.0714 (264)								
Space and water heating	1671.6267		0.2160		345.1058 (265)								
Pumps and fans	75.0000		0.5190		38.9250 (267)								
Energy for lighting	188.5731		0.5190		97.8695 (268)								
Total CO2, kg/m2/year					681.9003 (272)								
Emissions per m2 for space and water heating					13.9129 (272a)								
Fuel factor (mains gas)					1.0000								
Emissions per m2 for lighting					2.4979 (272b)								
Emissions per m2 for pumps and fans					0.9935 (272c)								
Target Carbon Dioxide Emission Rate (TER) = (13.9129 * 1.00) + 2.4979 + 0.9935, rounded to 2 d.p.					17.4000 (273)								

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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												
Ground floor						Area (m ²)		Storey height (m)		Volume (m ³)		
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	39.1800					39.1800 (1b)	x	2.5000 (2b)	=	97.9500 (1b) - (3b)	(4)	
Dwelling volume						(3a)+(3b)+(3c)+(3d)+(3e)...(3n)			=	97.9500 (5)		

2. Ventilation rate												
Number of chimneys	main heating		0	+	secondary heating		0	+	0	=	0 * 40 =	0.0000 (6a)
Number of open flues			0	+			0	+	0	=	0 * 20 =	0.0000 (6b)
Number of intermittent fans											2 * 10 =	20.0000 (7a)
Number of passive vents											0 * 10 =	0.0000 (7b)
Number of fuelless gas fires											0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =											20.0000 / (5) =	0.2042 (8)
Pressure test												Yes
Measured/design AP50												4.0000
Infiltration rate												0.4042 (18)
Number of sides sheltered												3 (19)
Shelter factor						(20) = 1 - (0.075 x (19)) =					0.7750 (20)	
Infiltration rate adjusted to include shelter factor						(21) = (18) x (20) =					0.3132 (21)	
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Adj infiltr rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Effective ac	0.3994	0.3916	0.3837	0.3446	0.3367	0.2976	0.2976	0.2898	0.3132	0.3367	0.3524	0.3681 (22b)
	0.5798	0.5767	0.5736	0.5594	0.5567	0.5443	0.5443	0.5420	0.5491	0.5567	0.5621	0.5677 (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	
Opening Type 1 (Uw = 0.90)					8.2600		0.8687		7.1757			
External Wall	18.5500		8.2600		10.2900		0.2400		2.4696		(27)	
Total net area of external elements Aum(A, m ²)					18.5500						(28a)	
Fabric heat loss, W/K = Sum (A x U)							(26)...(30) + (32) =		9.6453		(31)	
Wall to Corridor					15.4500		0.0000		0.0000		(32)	
Party Wall					35.1000		0.0000		0.0000		(32)	
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K												250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)												3.3598 (36)
Total fabric heat loss												(33) + (36) = 13.0051 (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	18.7397	18.6396	18.5415	18.0806	17.9944	17.5930	17.5930	17.5186	17.7476	17.9944	18.1688	18.3512 (38)
Average = Sum(39)/ 12 =	31.7448	31.6447	31.5465	31.0857	30.9994	30.5980	30.5980	30.5237	30.7526	30.9994	31.1739	31.3562 (39)
	31.0853 (39)											
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.8102	0.8077	0.8052	0.7934	0.7912	0.7810	0.7810	0.7791	0.7849	0.7912	0.7957	0.8003 (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												1.3847 (42)
Average daily hot water use (litres/day)												70.6179 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	77.6797	74.8550	72.0303	69.2055	66.3808	63.5561	63.5561	66.3808	69.2055	72.0303	74.8550	77.6797 (44)
Energy content (annual)	115.1967	100.7518	103.9668	90.6408	86.9720	75.0502	69.5451	79.8040	80.7571	94.1146	102.7335	111.5619 (45)
Distribution loss (46)m = 0.15 x (45)m	111.0945 (45)											
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)

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Heat gains from water heating, kWh/month
24.4793 21.4098 22.0930 19.2612 18.4816 15.9482 14.7783 16.9583 17.1609 19.9994 21.8309 23.7069 (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	69.2358	69.2358	69.2358	69.2358	69.2358	69.2358	69.2358	69.2358	69.2358	69.2358	69.2358	69.2358 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	10.6778	9.4839	7.7128	5.8391	4.3648	3.6850	3.9817	5.1756	6.9467	8.8204	10.2947	10.9746 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	119.4768	120.7166	117.5923	110.9412	102.5453	94.6544	89.3827	88.1429	91.2672	97.9183	106.3142	114.2051 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	29.9236	29.9236	29.9236	29.9236	29.9236	29.9236	29.9236	29.9236	29.9236	29.9236	29.9236	29.9236 (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)	-55.3886	-55.3886	-55.3886	-55.3886	-55.3886	-55.3886	-55.3886	-55.3886	-55.3886	-55.3886	-55.3886	-55.3886 (71)
Water heating gains (Table 5)	32.9023	31.8598	29.6948	26.7516	24.8408	22.1502	19.8633	22.7935	23.8346	26.8809	30.3206	31.8641 (72)
Total internal gains	206.8276	205.8310	198.7707	187.3027	175.5216	164.2603	156.9985	159.8827	165.8192	177.3903	190.7003	200.8145 (73)

6. Solar gains

[Jan]			Area m2		Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
Northeast			8.2600		11.2829		0.4000		0.8000		0.7700		20.6674 (75)
Solar gains	20.6674	42.0691	75.7951	124.4773	167.3219	178.3829	166.8735	133.0335	92.3575	51.4117	26.0049		16.8780 (83)
Total gains	227.4950	247.9000	274.5658	311.7799	342.8435	342.6432	323.8720	292.9162	258.1766	228.8020	216.7052		217.6926 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation factor for gains for living area, nil _m (see Table 9a)	0.9980	0.9960	0.9870	0.9384	0.7860	0.5664	0.4151	0.4778	0.7739	0.9703	0.9955	0.9985 (86)
tau	85.7096	85.9808	86.2482	87.5269	87.7704	88.9219	88.9219	89.1384	88.4748	87.7704	87.2793	86.7716
alpha	6.7140	6.7321	6.7499	6.8351	6.8514	6.9281	6.9426	6.8983	6.8514	6.8186	6.7848	6.7848
util living area	0.9980	0.9960	0.9870	0.9384	0.7860	0.5664	0.4151	0.4778	0.7739	0.9703	0.9955	0.9985 (86)
MIT	20.2256	20.3287	20.5232	20.7858	20.9517	20.9955	20.9995	20.9989	20.9682	20.7425	20.4425	20.2079 (87)
Th 2	20.2445	20.2467	20.2489	20.2591	20.2610	20.2699	20.2715	20.2664	20.2610	20.2571	20.2531	20.2531 (88)
util rest of house	0.9974	0.9947	0.9827	0.9198	0.7391	0.5041	0.3466	0.4030	0.7091	0.9576	0.9939	0.9981 (89)
MIT 2	19.5310	19.6355	19.8296	20.0890	20.2302	20.2679	20.2697	20.2712	20.2496	20.0348	19.7580	19.5206 (90)
Living area fraction	19.8827	19.9866	20.1808	20.4418	20.5956	20.6363	20.6393	20.6397	20.6134	20.4030	20.1046	19.8686 (92)
Temperature adjustment	19.8827	19.9866	20.1808	20.4418	20.5956	20.6363	20.6393	20.6397	20.6134	20.4030	20.1046	19.8686 (93)
adjusted MIT	19.8827	19.9866	20.1808	20.4418	20.5956	20.6363	20.6393	20.6397	20.6134	20.4030	20.1046	19.8686 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	226.8257	246.4449	269.7020	288.3353	260.9392	183.5137	123.4979	129.1611	191.2959	219.7976	215.2854	217.2074 (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	494.6691	477.4092	431.5831	358.7853	275.7585	184.6996	123.5945	129.4102	200.3058	303.8889	405.4038	491.3099 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	199.2755	155.2080	120.4396	50.7240	11.0255	0.0000	0.0000	0.0000	0.0000	62.6086	136.8852	203.9323 (98)
Space heating	199.2755	155.2080	120.4396	50.7240	11.0255	0.0000	0.0000	0.0000	0.0000	62.6086	136.8852	203.9323 (98)
Space heating per m2										(98) / (4) =		23.9944 (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	287.6213	226.4254	231.9801	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9840	0.9945	0.9896	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	283.0111	225.1688	229.5720	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	453.5246	430.6590	395.1701	0.0000	0.0000	0.0000	0.0000 (103)
Month fracti	0.0000	0.0000	0.0000	0.0000	1.0000	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	122.7697	152.8847	123.2050	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling	0.0000	0.0000	0.0000	0.0000	0.0000	122.7697	152.8847	123.2050	0.0000	0.0000	0.0000	0.0000 (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												

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Space cooling 0.0000 0.0000 0.0000 0.0000 0.0000 30.6924 38.2212 30.8013 0.0000 0.0000 0.0000 0.0000 (107)
Space cooling per m2 99.7149 (107)
Energy for space heating 2.5450 (108)
Energy for space cooling 23.9944 (99)
Total 2.5450 (108)
Dwelling Fabric Energy Efficiency (DFEE) 26.5394 (109)
26.5 (109)

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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	Storey height				Volume			
				(m2)	(m)				(m3)			
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)				39.1800	(1b)	x	2.5000	(2b)	=	97.9500	(1b) - (3b)	
Dwelling volume					(3a)+(3b)+(3c)+(3d)+(3e)...(3n)				=	97.9500	(5)	

2. Ventilation rate												

				main	secondary	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								2 * 10 =	20.0000 (7a)			
Number of passive vents								0 * 10 =	0.0000 (7b)			
Number of fuelless gas fires								0 * 40 =	0.0000 (7c)			
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =								Air changes per hour				
								20.0000 / (5) =		0.2042 (8)		
Measured/design AP50								5.0000				
Infiltration rate								0.4542 (18)				
Number of sides sheltered								3 (19)				
Shelter factor				(20) = 1 - (0.075 x (19)) =				0.7750 (20)				
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =				0.3520 (21)				

				Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	
Wind speed				5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	
Wind factor				1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	
Adj infiltr rate				0.4488	0.4400	0.4312	0.3872	0.3784	0.3344	0.3344	0.3256	
Effective ac				0.6007	0.5968	0.5930	0.5750	0.5716	0.5559	0.5559	0.5530	

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 k2/m2K	A x K k2/K		
TER Opening Type (Uw = 1.40)						8.2600	1.3258	10.9508			(27)	
External Wall				18.5500	8.2600	10.2900	0.1800	1.8522			(29a)	
Total net area of external elements Aum(A, m2)						18.5500					(31)	
Fabric heat loss, W/K = Sum (A x U)											(33)	
						(26) ... (30) + (32) =	12.8030					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K											250.0000 (35)	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)											1.7898 (36)	
Total fabric heat loss										(33) + (36) =	14.5928 (37)	

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)				Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	
(38)m				19.4170	19.2906	19.1667	18.5847	18.4758	17.9689	17.8751	18.1642	
Heat transfer coeff				34.0097	33.8833	33.7594	33.1775	33.0686	32.5617	32.5617	32.4678	
Average = Sum(39)m / 12 =												
				Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	
HLP				0.8680	0.8648	0.8616	0.8468	0.8440	0.8311	0.8311	0.8287	
HLP (average)												
Days in month				31	28	31	30	31	30	31	31	



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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	69.2358	69.2358	69.2358	69.2358	69.2358	69.2358	69.2358	69.2358	69.2358	69.2358	69.2358	69.2358 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	10.6778	9.4839	7.7128	5.8391	4.3648	3.6850	3.9817	5.1756	6.9467	8.8204	10.2947	10.9746 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	119.4768	120.7166	117.5923	110.9412	102.5453	94.6544	89.3827	88.1429	91.2672	97.9183	106.3142	114.2051 (68)
Pumps, fans	29.9236	29.9236	29.9236	29.9236	29.9236	29.9236	29.9236	29.9236	29.9236	29.9236	29.9236	29.9236 (69)
Losses e.g. evaporation (negative values) (Table 5)	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)
Water heating gains (Table 5)	-55.3886	-55.3886	-55.3886	-55.3886	-55.3886	-55.3886	-55.3886	-55.3886	-55.3886	-55.3886	-55.3886	-55.3886 (71)
Total internal gains	31.2572	30.2668	28.2101	25.4140	23.5988	21.0427	18.8702	21.6538	22.6428	25.5368	28.8046	30.2709 (72)
	205.1825	204.2380	197.2860	185.9651	174.2796	163.1528	156.0054	158.7431	164.6274	176.0463	189.1842	199.2213 (73)
6. Solar gains												
[Jan]	Area		Solar flux		g		FF		Access		Gains	
	m2		Table 6a W/m2		Specific data or Table 6b		Specific data or Table 6c		factor Table 6d		W	
Northeast	8.2600		11.2829		0.6300		0.7000		0.7700		28.4822 (75)	
Solar gains	28.4822	57.9764	104.4551	171.5453	230.5905	245.8339	229.9725	183.3368	127.2802	70.8518	35.8380	23.2600 (83)
Total gains	233.6647	262.2144	301.7411	357.5103	404.8701	408.9867	385.9779	342.0799	291.9076	246.8981	225.0223	222.4814 (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	6.3334	6.3533	6.3730	6.4672	6.4852	6.5706	6.5706	6.5867	6.5374	6.4852	6.4489	6.4115
util living area	0.9979	0.9950	0.9819	0.9107	0.7244	0.5065	0.3708	0.4356	0.7359	0.9641	0.9951	0.9984 (86)
MIT	20.1540	20.2804	20.5112	20.8075	20.9638	20.9969	20.9997	20.9991	20.9715	20.7312	20.3944	20.1363 (87)
Th 2	20.1948	20.1975	20.2002	20.2130	20.2153	20.2265	20.2285	20.2285	20.2222	20.2153	20.2105	20.2055 (88)
util rest of house	0.9972	0.9934	0.9761	0.8862	0.6740	0.4467	0.3058	0.3631	0.6674	0.9490	0.9932	0.9979 (89)
MIT 2	19.4176	19.5456	19.7753	20.0645	20.1932	20.2252	20.2264	20.2283	20.2076	20.0030	19.6705	19.4090 (90)
Living area fraction	MIT	19.7905	19.9177	20.1479	20.4408	20.5834	20.6159	20.6180	20.6186	20.5944	20.0371	19.7773 (92)
Temperature adjustment												0.0000
adjusted MIT	19.7905	19.9177	20.1479	20.4408	20.5834	20.6159	20.6180	20.6180	20.5944	20.3717	20.0371	19.7773 (93)
8. Space heating requirement												
Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9968	0.9928	0.9757	0.8939	0.6982	0.4770	0.3388	0.3998	0.7013	0.9525	0.9927	0.9976 (94)
Ext temp.	232.9079	260.3172	294.4018	319.5656	282.6927	195.0768	130.7608	136.7710	204.7045	235.1607	223.3755	221.9425 (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	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	526.8280	508.8493	460.7452	382.8930	293.7630	195.8895	130.8316	136.9690	212.7376	323.1378	430.6616	522.1365 (97b)
Space heating kWh	218.6765	167.0136	123.7595	45.5957	8.2363	0.0000	0.0000	0.0000	0.0000	6.4549	149.2460	223.3444 (98)
Space heating per m2										(98) / (4) =		25.5571 (99)
8c. Space cooling requirement												
Calculated for June, July and August. See Table 10b												
Ext. temp.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	306.8080	240.9556	246.7556	0.0000	0.0000	0.0000 (100)
Ext. temp.	0.0000	0.0000	0.0000	0.0000	0.0000	0.9885	0.9959	0.9916	0.0000	0.0000	0.0000	0.0000 (101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	302.5618	239.9608	244.6758	0.0000	0.0000	0.0000	0.0000 (102)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	0.531259	503.4180	452.8265	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	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	164.6598	196.0121	154.8641	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (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	41.1649	49.0330	38.7160	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (108)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Space cooling per m2	3.2895 (108)
Energy for space heating	25.5571 (99)
Energy for space cooling	3.2895 (108)
Total	28.8466 (109)
Target Fabric Energy Efficiency (TFEE)	33.2 (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 (m2)	Storey height (m)	Volume (m3)
Ground floor		39.1800 (1b)	x 2.5000 (2b)	= 97.9500 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	39.1800			(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 97.9500 (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											4.0000		
Infiltration rate											0.2000 (18)		
Number of sides sheltered											3 (19)		
Shelter factor									(20) = 1 - [0.075 x (19)] =		0.7750 (20)		
Infiltration rate adjusted to include shelter factor									(21) = (18) x (20) =		0.1550 (21)		
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind factor	4.6000	4.3000	4.4000	4.0000	4.0000	3.5000	3.6000	3.8000	3.7000	3.9000	3.9000	4.3000 (22)	
Adj infiltr rate	1.1500	1.0750	1.1000	1.0000	1.0000	0.8750	0.9000	0.9500	0.9250	0.9750	0.9750	1.0750 (22a)	
Balanced mechanical ventilation with heat recovery	0.1783	0.1666	0.1705	0.1550	0.1550	0.1356	0.1395	0.1473	0.1434	0.1511	0.1511	0.1666 (22b)	
If mechanical ventilation:												0.5000 (23a)	
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												63.0000 (23c)	
Effective ac	0.3633	0.3516	0.3555	0.3400	0.3400	0.3206	0.3245	0.3323	0.3284	0.3361	0.3361	0.3516 (25)	

3. Heat losses and heat loss parameter												
Element	Gross m2	Openings m2	NetArea m2	U-value W/mK	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Opening Type 1 (Uw = 0.90)												
External Wall	18.5500	8.2600	10.2900	0.8687	7.1757						(27)	
Total net area of external elements Aum(A, m2)			18.5500	0.2400	2.4696						(29a)	
Fabric heat loss, W/K = Sum (A x U)											(31)	
Wall to Corridor											(33)	
Party Wall			15.4500	0.0000	0.0000						(32)	
			35.1000	0.0000	0.0000						(32)	
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K											250.0000 (35)	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)											3.3598 (36)	
Total fabric heat loss										(33) + (36) =	13.0051 (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	11.7415	11.3658	11.4910	10.9900	10.9900	10.3637	10.4890	10.7395	10.6142	10.8647	10.8647	11.3658 (38)
Average = Sum(39)m / 12 =	24.7466	24.3708	24.4961	23.9951	23.9951	23.3688	23.4941	23.7446	23.6193	23.8698	23.8698	24.3708 (39)
HLP (average)	0.6316	0.6220	0.6252	0.6124	0.6124	0.5964	0.5996	0.6060	0.6028	0.6092	0.6092	0.6220 (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												1.3847 (42)
Average daily hot water use (litres/day)												70.6179 (43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	77.6797	74.8550	72.0303	69.2055	66.3808	63.5561	63.5561	66.3808	69.2055	72.0303	74.8550	77.6797 (44)
Energy content	115.1967	100.7518	103.9668	90.6408	86.9720	75.0502	69.5451	79.8040	80.7571	94.1146	102.7335	111.5619 (45)
Energy content (annual)											Total = Sum(43)m =	1111.0945 (45)
Distribution loss (46)m = 0.15 x (45)m	17.2795	15.1128	15.5950	13.5961	13.0458	11.2575	10.4318	11.9706	12.1136	14.1172	15.4100	16.7343 (46)
Water storage loss:												
Store volume	3.0000 (47)											

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF HEAT DEMAND 09 Jan 2014

b) If manufacturer declared loss factor is not known :											
Hot water storage loss factor from Table 2 (kWh/litre/day)											
Volume factor from Table 2a											
Temperature factor from Table 2b											
Enter (49) or (54) in (55)											
Total storage loss											
If cylinder contains dedicated solar storage											
Primary loss											
Total heat required for water heating calculated for each month											
Solar input											
Output from w/h											
RHI water heating demand											
Heat gains from water heating, kWh/month											

5. Internal gains (see Table 5 and 5a)											
Metabolic gains (Table 5), Watts											
(66)m											
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5											
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5											
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5											
Pumps, fans											
Losses e.g. evaporation (negative values) (Table 5)											
Water heating gains (Table 5)											
Total internal gains											

6. Solar gains											
(Jan)											
Northeast											
Solar gains											
Total gains											

7. Mean internal temperature (heating season)											
Temperature during heating periods in the living area from Table 9, Th1 (C)											
Utilisation factor for gains for living area, nil,m (see Table 9a)											
tau											
alpha											
util living area											
MIT											
Th 2											
util rest of house											
MIT 2											
Living area fraction											
MIT											
Temperature adjustment											
adjusted MIT											

8. Space heating requirement											
Utilisation											
Useful gains											
Ext temp.											
Heat loss rate W											
Month fracti											
Space heating kWh											
Space heating											
RHI space heating demand											

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF HEAT DEMAND 09 Jan 2014

b) If manufacturer declared loss factor is not known :											
Hot water storage loss factor from Table 2 (kWh/litre/day)											
Volume factor from Table 2a											
Temperature factor from Table 2b											
Enter (49) or (54) in (55)											
Total storage loss											
If cylinder contains dedicated solar storage											
Primary loss											
Total heat required for water heating calculated for each month											
Solar input											
Output from w/h											
RHI water heating demand											
Heat gains from water heating, kWh/month											

5. Internal gains (see Table 5 and 5a)											
Metabolic gains (Table 5), Watts											
(66)m											
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5											
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5											
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5											
Pumps, fans											
Losses e.g. evaporation (negative values) (Table 5)											
Water heating gains (Table 5)											
Total internal gains											

6. Solar gains											
(Jan)											
Northeast											
Solar gains											
Total gains											

7. Mean internal temperature (heating season)											
Temperature during heating periods in the living area from Table 9, Th1 (C)											
Utilisation factor for gains for living area, nil,m (see Table 9a)											
tau											
alpha											
util living area											
MIT											
Th 2											
util rest of house											
MIT 2											
Living area fraction											
MIT											
Temperature adjustment											
adjusted MIT											

8. Space heating requirement											
Utilisation											
Useful gains											
Ext temp.											
Heat loss rate W											
Month fracti											
Space heating kWh											
Space heating											
RHI space heating demand											

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													

Ground floor				Area	Storey height			Volume					
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	39.1800	(m2)	(1b)	x	2.5000	(2b)	=	97.9500	(1b) -	(3b)			
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	97.9500	(5)								

2. Ventilation rate													

Number of chimneys				main heating	+	secondary heating	+	other	=	total	m3 per hour		
Number of open flues				0	+	0	+	0	=	0 * 40 =	0.0000 (6a)		
Number of intermittent fans				0	+	0	+	0	=	0 * 20 =	0.0000 (6b)		
Number of passive vents				0	+	0	+	0	=	0 * 10 =	0.0000 (7a)		
Number of fireless gas fires				0	+	0	+	0	=	0 * 10 =	0.0000 (7c)		
										Air changes per hour			
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =										0.0000 / (5) = 0.0000 (8)			
Pressure test										Yes			
Measured/design AP50										4.0000			
Infiltration rate										0.2000 (18)			
Number of sides sheltered										3 (19)			
Shelter factor										(20) = 1 - (0.075 x (19)) = 0.7750 (20)			
Infiltration rate adjusted to include shelter factor										(21) = (18) x (20) = 0.1550 (21)			
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Adj infiltr rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Balanced mechanical ventilation with heat recovery	0.1976	0.1938	0.1899	0.1705	0.1666	0.1473	0.1473	0.1434	0.1550	0.1666	0.1744	0.1821	(22b)
If mechanical ventilation:										0.5000 (23a)			
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =										63.0000 (23c)			
Effective ac	0.3826	0.3788	0.3749	0.3555	0.3516	0.3323	0.3323	0.3284	0.3400	0.3516	0.3594	0.3671	(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			
Opening Type 1 (Uw = 0.90)				18.5500	8.2600	8.2600	0.8687	7.1757	2.4696	(27)			
External Wall				18.5500	8.2600	8.2600	0.8687	7.1757	2.4696	(28a)			
Total net area of external elements Aum(A, m2)				18.5500	8.2600	8.2600	0.8687	7.1757	2.4696	(31)			
Fabric heat loss, W/K = Sum (A x U)				15.4500	0.0000	0.0000	0.0000	0.0000	0.0000	(33)			
Wall to Corridor				35.1000	0.0000	0.0000	0.0000	0.0000	0.0000	(32)			
Party Wall				35.1000	0.0000	0.0000	0.0000	0.0000	0.0000	(32)			
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K										250.0000 (35)			
Thermal bridges (Sum(L x Psi) calculated using Appendix K)										3.3598 (36)			
Total fabric heat loss										(33) + (36) = 13.0051 (37)			
Ventilation heat loss calculated monthly (38m) = 0.33 x (25)m x (5)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38m)	12.3678	12.2425	12.1173	11.4910	11.3658	10.7395	10.7395	10.6142	10.9900	11.3658	11.6163	11.8668	(38)
Heat transfer coeff	25.3729	25.2476	25.1223	24.4961	24.3708	23.7446	23.7446	23.6193	23.9951	24.3708	24.6213	24.8718	(39)
Average = Sum(39m) / 12 =	25.3729	25.2476	25.1223	24.4961	24.3708	23.7446	23.7446	23.6193	23.9951	24.3708	24.6213	24.8718	(39)
HLP	0.6476	0.6444	0.6412	0.6252	0.6220	0.6060	0.6060	0.6028	0.6124	0.6220	0.6284	0.6348	(40)
HLP (average)	0.6476	0.6444	0.6412	0.6252	0.6220	0.6060	0.6060	0.6028	0.6124	0.6220	0.6284	0.6348	(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													1.3847 (42)
Average daily hot water use (litres/day)													70.6179 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	77.6797	74.8550	72.0303	69.2055	66.3808	63.5561	63.5561	66.3808	69.2055	72.0303	74.8550	77.6797	(44)
Energy content (annual)	115.1967	100.7518	103.9668	90.6408	86.9720	75.0502	69.5451	79.8040	80.7571	94.1146	102.7335	111.5619	(45)
Distribution loss (46)m = 0.15 x (45)m	17.2795	15.1128	15.5950	13.5961	13.0458	11.2575	10.4318	11.9706	12.1136	14.1172	15.4100	16.7343	(46)
Water storage loss:													3.0000 (47)
Score volume													3.0000 (47)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

b) If manufacturer declared loss factor is not known : Hot water storage loss factor from Table 2 (kWh/litre/day) Volume factor from Table 2a Temperature factor from Table 2b Enter (49) or (54) in (55) Total storage loss													0.0212 (51) 3.4200 (52) 1.0000 (53) 0.2173 (55)
If cylinder contains dedicated solar storage													6.7353 (56)
Primary loss													6.7353 (57)
Total heat required for water heating calculated for each month													23.2624 (59)
Solar input													141.5944 (62) 0.0000 (63) 0.0000 (63) 0.0000 (63)
Output from w/h													141.5596 (64)
Heat gains from water heating, kWh/month													61.0925 (65)

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

Metabolic gains (Table 5), Watts													
Lighting gains (calculated in Appendix L, equation L18 or L19a), also see Table 5													
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
Pumps, fans													
Losses e.g. evaporation (negative values) (Table 5)													
Water heating gains (Table 5)													
Total internal gains													

6. Solar gains													

[Jan]		Area m2		Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W	
Northeast		8.2600		11.2829		0.4000		0.8000		0.7700		20.6674 (75)	

Solar gains	20.6674	42.0691	75.7951	124.4773	167.3219	178.3829	166.8735	133.0335	92.3575	51.4117	26.0049	16.8780 (83)	
Total gains	381.8107	400.4469	421.6947	451.1603	474.7981	468.1719	445.9581	417.8371	387.8808	366.3130	362.5054	369.2707 (84)	

7. Mean internal temperature (heating season)													

Temperature during heating periods in the living area from Table 9, Th1 (C)													
Utilisation factor for gains for living area, n1, n8 (see Table 9a)													
tau	107.2340	107.7660	108.3033	111.0722	111.6430	114.5877	114.5877	115.1953	113.3914	111.6430	110.5071	109.3941	
alpha	1.1489	0.1844	0.2202	0.8408	8.4429	8.4429	8.6392	8.6797	8.5594	8.4429	8.3671	8.2929	
util living area	0.9311	0.8977	0.8162	0.6503	0.4769	0.3246	0.2343	0.2600	0.4267	0.6821	0.8658	0.9389 (86)	
MIT	20.8200	20.8759	20.9469	20.9920	20.9994	21.0000	21.0000	21.0000	20.9998	20.9905	20.9248	20.8118 (87)	
Th 2	20.3874	20.3902	20.3931	20.4074	20.4102	20.4246	20.4246	20.4274	20.4188	20.4102	20.4045	20.3988 (88)	
util rest of house	0.9310	0.8903	0.7912	0.6202	0.4468	0.2954	0.2036	0.2277	0.3908	0.6464	0.8428	0.9270 (89)	
MIT 2	20.1645	20.2410	20.3335	20.3994	20.4097	20.4246	20.4246	20.4274	20.4187	20.4013	20.3189	20.1641 (90)	
Living area fraction									fLA = Living area / (4) =			0.5064 (91)	
MIT	20.4964	20.5625	20.6441	20.6994	20.7083	20.7159	20.7160	20.7174	20.7130	20.6996	20.6257	20.4921 (92)	
Temperature adjustment												0.0000	
adjusted MIT	20.4964	20.5625	20.6441	20.6994	20.7083	20.7159	20.7160	20.7174	20.7130	20.6996	20.6257	20.4921 (93)	

8. Space heating requirement													

Utilisation	0.9205	0.8854	0.8017	0.6351	0.4620	0.3102	0.2191	0.2440	0.4090	0.6641	0.8517	0.9290 (94)	
Useful gains	351.4526	354.5678	338.0910	286.5408	219.3646	145.2163	97.7314	101.9730	158.6342	243.2552	308.7278	343.0479 (95)	
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.1000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)	
Heat loss rate W	410.9492	395.4044	355.3299	289.0402	219.5400	145.2204	97.7316	101.9734	158.6788	246.1362	333.0217	405.2142 (97)	
Month fraction	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (98)	
Space heating kWh	44.2655	27.4664	12.8280	1.7996	0.1305	0.0000	0.0000	0.0000	0.0000	2.1435	17.4917	46.2518 (98)	
Space heating												152.3768 (98)	
Space heating per m2										(98) / (4) =		3.8891 (99)	

8c. Space cooling requirement													

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

Not applicable

9a. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)
Fraction of space heat from community system
Fraction of heat from community Boilers
Fraction of heat from community Combined Heat and Power
Fraction of total space heat from community Boilers
Fraction of total space heat from community Combined Heat and Power
Factor for control and charging method (Table 4c(3)) for community space heating
Factor for control and charging method (Table 4c(3)) for community water heating
Distribution loss factor (Table 12c) for community heating system
Space heating:
Annual space heating requirement
Space heat from Boilers = (98) x 0.25 x 1.00 x 1.05
Space heat from Combined Heat and Power = (98) x 0.75 x 1.00 x 1.05
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)
Space heating fuel for secondary/supplementary system

0.0000 (301)
1.0000 (302)
0.2500 (303a)
0.7500 (303b)
0.2500 (304a)
0.7500 (304b)
1.0000 (305)
1.0000 (305a)
1.0500 (306)
152.3768 (98)
39.9989 (307a)
119.9967 (307b)
0.0000 (308)
0.0000 (309)

Water heating
Annual water heating requirement
Water heat from Boilers = (64) x 0.25 x 1.00 x 1.05
Water heat from Combined Heat and Power = (64) x 0.75 x 1.00 x 1.05
Electricity used for heat distribution
Annual totals kWh/year

1464.2931 (64)
384.3770 (310a)
1153.1309 (310b)
16.9750 (313)

Electricity for pumps and fans:
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.8000)
mechanical ventilation fans (SFP = 0.8000)
Total electricity for the above, kWh/year
Electricity for lighting (calculated in Appendix L)
Total delivered energy for all uses

95.5992 (330a)
95.5992 (331)
188.5731 (332)
1981.6758 (338)

10b. Fuel costs - using Table 12 prices

Space heating from Boilers
Space heating - secondary
Water heating from Boilers
Water heating from Combined Heat and Power
Mechanical ventilation fans
Pumps and fans for heating
Energy for lighting
Additional standing charges
Total energy cost

Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
39.9989	4.2400	1.6960 (340a)
119.9967	2.9700	3.5639 (340b)
0.0000	0.0000	0.0000 (341)
384.3770	4.2400	16.2976 (342a)
1153.1309	2.9700	34.2480 (342b)
95.5992	13.1900	12.6095 (349)
0.0000	0.0000	0.0000 (349)
188.5731	13.1900	24.8728 (350)
		120.0000 (351)
		213.2878 (355)

11b. SAP rating - Community heating scheme

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

0.4200 (356)
1.0642 (357)
85.1550
85
B

12b. Carbon dioxide emissions - Community heating scheme

Efficiency of heat source Boilers
Space heating from Boilers
Electrical efficiency of CHP unit
Heat efficiency of CHP unit
Space heating from Combined Heat and Power
less credit emissions for electricity
Water heating from Combined Heat and Power
less credit emissions for electricity
Electrical energy for heat distribution
Total CO2 associated with community systems
(negative value allowed since DPEE <= TPEE)
Space and water heating
Pumps and fans
Energy for lighting
Total kg/year
CO2 emissions per m2
EI value
EI rating
EI band

Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
446.7114	0.2160	96.4897 (367)
		96.4897 (367)
		38.3000 (361)
		40.6000 (362)
295.5584	0.2160	63.8406 (363)
-113.1989	0.5190	-58.7502 (364)
2840.2238	0.2160	613.4883 (365)
-1087.8057	0.5190	-564.5712 (366)
16.9750	0.5190	8.8100 (372)
		159.3073 (373)
		159.3073 (376)
95.5992	0.5190	49.6160 (378)
188.5731	0.5190	97.8695 (379)
		306.7927 (383)
		7.8300 (384)
		95.1164 (384a)
		95 (385)
		A

Calculation of stars for heating and DWH
Space heating energy efficiency
0.75 x 2.970 x 1.05
= 3.452, stars = 5

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

Space heating environmental impact 0.25 x 0.216 x 1.05 / 0.9500
0.75 x (0.216 - 0.383 x 0.519) x 1.05 / 0.406
= 0.0931, stars = 5
Water heating energy efficiency
Water heating environmental impact

3.452, stars = 5
0.0931, stars = 5

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 (m2)	Storey height (m)	Volume (m3)
Ground floor	39.1800 (1b)	2.5000 (2b)	97.9500 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	39.1800		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	97.9500 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour							
Number of chimneys	0	0	0	0	0.0000 (6a)							
Number of open flues	0	0	0	0	0.0000 (6b)							
Number of intermittent fans	0	0	0	0	0.0000 (7a)							
Number of passive vents	0	0	0	0	0.0000 (7b)							
Number of fuelless gas fires	0	0	0	0	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					4.0000							
Infiltration rate					0.2000 (18)							
Number of sides sheltered					3 (19)							
Shelter factor	(20) = 1 - (0.075 x (19)) =				0.7750 (20)							
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1550 (21)							
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.6000	4.3000	4.4000	4.0000	4.0000	3.5000	3.6000	3.8000	3.7000	3.9000	3.9000	4.3000 (22)
Wind factor	1.1500	1.0750	1.1000	1.0000	1.0000	0.8750	0.9000	0.9500	0.9250	0.9750	0.9750	1.0750 (22a)
Adj infiltr rate	0.1783	0.1666	0.1705	0.1550	0.1550	0.1356	0.1395	0.1473	0.1434	0.1511	0.1511	0.1666 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.3633	0.3516	0.3555	0.3400	0.3400	0.3206	0.3245	0.3323	0.3284	0.3361	0.3361	0.3516 (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					
Opening Type 1 (Uw = 0.90)							(27)					
External Wall	18.5500	8.2600	10.2900	0.8687	7.1757	2.4696	(28a)					
Total net area of external elements Aum(A, m2)			18.5500				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	9.6453		(33)					
Wall to Corridor			15.4500	0.0000	0.0000		(32)					
Party Wall			35.1000	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							3.3598 (36)					
Total fabric heat loss	(33) + (36) =						13.0051 (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	11.7415	11.3658	11.4910	10.9900	10.9900	10.3637	10.4890	10.7395	10.6142	10.8647	10.8647	11.3658 (38)
Average = Sum(39)m / 12 =	24.7466	24.3708	24.4961	23.9951	23.9951	23.3688	23.4941	23.7446	23.6193	23.8698	23.8698	24.3708 (39)
												23.9951 (39)
HLP	0.6316	0.6220	0.6252	0.6124	0.6124	0.5964	0.5996	0.6060	0.6028	0.6092	0.6092	0.6220 (40)
HLP (average)												0.6124 (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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Average daily hot water use (litres/day)	77.6797	74.8550	72.0303	69.2055	66.3808	63.5561	63.5561	66.3808	69.2055	72.0303	74.8550	77.6797 (44)
Energy conte	115.1967	100.7518	103.9668	90.6408	86.9720	75.0502	69.5451	79.8040	80.7571	94.1146	102.7335	111.5619 (45)
Energy content (annual)												1111.0945 (45)
Distribution loss (46)m = 0.15 x (45)m												
17.2795	15.1128	15.5950	13.5961	13.0458	11.2575	10.4318	11.9706	12.1136	14.1172	15.4100	16.7343 (46)	
Water storage loss:												3.0000 (47)
Store volume												

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



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

b) If manufacturer declared loss factor is not known : Hot water storage loss factor from Table 2 (kWh/litre/day)													0.0212 (51)
Volume factor from Table 2a													3.4200 (52)
Temperature factor from Table 2b													1.0000 (53)
Enter (49) or (54) in (55)													0.2173 (55)
Total storage loss													
6.7353 6.0835 6.7353 6.5180 6.7353 6.5180 6.7353 6.7353 6.5180 6.7353 6.5180 6.7353 (56)													
If cylinder contains dedicated solar storage													
6.7353 6.0835 6.7353 6.5180 6.7353 6.5180 6.7353 6.7353 6.5180 6.7353 6.5180 6.7353 (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													
145.1944 127.8465 133.9645 119.6708 116.9697 104.0803 99.5428 109.8017 109.7871 124.1123 131.7635 141.5596 (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													
145.1944 127.8465 133.9645 119.6708 116.9697 104.0803 99.5428 109.8017 109.7871 124.1123 131.7635 141.5596 (64)													
Heat gains from water heating, kWh/month													
62.3011 55.1757 58.5671 53.3621 52.9163 48.1782 47.1219 50.5330 50.0758 55.2913 57.3829 61.0925 (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	83.0830	83.0830	83.0830	83.0830	83.0830	83.0830	83.0830	83.0830	83.0830	83.0830	83.0830	83.0830 (66)
Lighting gains (calculated in Appendix L, equation L18 or L19a), also see Table 5	26.6945	23.7098	19.2821	14.5978	10.9120	9.2124	9.9543	12.9390	17.3667	22.0510	25.7368	27.4364 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	178.3235	180.1740	175.5109	165.5838	153.0527	141.2752	133.4071	131.5566	136.2197	146.1468	158.6779	170.4554 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	44.6930	44.6930	44.6930	44.6930	44.6930	44.6930	44.6930	44.6930	44.6930	44.6930	44.6930	44.6930 (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)	-55.3886	-55.3886	-55.3886	-55.3886	-55.3886	-55.3886	-55.3886	-55.3886	-55.3886	-55.3886	-55.3886	-55.3886 (71)
Water heating gains (Table 5)	83.7380	82.1067	78.7193	74.1140	71.1241	66.9142	63.3359	67.9207	69.5497	74.3162	79.6985	82.1135 (72)
Total internal gains	361.1433	358.3778	345.8996	326.6830	307.4762	289.7891	279.0846	284.8036	295.5233	314.9013	336.5005	352.3927 (73)

6. Solar gains

[Jan]											Gains	
			Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d				W	
Northeast			8.2600	12.4928	0.4000	0.8000	0.7700				22.8835 (75)	
Solar gains	22.8835	42.0320	76.2697	129.9242	168.1845	191.8590	180.1667	147.2724	102.8417	56.2043	29.7836	19.1110 (83)
Total gains	384.0268	400.4099	422.1693	456.6072	475.6607	481.6481	459.2513	432.0760	398.3650	371.1056	366.2841	371.5037 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation factor for gains for living area, nil,m (see Table 9a)												
tau	109.9478	111.6430	111.0722	113.3914	113.3914	116.4302	115.8095	114.5877	115.1953	113.9864	113.9864	111.6430
alpha	8.3299	8.4429	8.4048	8.5594	8.5594	8.7620	8.7620	8.6392	8.6797	8.5991	8.5991	8.4429
util living area	0.8951	0.8561	0.7452	0.5605	0.3833	0.2232	0.1279	0.1484	0.3202	0.5704	0.7941	0.9041 (86)
MIT	20.8881	20.9267	20.9768	20.9978	20.9999	21.0000	21.0000	21.0000	20.9980	20.9944	20.9674	20.8825 (87)
Th 2	20.4016	20.4102	20.4074	20.4188	20.4188	20.4332	20.4303	20.4246	20.4274	20.4217	20.4217	20.4102 (88)
util rest of house	0.8771	0.8347	0.7165	0.5306	0.3540	0.1957	0.0987	0.1168	0.2862	0.5341	0.7656	0.8871 (89)
MIT 2	20.2682	20.3253	20.3828	20.4168	20.4188	20.4332	20.4303	20.4246	20.4274	20.4200	20.3869	20.2694 (90)
Living area fraction	0.8771	0.8347	0.7165	0.5306	0.3540	0.1957	0.0987	0.1168	0.2862	0.5341	0.7656	0.8871 (89)
MIT 2	20.2682	20.3253	20.3828	20.4168	20.4188	20.4332	20.4303	20.4246	20.4274	20.4200	20.3869	20.2694 (90)
Temperature adjustment	20.5821	20.6299	20.6836	20.7110	20.7131	20.7202	20.7188	20.7160	20.7174	20.7127	20.6809	20.5799 (92)
adjusted MIT	20.5821	20.6299	20.6836	20.7110	20.7131	20.7202	20.7188	20.7160	20.7174	20.7127	20.6809	20.5799 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	339.0108	337.5137	308.2111	249.1634	175.4554	100.9582	52.1285	57.3658	120.8659	205.0106	285.1979	331.4598 (95)
Ext temp.	5.4000	5.8000	7.8000	10.3000	13.4000	16.4000	18.5000	18.5000	15.6000	12.1000	8.3000	5.4000 (96)
Heat loss rate W	375.7050	361.4163	315.5972	249.8135	175.4771	100.9582	52.1285	57.3658	120.8686	205.5835	295.5287	369.9455 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	27.3005	16.0625	5.4953	0.4681	0.0162	0.0000	0.0000	0.0000	0.0000	0.4263	7.4382	28.6334 (98)
Space heating												85.8404 (98)
Space heating per m2										(98) / (4) =		2.1909 (99)

8c. Space cooling requirement

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



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

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11) 0.0000 (301)
Fraction of space heat from community system 1.0000 (302)
Fraction of heat from community Boilers 0.2500 (303a)
Fraction of heat from community Combined Heat and Power 0.7500 (303b)
Fraction of total space heat from community Boilers 0.2500 (304a)
Fraction of total space heat from community Combined Heat and Power 0.7500 (304b)
Factor for control and charging method (Table 4c(3)) for community space heating 1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating 1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system 1.0500 (306)
Space heating:
Annual space heating requirement 85.8404 (98)
Space heat from Boilers = (98) x 0.25 x 1.00 x 1.05 22.5331 (307a)
Space heat from Combined Heat and Power = (98) x 0.75 x 1.00 x 1.05 67.5993 (307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E) 0.0000 (308)
Space heating fuel for secondary/supplementary system 0.0000 (309)
Water heating:
Annual water heating requirement 1464.2931 (64)
Water heat from Boilers = (64) x 0.25 x 1.00 x 1.05 384.3770 (310a)
Water heat from Combined Heat and Power = (64) x 0.75 x 1.00 x 1.05 1153.1309 (310b)
Electricity used for heat distribution 16.2764 (313)
Annual totals kWh/year

Electricity for pumps and fans:
(Balanced)HeatRecovery.Database: in-use factor = 1.2500, SFP = 0.8000
mechanical ventilation fans (SFP = 0.8000) 95.5992 (330a)
Total electricity for the above, kWh/year 95.5992 (331)
Electricity for lighting (calculated in Appendix L) 188.5731 (332)
Total delivered energy for all uses 1911.8126 (338)

10b. Fuel costs - using BODF prices (495)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating from Boilers	22.5331	4.4300	0.9982 (340a)
Space heating from Combined Heat and Power	67.5993	3.1000	2.0956 (340b)
Space heating - secondary	0.0000	0.0000	0.0000 (341)
Water heating from Boilers	384.3770	4.4300	17.0279 (342a)
Water heating from Combined Heat and Power	1153.1309	3.1000	35.7471 (342b)
Mechanical ventilation fans	95.5992	19.4400	18.5845 (349)
Pumps and fans for heating	0.0000	0.0000	0.0000 (349)
Energy for lighting	188.5731	19.4400	36.6586 (350)
Additional standing charges			95.0000 (351)
Total energy cost			206.1119 (355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Boilers			95.0000 (367a)
Space heating from Boilers	428.3264	0.2160	92.5185 (367)
Electrical efficiency of CHP unit			38.3000 (361)
Heat efficiency of CHP unit			40.6000 (362)
Space heating from Combined Heat and Power	166.5008	0.2160	35.9642 (363)
less credit emissions for electricity	-63.7698	0.5190	-33.0965 (364)
Water heating from Combined Heat and Power	2840.2238	0.2160	613.4883 (365)
less credit emissions for electricity	-1087.8057	0.5190	-564.5712 (366)
Electrical energy for heat distribution	16.2764	0.5190	8.4475 (372)
Total CO2 associated with community systems			152.7508 (373)
(negative value allowed since DFEF <= TFEF)			152.7508 (376)
Space and water heating			49.6160 (378)
Pumps and fans	95.5992	0.5190	97.8695 (379)
Energy for lighting	188.5731	0.5190	300.2362 (383)
Total kg/year			

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Efficiency of heat source Boilers			95.0000 (367a)
Space heating from Boilers	428.3264	1.2200	522.5582 (367)
Electrical efficiency of CHP unit			38.3000 (361)
Heat efficiency of CHP unit			40.6000 (362)
Space heating from Combined Heat and Power	166.5008	1.2200	203.1310 (363)
less credit emissions for electricity	-63.7698	3.0700	-195.7733 (364)
Water heating from Combined Heat and Power	2840.2238	1.2200	3465.0730 (365)
less credit emissions for electricity	-1087.8057	3.0700	-3339.5635 (366)
Electrical energy for heat distribution	16.2764	3.0700	49.9686 (372)
Total CO2 associated with community systems			705.3939 (373)
(negative value allowed since DFEF <= TFEF)			705.3939 (376)
Space and water heating			293.4895 (378)
Pumps and fans	95.5992	3.0700	578.9195 (379)
Energy for lighting	188.5731	3.0700	1577.8030 (383)
Primary energy kWh/year			40.2706 (384)
Primary energy kWh/m2/year			

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 85
Current environmental impact rating: A 95

(For testing purposes):

A	Not considered
B	Not considered
C	Not considered
D	Not considered
E	Low energy lighting
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
O	Not applicable
P	Not considered
R	Not considered
S	Not considered
T	Not considered
U	Solar photovoltaic panels
A2	Not considered
A3	Not considered
T2	Not considered
W	Not considered
X	Not considered
Y	Not considered
J2	Not considered
O2	Not considered
Z1	Not considered
Z2	Not considered
Z3	Not considered
Z4	Not considered
Z5	Not considered
V2	Wind turbine
L2	Not applicable
Q3	Not considered
O3	Not considered

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

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

Potential energy efficiency rating: B 85
Potential environmental impact rating: A 95

Fuel prices for cost data on this page from database revision number 495 TEST (29 Apr 2022)
Recommendation texts revision number 4.9c (22 Feb 2014)

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

	Current	Potential	Saving
Electricity	£55	£55	£0
Community scheme	£151	£151	£0
Space heating	£117	£117	£0
Water heating	£53	£53	£0
Lighting	£37	£37	£0
Total cost of fuels	£206	£206	£0
Total cost of uses	£207	£207	£0
Delivered energy	49 kWh/m²	49 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.3 tonnes	0.3 tonnes	0.0 tonnes
CO2 emissions per m²	8 kg/m²	8 kg/m²	0 kg/m²
Primary energy	40 kWh/m²	40 kWh/m²	0 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

No improvements selected / applicable

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

No improvements selected / applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



Property Reference	Flat Type T27 - HLF				Issued on Date	01/06/2022
Assessment Reference	BE CLEAN DLF 1.05	Prop Type Ref	02nd Floor - 2B3P			
Property	Flat Type T27, London , N8					
SAP Rating		85 B	DER	8.60	TER	17.31
Environmental		94 A	% DER<TER	50.33		
CO ₂ Emissions (t/year)		0.53	DFEE	40.64	TFEE	49.32
General Requirements Compliance		Pass	% DFEE<TFEE	17.59		
Assessor Details	Mr. Michael Wride, Michael Wride, Tel: 02036 031 600, Michael@hodkinsonconsultancy.com				Assessor ID	R572-0001
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

Mid-floor flat, total floor area 73 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:Mains gas (c)
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 17.31 kgCO₂/m²/yr
Dwelling Carbon Dioxide Emission Rate (DER) 8.60 kgCO₂/m²/yrOK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)49.3 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)40.6 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.24 (max. 0.30)	0.24 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)		OK
Floor	0.12 (max. 0.25)	0.12 (max. 0.70)	OK
Roof (no roof)			
Openings	0.90 (max. 2.00)	0.90 (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: 4.00 (design value)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system: None

5 Cylinder insulation

Hot water storage: Nominal cylinder loss: 0.22 kWh/day

Permitted by DBSCG 0.35 OK

Primary pipework insulated: No primary pipework

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and TRVsOK

Hot water controls: No cylinderstat

7 Low energy lights

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

8 Mechanical ventilation

Continuous supply and extract system
Specific fan power: 0.64
Maximum 1.5 OK
WWR efficiency: 90%
Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): Slight OK

Based on:

Overshading: Average
Windows facing South West: 8.26 m², No overhang
Windows facing North West: 7.44 m², No overhang
Air change rate: 4.00 ach

Blinds/curtains: None

10 Key features

Party wall U-value 0.00 W/m²K
Party wall U-value 0.00 W/m²K
Exposed floor U-value 0.12 W/m²K
Window U-value 0.90 W/m²K
Community CHP, Mains gas

HODKINSON

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

3. Heat losses and heat loss parameter

4. Water heating energy requirements (kWh/year)



Store volume	3.0000 (47)
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5. Internal gains (see Table 5 and 5a)

Solar gains	86.0123	152.6941	225.3469	306.7451	368.7077	377.0941	358.9593	311.0427	253.2693	173.1879	104.1490	72.8800 (83)
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Total gains	465.6124	530.2111	590.0448	650.8329	692.0385	680.2582	648.9107	606.9957	559.7083	500.4511	455.3431	441.8595	(84)
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Regs Region: England

 elmhurst Page 4 of 27 Elmhurst Energy System
SUSAN C. LINDEN, MD

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)

Fraction of space heat from community system

Fraction of heat from community Boilers

Fraction of heat from community Combined Heat and Power

Fraction of total space heat from community Boilers

Fraction of total space heat from community Combined Heat and Power

Factor for control and charging method (Table 4c(3)) for community space heating

Factor for control and charging method (Table 4c(3)) for community water heating

Distribution loss factor (Table 12c) for community heating system

Space heating:

Annual space heating requirement

Space heat from Boilers = (98) x 0.25 x 1.00 x 1.05

Space heat from Combined Heat and Power = (98) x 0.75 x 1.00 x 1.05

Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)

Space heating fuel for secondary/supplementary system

Water heating

Annual water heating requirement

Water heat from Boilers = (64) x 0.25 x 1.00 x 1.05

Water heat from Combined Heat and Power = (64) x 0.75 x 1.00 x 1.05

Electricity used for heat distribution

Annual totals kWh/year

Electricity for pumps and fans:

(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.8000)

mechanical ventilation fans (SFP = 0.8000)

Total electricity for the above, kWh/year

Electricity for lighting (calculated in Appendix L)

Total delivered energy for all uses

0.0000 (301)

1.0000 (302)

0.2500 (303a)

0.7500 (303b)

0.2500 (304a)

0.7500 (304b)

1.0000 (305)

1.0000 (305a)

1.0500 (306)

1886.2359 (98)

495.1369 (307a)

1485.4108 (307b)

0.0000 (308)

0.0000 (309)

1827.2899 (64)

479.6436 (310a)

1438.9908 (310b)

38.9920 (313)

177.1440 (330a)

177.1440 (331)

320.3886 (332)

4396.7346 (338)

12b. Carbon dioxide emissions - Community heating scheme

Energy kWh/year

Emission factor kg CO2/kWh

Emissions kg CO2/year

Efficiency of heat source Boilers

Space heating from Boilers

Electrical efficiency of CHP unit

Heat efficiency of CHP unit

Space heating from Combined Heat and Power

less credit emissions for electricity

Water heating from Combined Heat and Power

less credit emissions for electricity

Electrical energy for heat distribution

Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)

Space and water heating

Pumps and fans

Energy for lighting

Total CO2, kg/year

Dwelling Carbon Dioxide Emission Rate (DER)

95.0000 (367a)

221.6389 (367)

38.3000 (361)

40.6000 (362)

790.2678 (363)

-727.2549 (364)

765.5714 (365)

-704.5278 (366)

20.2369 (372)

365.9323 (373)

365.9323 (376)

91.9377 (378)

166.2817 (379)

624.1517 (383)

8.6000 (384)

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

Total Floor Area

Assumed number of occupants

CO2 emission factor in Table 12 for electricity displaced from grid

CO2 emissions from appliances, equation (L14)

CO2 emissions from cooking, equation (L16)

Total CO2 emissions

Residual CO2 emissions offset from biofuel CHP

Additional allowable electricity generation, kWh/m²/year

Resulting CO2 emissions offset from additional allowable electricity generation

Net CO2 emissions

8.6000 ZC1

72.6000

2.3076

N

0.5190

16.5928 ZC2

2.4019 ZC3

27.5948 ZC4

0.0000 ZC5

0.0000 ZC6

0.0000 ZC7

27.5948 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

Ground floor

Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)

Dwelling volume

Storey height (m)

Area (m²)

Volume (m³)

(3a)+(3b)+(3c)+(3d)+(3e)...(3n)

2. Ventilation rate

Number of chimneys

Number of open flues

Number of intermittent fans

Number of passive vents

Number of flueless gas fires

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =

Pressure test

Measured/design APS0

Infiltration rate

Number of sides sheltered

Shelter factor

Infiltration rate adjusted to include shelter factor

Air changes per hour

Yes

5.0000

0.4153 (18)

2 (19)

0.8500 (20)

0.3530 (21)

Wind speed

Wind factor

Adj infiltr rate

Effective ac

Jan

Feb

Mar

Apr

May

Jun

Jul

Aug

Sep

Oct

Nov

Dec

4.7000 (22)

1.1750 (22a)

0.4148 (22b)

0.5860 (25)

3. Heat losses and heat loss parameter

Element

Gross m²

Openings m²

NetArea m²

U-value W/m²K

A x U W/K

K-value kJ/m²K

A x K kJ/K

TER Opening Type (Uw = 1.40)

Floor above commercial

External Wall

Total net area of external elements Aum(A, m²)

Fabric heat loss, W/K = Sum (A x U)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K

Thermal bridges (Sum(L x Psi) calculated using Appendix K)

Total fabric heat loss

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

(38)m

Heat transfer coeff

Average = Sum(39m) / 12 =

Jan

Feb

Mar

Apr

May

Jun

Jul

Aug

Sep

Oct

Nov

Dec

250.0000 (35)

10.8516 (36)

47.5066 (37)

33.1404

33.6791

34.2599

34.6704

35.0995 (39)

82.6061 (39)

91.9684 (39)

1.1378 (40)

1.1290 (40)

HLP

HLP (average)

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

Average daily hot water use (litres/day)

Daily hot water use

Energy conte

Energy content (annual)

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

Water storage loss:

Store volume

a) If manufacturer declared loss factor is known (kWh/day):

Temperature factor from Table 2b

Enter (49) or (54) in (55)

Total storage loss

2.3076 (42)

89.0045 (43)

97.9049

145.1901

21.7785

17.1361

16.4425

14.1886

13.1478

15.0873

15.2675

17.7928

19.4223

21.0913 (46)

3.0000 (47)

0.2602 (48)

0.5400 (49)

0.1405 (55)

4.3553

3.9338

4.3553

4.2148

4.3553

4.2148

4.3553

4.3553

4.2148

4.3553

4.2148

4.3553 (56)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF TARGET EMISSIONS 09 Jan 2014

If cylinder contains dedicated solar storage												
	4.3553	3.9338	4.3553	4.3553	4.2148	4.3553	4.3553	4.2148	4.3553	4.2148	4.3553	(57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	(59)
Total heat required for water heating calculated for each month												
	172.8078	151.9292	158.6540	140.9674	137.2343	121.3176	115.2700	128.2000	128.5103	146.2366	156.2086	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Output from w/h												
	172.8078	151.9292	158.6540	140.9674	137.2343	121.3176	115.2700	128.2000	128.5103	146.2366	156.2086	(64)
Heat gains from water heating, kWh/month												
	70.3699	62.1783	65.6637	59.3664	58.5417	52.8329	51.2385	55.5378	55.2245	61.5349	64.4341	(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	115.3778	115.3778	115.3778	115.3778	115.3778	115.3778	115.3778	115.3778	115.3778	115.3778	115.3778	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	18.1417	16.1133	15.1042	9.9207	7.4159	6.2608	6.7650	8.7934	11.8025	14.9860	17.4909	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	203.2876	205.3971	200.0813	188.7645	174.4790	161.0527	152.0832	149.9737	155.2895	166.6063	180.8918	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	34.5378	34.5378	34.5378	34.5378	34.5378	34.5378	34.5378	34.5378	34.5378	34.5378	34.5378	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)												
	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022	(71)
Water heating gains (Table 5)												
	94.5831	92.5272	88.2577	82.4534	78.6850	73.3790	68.8690	74.6475	76.7006	82.7082	89.4919	(72)
Total internal gains												
	376.6258	374.6509	362.0565	341.7520	321.1933	301.3059	288.3305	294.0279	304.4060	324.9139	348.4878	(73)

6. Solar gains													
[Jan]		Area	Solar flux	g	FF	Access	Gains						
		m ²	Table 6a	W/m ²	Specific data or Table 6b	Specific data or Table 6c	Table 6d						
Southwest		8.2600	36.7938	0.6300	0.7000	0.7000	92.8810	(79)					
Northwest		7.4400	11.2829	0.6300	0.7000	0.7000	25.6547	(81)					
Solar gains	118.5357	210.4316	310.5563	422.7332	508.1252	519.6828	494.6908	428.6558	349.0367	238.6746	143.5303	100.4377	(83)
Total gains	495.1616	585.0826	672.6128	764.4851	829.3185	820.9887	783.0213	722.6837	653.4427	563.5885	492.0181	466.5508	(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	60.3645	60.5353	60.7036	61.5067	61.6593	62.3800	62.3800	62.5153	62.1004	61.6593	61.3513	61.0326	
alpha	5.0243	5.0357	5.0469	5.1004	5.1106	5.1587	5.1587	5.1677	5.1400	5.1106	5.0901	5.0688	
util living area													
	0.9964	0.9913	0.9759	0.9237	0.7981	0.6072	0.4499	0.5052	0.7666	0.9552	0.9921	0.9974	(86)
MIT	19.8340	20.0152	20.2905	20.6290	20.8719	20.9756	20.9957	20.9924	20.9229	20.5946	20.1510	19.8040	(87)
Th 2	19.9599	19.9625	19.9651	19.9772	19.9794	19.9900	19.9920	19.9920	19.9859	19.9794	19.9749	19.9701	(88)
util rest of house													
	0.9953	0.9884	0.9679	0.8989	0.7415	0.5209	0.3489	0.3987	0.6852	0.9352	0.9890	0.9965	(89)
MIT 2	18.4156	18.6807	19.0787	19.5572	19.8614	19.9749	19.9885	19.9890	19.9286	19.5230	18.8887	18.3792	(90)
Living area fraction													
	19.0576	19.2847	19.6272	20.0423	20.3188	20.4278	20.4444	20.4432	20.3786	20.0080	19.4600	19.0241	(91)
Temperature adjustment													
adjusted MIT	19.0576	19.2847	19.6272	20.0423	20.3188	20.4278	20.4444	20.4432	20.3786	20.0080	19.4600	19.0241	(92)
adjusted MIT	19.0576	19.2847	19.6272	20.0423	20.3188	20.4278	20.4444	20.4432	20.3786	20.0080	19.4600	19.0241	(93)

8. Space heating requirement												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9939	0.9860	0.9646	0.9007	0.7616	0.5593	0.3948	0.4471	0.7189	0.9359	0.9870	0.9953 (94)
Useful gains	492.1172	576.8677	648.8204	688.5488	631.6154	459.2027	309.1113	323.1194	469.7601	527.4609	485.6020	464.3752 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.4000	14.1000	10.6000	7.1000	4.2000	4.2000 (96)
Heat loss rate W												
	1232.5624	1198.0282	1090.2637	913.3278	704.7285	471.0155	310.7089	326.0693	509.7347	769.2620	1015.7103	1224.5601 (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												
	550.8912	417.4198	328.4338	161.8409	54.3962	0.0000	0.0000	0.0000	0.0000	179.9000	381.6780	565.5776 (98)
Space heating												2640.1376 (98)
Space heating per m2										(98) / (4) =		36.3655 (99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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												2823.6765	(211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	550.8912	417.4198	328.4338	161.8409	54.3962	0.0000	0.0000	0.0000	0.0000	179.9000	381.6780	565.5776 (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)	589.1885	446.4383	351.2661	173.0919	58.1777	0.0000	0.0000	0.0000	0.0000	192.4064	408.2118	604.8958 (211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)

Water heating												
Water heating requirement												
	172.8078	151.9292	158.6540	140.9674	137.2343	121.3176	115.2700	128.2000	128.5103	146.2366	156.2086	168.2266 (64)
Efficiency of water heater												
(217)m	87.6923	87.3737	86.7129	85.1828	82.5712	79.8000	79.8000	79.8000	79.8000	85.3675	87.1080	79.8000 (216)
Fuel for water heating, kWh/month												
	197.0615	173.8843	182.9648	165.4882	166.2012	152.0271	144.4486	160.6516	161.0405	171.3025	179.3275	191.5997 (219)
Water heating fuel used												
Annual totals kWh/year												2045.9974 (219)
Space heating fuel - main system												
Space heating fuel - secondary												2823.6765 (211)
												0.0000 (215)

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 (m2)	Storey height (m)	Volume (m3)
Ground floor	72.6000 (1b)	x 2.5000 (2b)	= 181.5000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6000		
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 181.5000 (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					3 * 10 = 30.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of fuelless gas fires					0 * 40 = 0.0000 (7c)

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =

Pressure test	30.0000 / (5) =	0.1633 (8)
Measured/design AP50		4.0000
Infiltration rate		0.3653 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3105 (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 infiltr rate	0.3959	0.3881	0.3804	0.3415	0.3338	0.2950	0.2950	0.2872	0.3105	0.3338	0.3493	0.3648 (22b)
Effective ac	0.5784	0.5753	0.5723	0.5583	0.5557	0.5435	0.5435	0.5412	0.5482	0.5557	0.5610	0.5666 (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
Opening Type 1 (Uw = 0.90)			15.7000	0.8687	13.6390		(27)
Floor above commercial			72.6000	0.1200	8.7120		(28a)
External Wall	51.2700	15.7000	35.5700	0.2400	8.5368		(29a)
Total net area of external elements Aum(A, m2)			123.8700				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...	(30) + (32) =	30.8878		(33)
Wall to Corridor			10.8000	0.0000	0.0000		(32)
Party Wall			33.8900	0.0000	0.0000		(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 11.5732 (36)
Total fabric heat loss (33) + (36) = 42.4610 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	34.6410	34.4587	34.2801	33.4410	33.2840	32.5532	32.5532	32.4178	32.8347	33.2840	33.6016	33.9336 (38)
Average = Sum(39)/ 12 =	77.1020	76.9197	76.7411	75.9020	75.7450	75.0142	75.0142	74.8788	75.2957	75.7450	76.0626	75.9012 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0620	1.0595	1.0570	1.0455	1.0433	1.0333	1.0333	1.0314	1.0371	1.0433	1.0477	1.0523 (40)
HLP (average)												1.0455 (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 2.3076 (42)
Average daily hot water use (litres/day) 93.6889 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	103.0578	99.3102	95.5627	91.8151	88.0676	84.3200	84.3200	88.0676	91.8151	95.5627	99.3102	103.0578 (44)
Energy conte	152.8317	133.6676	137.9330	120.2533	115.3859	99.5693	92.2656	105.8761	107.1406	124.8620	136.2967	148.0094 (45)
Energy content (annual)												Total = Sum(45)m = 1474.0912 (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	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)

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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 32.4767 28.4044 29.3108 25.5538 24.5195 21.1585 19.6064 22.4987 22.7674 26.5332 28.9630 31.4520 (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	115.3778	115.3778	115.3778	115.3778	115.3778	115.3778	115.3778	115.3778	115.3778	115.3778	115.3778	115.3778 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.1417	16.1133	13.1042	9.9207	7.4159	6.2608	6.7650	8.7934	11.8025	14.9860	17.4909	18.6459 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	203.2876	205.3971	200.0813	188.7645	174.4790	161.0527	152.0832	149.9737	155.2895	166.6063	180.8918	194.3180 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5378	34.5378	34.5378	34.5378	34.5378	34.5378	34.5378	34.5378	34.5378	34.5378	34.5378	34.5378 (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)	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022 (71)
Water heating gains (Table 5)	43.6515	42.2684	39.3962	35.4914	32.9563	29.3868	26.3527	30.2401	31.6214	35.6629	40.2264	42.2742 (72)
Total internal gains	322.6942	321.3922	310.1950	291.7900	272.4646	254.3136	242.8142	246.6206	256.3267	274.8685	296.2224	312.8515 (73)

6. Solar gains

[Jan]											Gains W	
	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d							
Southwest	8.2600	36.7938	0.4000		0.8000	0.7700					67.3966 (79)	
Northwest	7.4400	11.2829	0.4000		0.8000	0.7700					18.6157 (81)	
Solar gains	86.0123	152.6941	225.3469	306.7451	368.7077	377.0941	358.9593	311.0427	253.2693	173.1879	104.1490	72.8800 (83)
Total gains	408.7065	474.0863	535.5420	598.5351	641.1722	631.4078	601.7736	557.6633	509.5960	448.0565	400.3714	385.7315 (84)

7. Mean internal temperature (heating season)

tau	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Alpha	65.3896	65.5445	65.6971	66.4234	66.5611	67.2095	67.2095	67.3310	66.9583	66.5611	66.2831	65.9951
util living area	0.9985	0.9964	0.9898	0.9636	0.8815	0.7115	0.5391	0.6001	0.8533	0.9794	0.9968	0.9989 (86)
MIT	19.8438	19.9925	20.2332	20.5494	20.8163	20.9592	20.9925	20.9871	20.8882	20.5397	20.1324	19.8171 (87)
Th 2	20.0320	20.0340	20.0361	20.0456	20.0474	20.0557	20.0557	20.0573	20.0525	20.0474	20.0438	20.0400 (88)
util rest of house	0.9980	0.9952	0.9861	0.9499	0.8387	0.6256	0.4283	0.4860	0.7863	0.9692	0.9955	0.9986 (89)
MIT 2	18.9736	19.1235	19.3641	19.6797	19.9227	20.0369	20.0538	20.0535	19.9898	19.6762	19.2714	18.9536 (90)
Living area fraction	19.3674	19.5168	19.7575	20.0734	20.3272	20.4544	20.4787	20.4760	20.3964	20.0670	19.6611	19.3444 (91)
MIT	19.3674	19.5168	19.7575	20.0734	20.3272	20.4544	20.4787	20.4760	20.3964	20.0670	19.6611	19.3444 (92)
Temperature adjustment												0.0000
adjusted MIT	19.3674	19.5168	19.7575	20.0734	20.3272	20.4544	20.4787	20.4760	20.3964	20.0670	19.6611	19.3444 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	407.7243	471.4193	527.3725	568.8097	546.6401	418.9605	288.1295	300.0529	414.4099	434.3599	398.2756	385.0480 (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	1161.7289	1124.3203	1017.3923	848.0812	653.4638	439.1598	290.9551	305.2098	474.0921	717.0809	955.4275	1156.9527 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	560.9794	438.7494	364.5747	201.0755	79.4768	0.0000	0.0000	0.0000	0.0000	210.3444	401.1493	574.2971 (98)
Space heating												2830.6467 (98)
Space heating per m2										(98) / (4) =		38.3896 (99)

8c. Space cooling requirement

Ext. temp.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	705.1332	555.1048	569.0791	0.0000	0.0000	0.0000	0.0000 (100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.9032	0.9515	0.9322	0.0000	0.0000	0.0000	0.0000 (101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	656.8523	528.1696	530.4951	0.0000	0.0000	0.0000	0.0000 (102)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000 (103a)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	134.3715	192.6605	153.5842	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												480.6162 (104)
Cooled fraction												1.0000 (105)
Intermittency factor (Table 10b)												fc = cooled area / (4) =

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Space cooling kWh	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	0.0000	0.0000	0.0000	0.0000	0.0000	33.5929	48.1651	38.3960	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling per m2												1.6550 (108)
Energy for space heating												38.9896 (99)
Energy for space cooling												1.6550 (108)
Total												40.6446 (109)
Dwelling Fabric Energy Efficiency (DFEE)												40.6 (109)

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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 (m2)	Storey height (m)	Volume (m3)
Ground floor			72.6000 (1b)	x 2.5000 (2b)	= 181.5000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)			72.6000		(4)
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 181.5000 (5)

2. Ventilation rate												m3 per hour
	main heating		secondary heating		other		total					
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									3 * 10 =	30.0000 (7a)		
Number of passive vents									0 * 10 =	0.0000 (7b)		
Number of flueless gas fires									0 * 40 =	0.0000 (7c)		
									Air changes per hour			
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =									30.0000 / (5) =	0.1653 (8)		
Pressure test										Yes		
Measured/design AP50										5.0000		
Infiltration rate										0.4153 (18)		
Number of sides sheltered										2 (19)		
Shelter factor									(20) = 1 - [0.075 x (19)] =	0.8500 (20)		
Infiltration rate adjusted to include shelter factor									(21) = (18) x (20) =	0.3530 (21)		
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Adj infiltr rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Effective ac	0.4501	0.4412	0.4324	0.3883	0.3795	0.3353	0.3353	0.3265	0.3530	0.3795	0.3971	0.4148 (22b)
	0.6013	0.5973	0.5935	0.5754	0.5720	0.5562	0.5562	0.5533	0.5623	0.5720	0.5789	0.5860 (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 Opening Type (Uw = 1.40)				15.7000	1.3258	20.8144			(27)				
Floor above commercial				72.6000	0.1300	9.4380			(28a)				
External Wall	51.2700		15.7000	35.5700	0.1800	6.4026			(29a)				
Total net area of external elements Aum(A, m ²)				123.8700					(31)				
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =		36.6550			(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)										10.8516	(36)		
Total fabric heat loss										(33) + (36) =		47.5066	(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	36.0137	35.7782	35.5473	34.4628	34.2599	33.3153	33.3153	33.1404	33.6791	34.2599	34.6704	35.0995 (38)	
Average = Sum(39)m / 12 =	83.5203	83.2848	83.0539	81.9694	81.7665	80.8219	80.8219	80.6470	81.1857	81.7665	82.1770	82.6061 (39)	
	83.5203	83.2848	83.0539	81.9694	81.7665	80.8219	80.8219	80.6470	81.1857	81.7665	82.1770	82.6061 (39)	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.1504	1.1472	1.1440	1.1291	1.1263	1.1132	1.1132	1.1108	1.1183	1.1263	1.1319	1.1378 (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												2.3076 (42)
Average daily hot water use (litres/day)												89.0045 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	97.9049	94.3447	90.7845	87.2244	83.6642	80.1040	80.1040	83.6642	87.2244	90.7845	94.3447	97.9049 (44)
Energy conte	145.1901	126.9842	131.0363	114.2407	109.6166	94.5908	87.6523	100.5823	101.7836	118.6189	129.4818	140.6089 (45)
Energy content (annual)												Total = Sum(45)m = 1400.3867 (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:												
	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												

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30.8529 26.9841 27.8452 24.2761 23.2935 20.1005 18.6261 21.3737 21.6290 25.2065 27.5149 29.8794 (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	115.3778	115.3778	115.3778	115.3778	115.3778	115.3778	115.3778	115.3778	115.3778	115.3778	115.3778	115.3778 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	18.1417	16.1133	13.1042	9.9207	7.4159	6.2608	6.7650	8.7934	11.8025	14.9860	17.4909	18.6459 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	203.2876	205.3971	200.0813	188.7645	174.4790	161.0527	152.0832	149.9737	155.2895	166.6063	180.8918	194.3180 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.5378	34.5378	34.5378	34.5378	34.5378	34.5378	34.5378	34.5378	34.5378	34.5378	34.5378	34.5378 (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)	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022 (71)
Water heating gains (Table 5)	41.4690	40.1550	37.4264	33.7169	31.3085	27.9174	25.0351	28.7281	30.0403	33.8797	38.2151	40.1605 (72)
Total internal gains	320.5117	319.2788	308.2252	290.0154	270.8168	252.8443	241.4966	245.1086	254.7456	273.0854	294.2111	310.7378 (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
Southwest	8.2600	36.7938	0.6300	0.7000	0.7700	92.8810 (79)
Northwest	7.4400	11.2829	0.6300	0.7000	0.7700	25.6547 (81)
Solar gains	118.5357	210.4316	310.5563	422.7332	508.1252	519.6828
Total gains	439.0474	529.7104	618.7815	712.7486	778.9420	772.5271
			736.1874	673.7643	603.7823	511.7600
						437.7414
						411.1755 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, T _{hl} (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	60.3645	60.5353	60.7036	61.5067	61.6593	62.3800	62.3800	62.5153	62.1004	61.6593	61.3513	61.0326
alpha	5.0243	5.0357	5.0469	5.1004	5.1106	5.1587	5.1587	5.1677	5.1400	5.1106	5.0901	5.0688
util living area	0.9979	0.9943	0.9828	0.9398	0.8261	0.6390	0.4771	0.5390	0.8042	0.9689	0.9953	0.9985 (86)
MIT	19.7626	19.9462	20.2280	20.5819	20.8481	20.9693	20.9943	20.9898	20.9029	20.5394	20.0830	19.7331 (87)
T _h 2	19.9599	19.9625	19.9651	19.9772	19.9794	19.9900	19.9920	19.9859	19.9794	19.9749	19.9701	19.9701 (88)
util rest of house	0.9972	0.9924	0.9768	0.9189	0.7726	0.5507	0.3707	0.4268	0.7264	0.9540	0.9934	0.9980 (89)
MIT 2	19.8344	19.0193	19.2396	19.6486	19.8818	19.9768	19.9887	19.9892	19.9348	19.6174	19.1661	18.8132 (90)
Living area fraction	0.9924	0.9924	0.9768	0.9189	0.7726	0.5507	0.3707	0.4268	0.7264	0.9540	0.9934	0.9980 (91)
MIT	19.2545	19.4388	19.7198	20.0710	20.3192	20.4260	20.4438	20.4421	20.3730	20.0347	19.5811	19.2295 (92)
Temperature adjustment	19.2545	19.4388	19.7198	20.0710	20.3192	20.4260	20.4438	20.4421	20.3730	20.0347	19.5811	19.2295 (93)
adjusted MIT	19.2545	19.4388	19.7198	20.0710	20.3192	20.4260	20.4438	20.4421	20.3730	20.0347	19.5811	19.2295 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9966	0.9912	0.9751	0.9211	0.7918	0.5901	0.4191	0.4779	0.7586	0.9550	0.9924	0.9975 (94)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	14.1000	10.6000	7.1000	4.2000	4.2000 (96)
Heat loss rate W	1249.0057	1210.8632	1097.9550	915.6830	704.7586	470.8681	301.6664	325.9835	509.2783	771.4407	1025.6557	1241.5297 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	603.7194	460.8711	367.9830	186.5776	65.4480	0.0000	0.0000	0.0000	0.0000	210.3331	425.6810	618.5399 (98)
Space heating												2939.1531 (98)
Space heating per m2										(98) / (4) =		40.4842 (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	14.1000	10.6000	7.1000	4.2000	4.2000
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	759.7259	598.0821	612.9170	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9259	0.9630	0.9460	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	703.3953	575.9813	579.8117	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	988.6722	944.4515	872.8832	0.0000	0.0000	0.0000	0.0000 (103)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000 (103a)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	205.3993	274.1418	218.0452	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												697.5863 (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												

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 51.3498 68.5354 54.5113 0.0000 0.0000 0.0000 0.0000 0.0000 (107)

Space cooling 174.3966 (107)
Space cooling per m2 2.4022 (108)
Energy for space heating 40.4842 (99)
Energy for space cooling 2.4022 (108)
Total 42.8864 (109)
Target Fabric Energy Efficiency (TFEE) 49.3 (109)

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

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[illegible]

[illegible]

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	138.4534	138.4534	138.4534	138.4534	138.4534	138.4534	138.4534	138.4534	138.4534	138.4534	138.4534	138.4534 (66)
Lighting gains (calculated in Appendix L, equation L19 or L5a), also see Table 5												
	45.3543	40.2833	32.7606	24.8019	18.5397	15.6520	16.9125	21.9835	29.5063	37.4650	46.4149	64.6149 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	303.4144	306.5629	298.6288	281.7380	260.4165	240.3772	226.9898	223.8413	231.7754	248.6661	269.9877	290.0269 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	51.1529	51.1529	51.1529	51.1529	51.1529	51.1529	51.1529	51.1529	51.1529	51.1529	51.1529	51.1529 (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. evaporators (negative values)												
	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022 (71)
Water heating gains (Table 5)												
	100.5574	98.3932	93.8990	87.7892	83.8225	78.2372	73.4899	79.5725	81.7337	88.0575	95.1981	98.4022 (72)
Total internal gains	546.6301	542.5434	522.5924	491.6331	460.0827	431.5705	414.6962	422.7014	440.3194	476.0216	502.2160	532.3480 (73)

[Jan]		Area	Solar flux	g	FF	Access	Gains						
		m2	Table 6a	Table 6b	Table 6c	factor	W						
			W/m2	or Table 6b	or Table 6c	Table 6d							

Southwest		8.24600	36.7938	0.4000	0.8000	0.7700	67.3966 (79)						
Northwest		7.4400	11.2829	0.4000	0.8000	0.7700	18.6157 (81)						

Solar gains	86.0123	152.6941	225.3469	304.7451	368.7077	377.0941	358.3593	331.0427	253.2693	173.1879	104.1490	72.8800	(83)
Total	635.6424	685.2375	747.9393	798.1783	828.7904	808.6664	773.6555	733.7441	693.5886	644.6806	610.3660	60.7280	(84)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilization factor for gains for living area, n _l /m (see Table 9)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	75.7874	76.0785	76.3719	77.8733	78.1807	79.7548	79.7548	80.0772	79.1746	78.1807	77.5683	76.9654	
alpha	6.0525	6.0719	6.0915	6.1916	6.2120	6.3170	6.3170	6.3385	6.2745	6.2120	6.1712	6.1310	
util living area	0.9855	0.9728	0.9411	0.8527	0.6939	0.4971	0.3592	0.3940	0.6201	0.8778	0.9693	0.9883 (86)	
MIT	20.3413	20.4719	20.4673	20.8607	20.9965	20.9996	20.9996	20.9993	20.9870	20.8577	20.7700	20.3195 (87)	
Th 2	20.1537	20.1566	20.1596	20.1745	20.1775	20.1925	20.1925	20.1955	20.1866	20.1775	20.1715	20.1656 (88)	
util rest of house	0.9813	0.9654	0.9257	0.8196	0.6418	0.4358	0.2934	0.3255	0.5527	0.8422	0.9597	0.9850 (89)	
MIT 2	19.2652	19.4836	19.7447	20.0242	20.1481	20.1903	20.1923	20.1952	20.1770	20.0289	19.8473	19.7733 (90)	
Living area fraction	19.7687	19.9309	20.1577	20.4028	20.5186	20.5552	20.5577	20.5592	20.5439	20.4040	20.0681	0.4526 (91)	
adjusted MIT	19.7687	19.9309	20.1577	20.4028	20.5186	20.5552	20.5577	20.5592	20.5439	20.4040	20.0681	19.7468 (92)	
temperature adjustment	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
MIT adjusted	19.7687	19.9309	20.1577	20.4028	20.5186	20.5552	20.5577	20.5592	20.5439	20.4040	20.0681	19.7468 (93)	

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8c. Space cooling requirement	

Not applicable	

9b. Energy requirements	

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Boilers	0.2500 (303a)
Fraction heat from community Combined Heat and Power	0.7500 (303b)
Fraction of total space heat from community Boilers	0.2500 (304a)
Fraction of total space heat from community Combined Heat and Power	0.7500 (304b)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.0500 (306)
Space heating:	
Annual space heating requirement	1315.3363 (98)
Space heat from Boilers = $(98) \times 0.25 \times 1.00 \times 1.05$	345.2758 (307a)
Space heat from Combined Heat and Power = $(98) \times 0.75 \times 1.00 \times 1.05$	1035.8273 (307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)

Water heating		
Annual water heating requirement		1827.2899 (64)
Water heat from Boilers (64) $\times 0.25 \times 1.00 \times 1.05$		479.4636 (310a)
Water heat from Combined Heat and Power = (64) $\times 0.75 \times 1.00 \times 1.05$		1438.9908 (310b)
Electricity used for heat distribution		32.9976 (313)
Annual totals kWh/year		
Electricity for pumps and fans:		
(BalanceWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.8000)		
mechanical ventilation fans (SFP = 0.8000)		177.1440 (330a)
Total electricity for the above, kWh/year		177.1440 (331)
Electricity for lighting (calculated in Appendix L)		320.3886 (332)
Total delivered energy for all use		3797.2903 (338)

	Fuel kWh/year	Fuel price £/kWh	Fuel cost £/year
Space heating from Boilers	345,278	4.2400	14,6397 (340a)
Space heating from Combined Heat and Power	1035,8273	2.9700	30,7641 (340b)
Space heating - secondary	0.0000	0.0000	0.0000 (341)
Water heating from Boilers	479,6636	4.2400	20,3377 (342a)
Water heating from Combined Heat and Power	1438,9908	2.9700	42,7380 (342b)
Mechanical ventilation fan	177,1440	13.1900	23,3453 (349)
Pumps and fans for heating	0.0000	0.0000	0.0000 (349)
Energy for lighting	320,3886	13.1900	42,2593 (350)
Additional standing charges			120.0000 (351)
Total energy cost			294.1041 (355)

Energy cost deflator (Table 12):		0.4200 (356)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	1.0504 (357)
SAP value		85.3473
SAP rating (Section 12)		85 (358)
SAP band		

	Energy kWh/year	Emission factor kg CO ₂ /kWh	Emissions kg CO ₂ /year
Efficiency of heat source Boilers			95.0000 (367a)
Space heating from Boilers	868.3372	0.2160	187.5632 (367)
Electrical efficiency of CHP unit			38.3000 (361)
Heat efficiency of CHP unit			40.6000 (362)
Space heating from Combined Heat and Power	2551.2989	0.2160	551.0806 (363)
Less credit emissions for electricity	-977.1475	0.5190	-507.1395 (364)
Water heating from Combined Heat and Power	3544.3122	0.2160	765.5714 (365)
Less credit emissions for electricity	-1357.4716	0.5190	-704.5278 (366)
Electrical energy for heat distribution	32.9976	0.5190	17.1257 (372)
Total CO ₂ associated with community systems (negative value allowed since DFEE <= TFEF)			309.6756 (373)
Space and water heating			309.6756 (376)
Pumps and fans	177.1440	0.5190	91.9377 (378)
Energy for lighting	320.3886	0.5190	166.2817 (379)
Total kg/year			567.8950 (383)
CO ₂ emissions per m ²			7.8200 (384)
EI value			93.5291 (384a)
EI rating			94 (385)
EI band			

$$0.25 \times 4.240 \times 1.05$$

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

0.75 x 2.970 x 1.05
= 3.452, stars = 5
Space heating environmental impact 0.25 x 0.216 x 1.05 / 0.9500
0.75 x (0.216 - 0.383 x 0.519) x 1.05 / 0.406
= 0.0931, stars = 5
Water heating energy efficiency
Water heating environmental impact

3.452, stars = 5
0.0931, stars = 5

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 (m2)	Storey height (m)	Volume (m3)
Ground floor	72.6000 (1b)	x 2.5000 (2b)	= 181.5000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	72.6000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 181.5000 (5)

2. Ventilation rate

	main		secondary		other	total	m3 per hour					
	heating	main	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)				
						Air changes per hour						
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =						0.0000 / (5) =	0.0000	(8)				
Pressure test						Yes						
Measured/design AP50							4.0000					
Infiltration rate							0.2000	(18)				
Number of sides sheltered							2	(19)				
Shelter factor						(20) = 1 - [0.075 x (19)] =	0.8500	(20)				
Infiltration rate adjusted to include shelter factor						(21) = (18) x (20) =	0.1700	(21)				
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	4.6000	4.3000	4.4000	4.0000	4.0000	3.5000	3.6000	3.8000	3.7000	3.9000	3.9000	4.3000 (22)
Adj infiltr rate	1.1500	1.0750	1.1000	1.0000	1.0000	0.8750	0.9000	0.9500	0.9250	0.9750	0.9750	1.0750 (22a)
	0.1955	0.1828	0.1870	0.1700	0.1700	0.1488	0.1530	0.1615	0.1573	0.1658	0.1658	0.1828 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.3805	0.3678	0.3720	0.3550	0.3550	0.3338	0.3380	0.3465	0.3423	0.3508	0.3508	0.3678 (25)
												63.0000 (23c)

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					
Opening Type 1 (Uw = 0.90)			15.7000	0.8687	13.6390		(27)					
Floor above commercial			72.6000	0.1200	8.7120		(28b)					
External Wall	51.2700	15.7000	35.5700	0.2400	8.5368		(29a)					
Total net area of external elements Aum(A, m2)			123.8700				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =			30.8878	(33)					
Wall to Corridor			10.8000	0.0000	0.0000		(32)					
Party Wall			33.8900	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							11.5732 (36)					
Total fabric heat loss						(33) + (36) =	42.4610 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 22.7900	Feb 22.0264	Mar 22.2809	Apr 21.2627	May 21.2627	Jun 19.9900	Jul 20.2445	Aug 20.7536	Sep 20.4991	Oct 21.0082	Nov 21.0082	Dec 22.0264 (38)
Heat transfer coeff	65.2510	64.4874	64.7419	63.7237	63.7237	62.4510	62.7055	63.2146	62.9601	63.4692	63.4692	64.4874 (39)
Average = Sum(39)m / 12 =												63.7237 (39)
HLP	Jan 0.8988	Feb 0.8883	Mar 0.8918	Apr 0.8777	May 0.8777	Jun 0.8602	Jul 0.8637	Aug 0.8707	Sep 0.8672	Oct 0.8742	Nov 0.8742	Dec 0.8883 (40)
HLP (average)												0.8777 (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												2.3076 (42)
Average daily hot water use (litres/day)												93.6889 (43)
Daily hot water use	Jan 103.0578	Feb 99.3102	Mar 95.5627	Apr 91.8151	May 88.0676	Jun 84.3200	Jul 84.3200	Aug 88.0676	Sep 91.8151	Oct 95.5627	Nov 99.3102	Dec 103.0578 (44)
Energy conte	152.8317	133.6676	137.9330	120.2533	115.3859	99.5693	92.2656	105.8761	107.1406	124.8620	136.2967	148.0094 (45)
Energy content (annual)										Total = Sum(45)m =	1474.0912 (45)	
Distribution loss (46)m = 0.15 x (45)m												
Water storage loss:	22.9248	20.0501	20.6899	18.0380	17.3079	14.9354	13.8398	15.8814	16.0711	18.7293	20.4445	22.2014 (46)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



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

Store volume												3.0000 (47)
b) If manufacturer declared loss factor is not known :												
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0212 (51)
Volume factor from Table 2a												3.4200 (52)
Temperature factor from Table 2b												1.0000 (53)
Enter (49) or (54) in (55)												0.2173 (55)
Total storage loss	6.7353	6.0835	6.7353	6.5180	6.7353	6.5180	6.7353	6.7353	6.5180	6.7353	6.5180	6.7353 (56)
If cylinder contains dedicated solar storage	6.7353	6.0835	6.7353	6.5180	6.7353	6.5180	6.7353	6.7353	6.5180	6.7353	6.5180	6.7353 (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	182.8294	160.7623	167.9307	149.2834	145.3836	128.5993	122.2633	135.8738	136.1706	154.8597	165.3267	178.0071 (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)
Output from w/h	182.8294	160.7623	167.9307	149.2834	145.3836	128.5993	122.2633	135.8738	136.1706	154.8597	165.3267	178.0071 (64)
Heat gains from water heating, kWh/month	74.8147	66.1202	69.8609	63.2083	62.3640	56.3308	54.6765	59.2020	58.8483	65.5148	68.5427	73.2131 (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	138.4534	138.4534	138.4534	138.4534	138.4534	138.4534	138.4534	138.4534	138.4534	138.4534	138.4534	138.4534 (66)
Lighting gains (calculated in Appendix L, equation 19 or 19a), also see Table 5	45.3543	40.2833	32.7606	24.8019	18.5397	15.6520	16.9125	21.9835	29.5063	37.4650	43.7272	46.6149 (67)
Appliances gains (calculated in Appendix L, equation 113 or 113a), also see Table 5	303.4144	306.5629	298.6288	281.7380	260.4165	240.3772	226.9898	223.8413	231.7754	248.6661	269.9877	290.0269 (68)
Cooking gains (calculated in Appendix L, equation 115 or 115a), also see Table 5	51.1529	51.1529	51.1529	51.1529	51.1529	51.1529	51.1529	51.1529	51.1529	51.1529	51.1529	51.1529 (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)	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022	-92.3022 (71)
Water heating gains (Table 5)	100.5574	98.3932	93.8990	87.7892	83.8225	78.2372	73.4899	79.5725	81.7337	88.0575	95.1981	98.4022 (72)
Total internal gains	546.6301	542.5434	522.5924	491.6331	460.0827	431.5705	414.6962	422.7014	440.3194	471.4926	506.2170	532.3480 (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
Southwest	8.2600	39.1209	0.4000	0.8000	0.7700	71.6593 (79)
Northwest	7.4400	12.4928	0.4000	0.8000	0.7700	20.6118 (81)
Solar gains	92.2710	147.3948	219.3352	311.8340	363.5928	399.1581
Total gains	638.9011	689.9382	741.9276	830.7286	795.5612	759.0895

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, n _{li,m} (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	77.2657	78.1807	77.8733	79.1176	79.1176	80.7200	80.4023	79.7548	80.0772	79.4349	79.4349	78.1807
alpha	6.1510	6.2120	6.1916	6.2745	6.2745	6.3820	6.3602	6.3170	6.3385	6.2957	6.2957	6.2120
util living area	0.9780	0.9637	0.9139	0.7828	0.5792	0.3456	0.1970	0.2248	0.4741	0.7922	0.9475	0.9816 (86)
MIT	20.4671	20.5717	20.7604	20.9280	20.9901	20.9997	21.0000	21.0000	20.9978	20.9366	20.7044	20.4500 (87)
Th 2	20.1685	20.1775	20.1745	20.1865	20.1865	20.2015	20.1985	20.1925	20.1955	20.1895	20.1895	20.1775 (88)
util rest of house	0.9716	0.9537	0.8917	0.7397	0.5207	0.2857	0.1339	0.1576	0.4046	0.7404	0.9313	0.9761 (89)
MIT 2	19.4877	19.6420	19.8970	20.1154	20.1792	20.2013	20.1985	20.1925	20.1943	20.1317	19.8390	19.4708 (90)
Living area fraction									f _{LA} =	Living area / (4) =		0.4526 (91)
MIT	19.9310	20.0628	20.2878	20.4832	20.5462	20.5627	20.5612	20.5580	20.5580	20.4960	20.2307	19.9140 (92)
Temperature adjustment												0.0000
adjusted MIT	19.9310	20.0628	20.2878	20.4832	20.5462	20.5627	20.5612	20.5580	20.5580	20.4960	20.2307	19.9140 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9694	0.9521	0.8951	0.7561	0.5468	0.3128	0.1625	0.1880	0.4361	0.7609	0.9322	0.9740 (94)
Useful gains	619.3627	656.8856	664.0732	607.4867	450.3731	259.8567	129.2504	142.7328	311.2238	497.9186	578.5256	596.4745 (95)
Ext temp	5.4000	5.8000	7.8000	10.3000	13.4000	16.4000	18.5000	18.3000	15.6000	12.1000	8.3000	5.4000 (96)
Heat loss rate W	948.1629	919.7687	808.4843	648.9123	455.3841	259.9643	129.2514	142.7358	312.1931	532.8893	757.2324	935.9711 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	244.6274	176.6574	107.4419	29.8264	3.7282	0.0000	0.0000	0.0000	0.0000	26.0197	127.9489	252.5855 (98)
Space heating												968.8355 (98)
Space heating per m ²										(98) / (4) =		13.3448 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



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

8c. Space cooling requirement	
Not applicable	
9b. Energy requirements	
Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Boilers	0.2500 (303a)
Fraction of heat from community Combined Heat and Power	0.7500 (303b)
Fraction of total space heat from community Boilers	0.2500 (304a)
Fraction of total space heat from community Combined Heat and Power	0.7500 (304b)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.0500 (306)
Space heating:	
Annual space heating requirement	968.8355 (98)
Space heat from Boilers = (98) x 0.25 x 1.00 x 1.05	254.3193 (307a)
Space heat from Combined Heat and Power = (98) x 0.75 x 1.00 x 1.05	762.9579 (307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)

Water heating	
Annual water heating requirement	1827.2899 (64)
Water heat from Boilers = (64) x 0.25 x 1.00 x 1.05	479.6636 (310a)
Water heat from Combined Heat and Power = (64) x 0.75 x 1.00 x 1.05	1438.9908 (310b)
Electricity used for heat distribution	29.3593 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.8000)	
Mechanical ventilation fans (SFP = 0.8000)	177.1440 (330a)
Total electricity for the above, kWh/year	177.1440 (331)
Electricity for lighting (calculated in Appendix L)	320.3886 (332)
Total delivered energy for all uses	3433.4642 (338)

10b. Fuel costs - using BREF prices (495)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating from Boilers	254.3193	4.4300	11.2663 (340a)
Space heating from Combined Heat and Power	762.9579	3.1000	23.6517 (340b)
Space heating - secondary	0.0000	0.0000	0.0000 (341)
Water heating from Boilers	479.6636	4.4300	21.2491 (342a)
Water heating from Combined Heat and Power	1438.9908	3.1000	44.6087 (342b)
Mechanical ventilation fans	177.1440	0.0000	34.4368 (349)
Pumps and fans for heating	0.0000	0.0000	0.0000 (349)
Energy for lighting	320.3886	19.4400	62.2835 (350)
Additional standing charges			95.0000 (351)
Total energy cost			292.4962 (355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO ₂ /kWh	Emissions kg CO ₂ /year
Efficiency of heat source Boilers			95.0000 (367a)
Space heating from Boilers	772.6136	0.2160	166.8845 (367)
Electrical efficiency of CHP unit			38.3000 (361)
Heat efficiency of CHP unit			40.6000 (362)
Space heating from Combined Heat and Power	1879.2067	0.2160	405.9086 (363)
less credit emissions for electricity	-719.7362	0.5190	-373.5431 (364)
Water heating from Combined Heat and Power	3544.3122	0.2160	765.5714 (365)
less credit emissions for electricity	-1357.4716	0.5190	-704.5278 (366)
Electrical energy for heat distribution	29.3593	0.5190	15.2375 (372)
Total CO ₂ associated with community systems			275.5313 (373)
(negative value allowed since DFEE <= TFEF)			
Space and water heating			275.5313 (376)
Pumps and fans	177.1440	0.5190	91.9177 (378)
Energy for lighting	320.3886	0.5190	166.2817 (379)
Total kg/year			533.7507 (383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO ₂ /kWh	Primary energy kWh/year
Efficiency of heat source Boilers			95.0000 (367a)
Space heating from Boilers	772.6136	1.2200	942.5886 (367)
Electrical efficiency of CHP unit			38.3000 (361)
Heat efficiency of CHP unit			40.6000 (362)
Space heating from Combined Heat and Power	1879.2067	1.2200	2292.6322 (363)
less credit emissions for electricity	-719.7362	3.0700	-2209.5900 (364)
Water heating from Combined Heat and Power	3544.3122	1.2200	4324.0609 (365)
less credit emissions for electricity	-1357.4716	3.0700	-4167.4378 (366)
Electrical energy for heat distribution	29.3593	3.0700	90.1331 (372)
Total CO ₂ associated with community systems			1272.3870 (373)
(negative value allowed since DFEE <= TFEF)			
Space and water heating			1272.3870 (376)
Pumps and fans	177.1440	3.0700	543.8321 (378)
Energy for lighting	320.3886	3.0700	983.5929 (379)



FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



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

Primary energy kWh/year
Primary energy kWh/m²/year

2799.8120 (383)
38.5649 (384)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating: B 85
Current environmental impact rating: A 94

(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	Not applicable
O	Not considered
P	Not considered
R	Not considered
S	Not considered
T	Not considered
U Solar photovoltaic panels	Not applicable
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
(none)

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

Potential energy efficiency rating: B 85
Potential environmental impact rating: A 94

Fuel prices for cost data on this page from database revision number 495 TEST (29 Apr 2022)
Recommendation texts revision number 4.9c (22 Feb 2014)

Typical heating and lighting costs of this home (per year, Thames Valley):			
	Current	Potential	Saving
Electricity	£97	£97	£0
Community scheme	£196	£196	£0
Space heating	£164	£164	£0
Water heating	£66	£66	£0
Lighting	£62	£62	£0
Total cost of fuels	£293	£293	£0
Total cost of uses	£292	£292	£0
Delivered energy	47 kWh/m ²	47 kWh/m ²	0 kWh/m ²
Carbon dioxide emissions	0.5 tonnes	0.5 tonnes	0.0 tonnes
CO2 emissions per m ²	7 kg/m ²	7 kg/m ²	0 kg/m ²
Primary energy	39 kWh/m ²	39 kWh/m ²	0 kWh/m ²

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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

No improvements selected / applicable

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

No improvements selected / applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



Property Reference	Flat Type T33 - MID				Issued on Date	01/06/2022
Assessment Reference	BE CLEAN DLF 1.05	Prop Type Ref	03rd Floor - 1B2P			
Property	Flat Type T33, London , N8					
SAP Rating	85 B	DER	8.45	TER	16.75	
Environmental	95 A	% DER<TER	49.54			
CO ₂ Emissions (t/year)	0.38	DFEE	32.59	TFEE	37.83	
General Requirements Compliance	Pass	% DFEE<TFEE	13.86			
Assessor Details	Mr. Michael Wride, Michael Wride, Tel: 02036 031 600, Michael@hodkinsonconsultancy.com				Assessor ID	R572-0001
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

Mid-floor flat, total floor area 51 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:Mains gas (c)
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 16.75 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 8.45 kgCO₂/m²OK

1b TFE and DFE
Target Fabric Energy Efficiency (TFEE) 37.8 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 32.6 kWh/m²/yrOK

2 Fabric U-values
Element Average Highest OK
External wall 0.24 (max. 0.30) 0.24 (max. 0.70) OK
Party wall 0.00 (max. 0.20) - OK
Floor 0 (no floor) - OK
Roof 0 (no roof) - OK
Openings 0.90 (max. 2.00) 0.90 (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: 4.00 (design value)
Maximum 10.0 OK

4 Heating efficiency
Main heating system: Community heating scheme -

Secondary heating system: None

5 Cylinder insulation
Hot water storage Nominal cylinder loss: 0.22 kWh/day
Permitted by DBSCG 0.35 OK
Primary pipework insulated: No primary pipework

6 Controls
Space heating controls: Charging system linked to use of community heating, programmer and TRVsOK

Hot water controls: No cylinderstat

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

8 Mechanical ventilation
Continuous supply and extract system
Specific fan power: 0.64
Maximum 1.5 OK
WWR efficiency: 90% OK
Minimum: 70% OK

9 Summertime temperature
Overheating risk (Thames Valley): Slight OK
Based on:
Overshading: Average
Windows facing North East: 8.26 m², No overhang
Windows facing South East: 2.48 m², No overhang
Air change rate: 4.00 ach
Blinds/curtains: None

10 Key Features
Party wall U-value 0.00 W/m²K
Party wall U-value 0.00 W/m²K
Window U-value 0.90 W/m²K
Community CHP, Mains gas

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.5900 (1b)	x 2.5000 (2b)	= 126.4750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.5900		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	126.4750 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of fuelless 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 APS0 4.0000
Infiltration rate 0.2000 (18)
Number of sides sheltered 2 (19)

Shelter factor (20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.1700 (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 infiltr rate	0.2168	0.2125	0.2083	0.1870	0.1828	0.1615	0.1615	0.1573	0.1700	0.1828	0.1913	0.1998 (22b)
Balanced mechanical ventilation with heat recovery												0.5000 (23a)
If mechanical ventilation:												63.0000 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.4018	0.3975	0.3933	0.3720	0.3678	0.3465	0.3465	0.3423	0.3550	0.3678	0.3763	0.3848 (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
Opening Type 1 (Uw = 0.90)							
External Wall	40.3600	10.7400	29.6200	0.8687	9.3301	0.2400	7.1098 (27)
Total net area of external elements Aum(A, m ²)			40.3600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...	(30) + (32) =	16.4389	(33)
Wall to Corridor				22.9300	0.0000	0.0000	(32)
Party Wall			17.5900	0.0000	0.0000	0.0000	(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K) 5.6842 (36)
Total fabric heat loss (33) + (36) = 22.1231 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)
(38)m
Heat transfer coeff
Average = Sum(39)m / 12 =

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Jan	16.7677	16.5904	16.4130	15.5261	15.3487	14.4618	14.4618	14.2844	14.8165	15.3487	15.7035	16.0582 (38)
Feb	38.8909	38.7135	38.5361	37.6492	37.4718	36.5849	36.5849	36.4075	36.9397	37.4718	37.8266	38.1813 (39)
Mar												37.6048 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.7687	0.7652	0.7617	0.7442	0.7407	0.7232	0.7232	0.7197	0.7302	0.7407	0.7477	0.7547 (40)
HLP (average)												0.7433 (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 1.7075 (42)
Average daily hot water use (litres/day) 78.6871 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	86.5558	83.4083	80.2608	77.1133	73.9658	70.8184	70.8184	73.9658	77.1133	80.2608	83.4083	86.5558 (44)
Energy conte	128.3597	112.2642	115.8466	100.9979	96.9099	83.6259	77.4916	88.9228	89.9848	104.8686	114.4723	124.3095 (45)
Energy content (annual)										Total = Sum(45)m =		1238.0538 (45)
Distribution loss (46)m = 0.15 x (45)m	19.2540	16.8396	17.3770	15.1497	14.5365	12.5439	11.6237	13.3384	13.4977	15.7303	17.1708	18.6464 (46)
Water storage loss:												
Store volume												3.0000 (47)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

b) If manufacturer declared loss factor is not known : Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0212 (51)
Volume factor from Table 2a												3.4200 (52)
Temperature factor from Table 2b												1.0000 (53)
Enter (49) or (54) in (55)												0.2173 (55)
Total storage loss												6.7353 (56)
If cylinder contains dedicated solar storage												6.7353 (57)
Primary loss												23.2624 (59)
Total heat required for water heating calculated for each month												158.3574 (62)
Solar input												0.0000 (63)
Output from w/h												158.3574 (64)
Heat gains from water heating, kWh/month												66.6778 (65)

5. Internal gains (see Table 5 and 5a)											
Metabolic gains (Table 5), Watts											
(66m)											
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5											
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5											
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5											
Pumps, fans											
Losses e.g. evaporation (negative values) (Table 5)											
Water heating gains (Table 5)											
Total internal gains											

6. Solar gains											
[Jan]											
Area m2											
Solar flux Table 6a W/m2											
Specific data or Table 6b											
Specific data or Table 6c											
Access factor Table 6d											
Gains W											
Northeast											
Southeast											
Solar gains											
Total gains											

7. Mean internal temperature (heating season)											
Temperature during heating periods in the living area from Table 9, Th1 (C)											
Utilisation factor for gains for living area, n11,m (see Table 9a)											
tau											
alpha											
util living area											
MIT											
Th 2											
util rest of house											
MIT 2											
Living area fraction											
MIT											
Temperature adjustment											
adjusted MIT											

8. Space heating requirement											
Utilisation											
Useful gains											
Ext temp.											
Heat loss rate W											
Month fracti											
Space heating kWh											
Space heating											
Space heating per m2											

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement			0.0000 (301)
Not applicable			0.0000 (302)

9b. Energy requirements			0.0000 (301)
Fraction of space heat from secondary/supplementary system (Table 11)			1.0000 (302)
Fraction of space heat from community system			0.2500 (303a)
Fraction of heat from community Boilers			0.7500 (303b)
Fraction of heat from community Combined Heat and Power			0.2500 (304a)
Fraction of total space heat from community Boilers			0.7500 (304b)
Factor for control and charging method (Table 4c(3)) for community space heating			1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating			1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system			1.0500 (306)
Space heating			862.6153 (98)
Annual space heating requirement			226.4365 (307a)
Space heat from Boilers = (98) x 0.25 x 1.00 x 1.05			679.3095 (307b)
Space heat from Combined Heat and Power = (98) x 0.75 x 1.00 x 1.05			0.0000 (308)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)			0.0000 (309)
Space heating fuel for secondary/supplementary system			

Water heating			1591.2525 (64)
Annual water heating requirement			417.7038 (310a)
Water heat from Boilers = (64) x 0.25 x 1.00 x 1.05			1253.1113 (310b)
Water heat from Combined Heat and Power = (64) x 0.75 x 1.00 x 1.05			25.7656 (311)
Electricity used for heat distribution			
Annual totals kWh/year			
Electricity for pumps and fans:			
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.8000)			
mechanical ventilation fans (SFP = 0.8000)			123.4396 (331)
Total electricity for the above, kWh/year			234.6960 (332)
Electricity for lighting (calculated in Appendix L)			2934.6968 (338)
Total delivered energy for all uses			

12b. Carbon dioxide emissions - Community heating scheme			
Efficiency of heat source Boilers			95.0000 (367a)
Space heating from Boilers			146.4572 (367)
Electrical efficiency of CHP unit			38.3000 (361)
Heat efficiency of CHP unit			40.6000 (362)
Space heating from Combined Heat and Power			361.4061 (363)
less credit emissions for electricity			-532.5889 (364)
Water heating from Combined Heat and Power			666.6799 (365)
less credit emissions for electricity			-613.5214 (366)
Electrical energy for heat distribution			13.3724 (372)
Total CO2 associated with community systems			241.8051 (373)
(negative value allowed since DFEE <= TFEF)			
Space and water heating			241.8051 (376)
Pumps and fans			64.0652 (378)
Energy for lighting			121.8072 (379)
Total CO2, kg/year			427.6775 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			8.4500 (384)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES			
DER			8.4500 EC1
Total Floor Area			50.5900
Assumed number of occupants			1.7075
CO2 emission factor in Table 12 for electricity displaced from grid			0.5190
CO2 emissions from appliances, equation (L14)			17.4255 EC2
CO2 emissions from cooking, equation (L16)			3.1623 EC3
Total CO2 emissions			29.0378 EC4
Residual CO2 emissions offset from biofuel CHP			0.0000 EC5
Additional allowable electricity generation, kWh/m²/year			0.0000 EC6
Resulting CO2 emissions offset from additional allowable electricity generation			0.0000 EC7
Net CO2 emissions			29.0378 EC8

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 (m2)		Storey height (m)			Volume (m3)	
Ground floor						50.5900	(1b)	x	2.5000	(2b)	=	126.4750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)						50.5900						(4)
Dwelling volume									(3a)+(3b)+(3c)+(3d)+(3e)...(3n)		=	126.4750 (5)

2. Ventilation rate												

						main heating	+	secondary heating	+	other	=	total
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												2 * 10 = 20.0000 (7a)
Number of passive vents												0 * 10 = 0.0000 (7b)
Number of fuelless gas fires												0 * 40 = 0.0000 (7c)
											Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =											20.0000 / (5) =	0.1581 (8)
Pressure test												Yes
Measured/design AP50												5.0000
Infiltration rate												0.4081 (18)
Number of sides sheltered												2 (19)
Shelter factor										(20) = 1 -	[0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor										(21) = (18) x (20) =		0.3469 (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 (22a)
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 infiltr rate	0.4423	0.4336	0.4250	0.3816	0.3729	0.3296	0.3296	0.3209	0.3469	0.3729	0.3903	0.4076 (22b)
Effective ac	0.5978	0.5940	0.5903	0.5728	0.5695	0.5543	0.5543	0.5515	0.5602	0.5695	0.5762	0.5831 (25)

3. Heat losses and heat loss parameter												

Element						Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
TER Opening Type (Uw = 1.40)												
External Wall						40.3600	10.7400	10.7400	1.3258	14.2386		(27)
Total net area of external elements Aum(A, m2)								29.6200	0.1800	5.3316		(29a)
Fabric heat loss, W/K = Sum (A x U)								40.3600				(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								(26)...(30) + (32) =	19.5702			250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)												3.4168 (36)
Total fabric heat loss											(33) + (36) =	22.9870 (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	24.9311	24.7926	24.6372	23.9073	23.7707	23.1350	23.1350	23.0173	23.3799	23.7707	24.0470	24.3358 (38)
Average = Sum(39m) / 12 =	47.9382	47.7796	47.6242	46.8943	46.7578	46.1220	46.1220	46.0043	46.3669	46.7578	47.0340	47.3228 (39)
HLP	0.9476	0.9444	0.9414	0.9269	0.9242	0.9117	0.9117	0.9094	0.9165	0.9242	0.9297	0.9354 (40)
HLP (average)												0.9269 (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												1.7075 (42)
Average daily hot water use (litres/day)												74.7527 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	82.2280	79.2379	76.2478	73.2577	70.2675	67.2774	67.2774	70.2675	73.2577	76.2478	79.2379	82.2280 (44)
Energy content (annual)	121.9417	106.6510	110.0543	95.9480	92.0644	79.4446	73.6171	84.4767	85.4856	99.6252	108.7487	118.0940 (45)
Distribution loss (46)m = 0.15 x (45)m	18.2913	15.9976	16.5081	14.3922	13.8097	11.9167	11.0426	12.6715	12.8228	14.9438	16.3123	17.7141 (46)
Water storage loss:												
Store volume												3.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												0.2602 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.1405 (55)
Total storage loss												
If cylinder contains dedicated solar storage	4.3553	3.9338	4.3553	4.2148	4.3553	4.2148	4.3553	4.3553	4.2148	4.3553	4.2148	4.3553 (56)



FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Primary loss	4.3553	3.9338	4.3553	4.2148	4.3553	4.2148	4.3553	4.3553	4.2148	4.3553	4.2148	4.3553 (57)
Total heat required for water heating calculated for each month	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)
Solar input	149.5594	131.5960	137.6720	122.6748	119.6821	106.1713	101.2347	112.0943	112.2124	127.2429	135.4755	145.7117 (62)
	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)
Output from w/h	149.5594	131.5960	137.6720	122.6748	119.6821	106.1713	101.2347	112.0943	112.2124	127.2429	135.4755	145.7117 (64)
Heat gains from water heating, kWh/month	62.6398	55.4175	58.6872	53.2841	52.7055	47.7967	46.5718	50.1826	49.8054	55.2195	57.5404	61.3604 (65)
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HODKINSON

Fraction of space heat from secondary/supplementary system (Table 11)								
Fraction of space heat from main system(s)								
Efficiency of main space heating system 1 (in %)								
Efficiency of secondary/supplementary heating system, %								
Space heating requirement								
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
Space heating requirement	284.4470	212.2377	155.6060	60.8090	13.3122	0.0000	0.0000	0.0000
Space heating efficiency (main heating system 1)	93.5350	93.5350	93.5350	93.5000	93.5000	0.0000	0.0000	0.0000
Space heating fuel (main heating system)	304.2214	226.9922	166.4236	55.0364	14.2376	0.0000	0.0000	0.0000
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Water heating requirement	149.5594	131.5960	137.6720	122.6748	119.6821	106.1713	101.2347	112.0943
Efficiency of water heater	93.1716	86.0824	85.1410	83.0544	80.7557	79.8000	79.8000	79.8000
Fuel for water heating, kWh/month	172.8949	152.8722	161.6988	147.7042	148.2026	133.0468	126.8606	140.4691
Water heating fuel used								
Annual totals kWh/year								
Space heating fuel - main system								
Space heating fuel - secondary								
Electricity for pumps and fans:								
central heating pump								
main heating flow fan								
Total electricity for the above, kWh/year								
Electricity for lighting (calculated in Appendix L)								
Total delivered energy for all uses								

	Energy
Space heating - main system 1	1374.5065
Space heating - secondary	0.0000
Water heating (other fuel)	1802.9430
Space and water heating	
Pumps and fans	75.0000
Energy for lighting	234.6960
Total CO ₂ , kg/m ² /year	
Emissions per m ² for space and water heating	
Fuel factor (mains gas)	
Emissions per m ² for lighting	
Emissions per m ² for pumps and fans	
Target Carbon Dioxide Emission Rate (TER) = (13,5682 * 1.00) + 2.4077 + 0.7694, rounded to 2 d.p.	

	Energy
Space heating - main system 1	1374.5065
Space heating - secondary	0.0000
Water heating (other fuel)	1802.9430
Space and water heating	
Pumps and fans	75.0000
Energy for lighting	234.6960
Total CO ₂ , kg/m ² /year	
Emissions per m ² for space and water heating	
Fuel factor (mains gas)	
Emissions per m ² for lighting	
Emissions per m ² for pumps and fans	
Target Carbon Dioxide Emission Rate (TER) = (13,5682 * 1.00) + 2.4077 + 0.7694, rounded to 2 d.p.	

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		
Ground floor		Area (m ²)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.5900	50.5900
Dwelling volume		

	main heating		secondary heating	
Number of chimneys	0	+	0	+
Number of open flues	0	+	0	+
Number of intermittent fans				
Number of passive vents				
Number of flueless gas fires				

	main heating		secondary heating	
Number of chimneys	0	+	0	+
Number of open flues	0	+	0	+
Number of intermittent fans				
Number of passive vents				
Number of flueless gas fires				

Infiltration due to chimneys, flues and fans = $(6a) + (6b) + (7a) + (7b) + (7c)$ =
 Pressure test
 Measured/design AP50
 Infiltration rate
 Number of sides sheltered

Shelter factor
 Infiltration rate adjusted to include shelter factor

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250
Adj infilt rate								
	0.3881	0.3805	0.3729	0.3349	0.3272	0.2892	0.2892	0.2811
Effective ac	0.5753	0.5724	0.5695	0.5561	0.5535	0.5418	0.5418	0.5391

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K
Opening Type 1 (Uw = 0.90)			10.7400	0.8687
External Wall	40.3600	10.7400	29.6200	0.2400
Total net area of external elements Aum(A, m2)			40.3600	
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32)	
Wall to Corridor			22.9300	0.0000
Partit.Wall			17.5900	0.0000

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K
Opening Type 1 (Uw = 0.90)			10.7400	0.8687
External Wall	40.3600	10.7400	29.6200	0.2400
Total net area of external elements A _{um} (A, m2)			40.3600	
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32)	
Wall to Corridor			22.9300	0.0000
Partit.Wall			17.5900	0.0000

Thermal bridges (Sum(L x Psi) calculated using Appendix K)
Total fabric heat loss

Thermal bridges (Sum(L x Psi) calculated using Appendix K)
Total fabric heat loss

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
(38)m	24.0121	23.8900	23.7703	23.2083	23.1032	22.6137	22.6137	22.523

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
(38)m	24.0121	23.8900	23.7703	23.2083	23.1032	22.6137	22.6137	22.523

```
Average = Sum(39)m / 12 =
```

```
Average = Sum(39)m / 12 =
```

HLF (average)							
Days in month	31	28	31	30	31	30	31

HLF (average)							
Days in month	31	30	31	30	31	30	31

Assumed occupancy

Assumed occupancy

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
Daily hot water use								

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
Daily hot water use								

Energy content (annual)
Distribution loss (46)m = 0.15 x (45)m

Energy content (annual)
Distribution loss (46)m = 0.15 x (45)m

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FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Heat gains from water heating, kWh/month
27.2764 23.8561 24.6174 21.4620 20.5933 17.7705 16.4670 18.8961 19.1218 22.2846 24.3254 26.4158 (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)a	85.3741	85.3741	85.3741	85.3741	85.3741	85.3741	85.3741	85.3741	85.3741	85.3741	85.3741	85.3741 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.2895	11.8036	9.5993	7.2673	5.4324	4.5863	4.9556	6.4415	8.6458	10.9778	12.8127	13.6588 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	148.7662	150.3099	146.4198	138.1381	127.6840	117.8586	111.2947	109.7510	113.6411	121.9228	132.3769	142.2022 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5374	31.5374	31.5374	31.5374	31.5374	31.5374	31.5374	31.5374	31.5374	31.5374	31.5374	31.5374 (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)	-68.2993	-68.2993	-68.2993	-68.2993	-68.2993	-68.2993	-68.2993	-68.2993	-68.2993	-68.2993	-68.2993	-68.2993 (71)
Water heating gains (Table 5)	36.6619	35.5002	33.0879	29.8084	27.6792	24.6812	22.1330	25.3980	26.5580	29.9524	33.7852	35.5051 (72)
Total internal gains	247.3298	246.2260	237.7192	223.8261	209.4079	195.7384	186.9956	190.2027	197.4571	211.4652	227.5870	239.9784 (73)

6. Solar gains												
[Jan]		Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W					
Northeast		8.2600	11.2829	0.4000		0.7700	20.6674 (75)					
Southeast		2.4800	36.7938	0.4000	0.8000	0.7700	20.2353 (77)					

Solar gains	40.9027	76.5373	122.9560	182.9120	232.7736	243.3612	229.5196	190.4446	143.4228	89.5065	50.2422	34.1952 (83)
Total gains	288.2325	322.7633	360.6753	406.7380	442.1815	439.0996	416.5152	380.6472	340.8799	300.9716	277.8292	274.1736 (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	76.1500	76.3521	76.5511	77.5002	77.6804	78.5304	78.5304	78.6898	78.2008	77.6804	77.3167	76.9402
alpha	6.0767	6.0901	6.1034	6.1667	6.1787	6.2354	6.2354	6.2460	6.2134	6.1787	6.1544	6.1293
util living area	0.9984	0.9964	0.9890	0.9537	0.8383	0.6355	0.4703	0.5342	0.8173	0.9762	0.9964	0.9988 (86)
MIT	20.0633	20.1861	20.4003	20.6874	20.9028	20.9859	20.9981	20.9960	20.9388	20.6562	20.3097	20.0411 (87)
Th 2	20.1574	20.1594	20.1614	20.1709	20.1726	20.1809	20.1809	20.1824	20.1777	20.1726	20.1690	20.1653 (88)
util rest of house	0.9979	0.9952	0.9852	0.9379	0.7923	0.5612	0.3840	0.4421	0.7507	0.9652	0.9950	0.9984 (89)
MIT 2	19.2958	19.4199	19.6338	19.9189	20.1086	20.1745	20.1804	20.1812	20.1443	19.8953	19.5515	19.2803 (90)
Living area fraction									FLA = Living area / (4) =			0.5466 (91)
MIT	19.7153	19.8387	20.0527	20.3389	20.5427	20.6180	20.6273	20.6266	20.5785	20.3112	19.9659	19.6961 (92)
Temperature adjustment												0.0000
adjusted MIT	19.7153	19.8387	20.0527	20.3389	20.5427	20.6180	20.6273	20.6266	20.5785	20.3112	19.9659	19.6961 (93)

8. Space heating requirement												
Utilisation	0.9975	0.9947	0.9846	0.9415	0.8140	0.6016	0.4312	0.4926	0.7851	0.9674	0.9946	0.9982 (94)
Useful gains	287.5225	321.0409	355.1137	382.9493	359.9297	264.1452	179.6173	187.5043	267.6190	291.1515	276.3246	273.6702 (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	711.1878	687.3749	621.9810	518.5425	399.9209	269.2243	180.1684	188.7001	291.0499	439.2002	584.6142	707.5737 (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	315.2070	246.1764	198.5493	97.6271	29.7535	0.0000	0.0000	0.0000	0.0000	110.1482	221.9686	322.8242 (98)
Space heating												1542.2542 (98)
Space heating per m2										(98) / (4) =		30.4854 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b												
Ext. temp.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	420.5256	331.0521	339.3105	0.0000	0.0000	0.0000	0.0000 (100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.9582	0.9828	0.9720	0.0000	0.0000	0.0000	0.0000 (101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	402.9519	325.3460	329.8246	0.0000	0.0000	0.0000	0.0000 (102)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	125.7506	167.1465	133.3130	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												426.2101 (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)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

Space cooling kWh
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 31.4377 41.7866 33.3282 0.0000 0.0000 0.0000 0.0000 (107)
Space cooling
106.5525 (107)
Space cooling per m2
2.1062 (108)
Energy for space heating
30.4854 (99)
Energy for space cooling
2.1062 (108)
Total
32.5916 (109)
Dwelling Fabric Energy Efficiency (DFEE)
32.6 (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														

Ground floor	Area (m2)		Storey height (m)		Volume (m3)									
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.5900 (1b)		x	2.5000 (2b)	=	126.4750 (1b) - (3b)								
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)		=	126.4750 (5)								

2. Ventilation rate														

Number of chimneys	main heating		secondary heating		other		total		m3 per hour					
Number of open flues	0		+	0	+	0	=	0 * 40 =	0.0000 (6a)					
Number of intermittent fans	0		+	0	+	0	=	0 * 20 =	0.0000 (6b)					
Number of passive vents								2 * 10 =	20.0000 (7a)					
Number of fuelless gas fires								0 * 10 =	0.0000 (7b)					
								0 * 40 =	0.0000 (7c)					
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				20.0000 / (5) =		0.1581 (8)		Air changes per hour					
Pressure test							Yes							
Measured/design AP50							5.0000							
Infiltration rate							0.4081 (18)							
Number of sides sheltered							2 (19)							
Shelter factor					(20) = 1 - [0.075 x (19)] =		0.8500 (20)							
Infiltration rate adjusted to include shelter factor					(21) = (18) x (20) =		0.3469 (21)							
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)		
Adj infiltr rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)		
Effective ac	0.4423	0.4336	0.4250	0.3816	0.3729	0.3296	0.3296	0.3209	0.3469	0.3729	0.3903	0.4076 (22b)		
Effective ac	0.5978	0.5940	0.5903	0.5728	0.5695	0.5543	0.5543	0.5515	0.5602	0.5695	0.5762	0.5831 (25)		

3. Heat losses and heat loss parameter														

Element	Gross m2		Openings m2		NetArea m2		U-value W/m2K		A x U W/K		K-value kJ/m2K		A x K kJ/K	
TER Opening Type (Uw = 1.40)					10.7400		1.3258		14.2386				(27)	
External Wall	40.3600		10.7400		29.6200		0.1800		5.3316				(29a)	
Total net area of external elements Aum(A, m2)	40.3600				40.3600								(31)	
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =		19.5702						(33)	
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K													250.0000 (35)	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)													3.4168 (36)	
Total fabric heat loss											(33) + (36) =		22.9870 (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	24.9311	24.7926	24.6372	23.9073	23.7707	23.1350	23.1350	23.0173	23.3799	23.7707	24.0470	24.3358	(38)	
Average = Sum(39)m / 12 =	47.9382	47.7796	47.6242	46.8943	46.7578	46.1220	46.1220	46.0043	46.3669	46.7578	47.0340	47.3228	(39)	
HLP	0.9476	0.9444	0.9414	0.9269	0.9242	0.9117	0.9117	0.9094	0.9165	0.9242	0.9297	0.9354	(40)	
HLP (average)												0.9269	(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													1.7075 (42)	
Average daily hot water use (litres/day)													74.7527 (43)	
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Energy content	82.2280	79.2379	76.2478	73.2577	70.2675	67.2774	67.2774	70.2675	73.2577	76.2478	79.2379	82.2280	(44)	
Energy content (annual)	121.9417	106.6510	110.0543	95.9480	92.0644	79.4446	73.6171	84.4767	85.4856	99.6252	108.7487	118.0940	(45)	
Distribution loss (46)m = 0.15 x (45)m													Total = Sum(45)m = 1176.1511 (45)	
Water storage loss:														
Total storage loss														
If cylinder contains dedicated solar storage													0.0000 (56)	
Primary loss													0.0000 (57)	
Heat gains from water heating, kWh/month													0.0000 (59)	
	25.9126	22.6633	23.3865	20.3889	19.5637	16.8820	15.6436	17.9513	18.1657	21.1704	23.1091	25.0950	(65)	



FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

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	85.3741	85.3741	85.3741	85.3741	85.3741	85.3741	85.3741	85.3741	85.3741	85.3741	85.3741	85.3741 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.2895	11.8036	9.5993	7.2673	5.4324	4.5863	4.9556	6.4415	8.6458	10.9778	12.8127	13.6588 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	148.7662	150.3099	146.4198	138.1381	127.6840	117.8586	111.2947	109.7510	113.6411	121.9228	132.3769	142.2022 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5374	31.5374	31.5374	31.5374	31.5374	31.5374	31.5374	31.5374	31.5374	31.5374	31.5374	31.5374 (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)	-68.2993	-68.2993	-68.2993	-68.2993	-68.2993	-68.2993	-68.2993	-68.2993	-68.2993	-68.2993	-68.2993	-68.2993 (71)
Water heating gains (Table 5)	34.8288	33.7252	31.4335	28.3180	26.2953	23.4472	21.0264	24.1281	25.2301	28.4548	32.0960	33.7298 (72)
Total internal gains	245.4967	244.4510	236.0649	222.3356	208.0239	194.5043	185.8889	188.9328	196.1292	209.9675	225.8977	238.2031 (73)
6. Solar gains												
[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W						
Northeast	8.2600	11.2829	0.6300	0.7000	0.7700	28.4822 (75)						
Southeast	2.4800	36.7938	0.6300	0.7000	0.7700	27.8868 (77)						
Solar gains	56.3690	105.4780	169.4487	252.0756	320.7911	335.3822	316.3067	262.4564	197.6545	123.3511	69.2400	47.1253 (83)
Total gains	301.8657	349.9289	405.5136	474.4112	528.8150	529.8865	502.1956	451.3892	393.7837	333.3186	295.1377	285.3284 (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	73.2860	73.5291	73.7691	74.9173	75.1361	76.1717	76.1717	76.3666	75.7694	75.1361	74.6948	74.2389
alpha	5.8857	5.9019	5.9179	5.9945	6.0091	6.0781	6.0781	6.0911	6.0513	6.0091	5.9797	5.9493
util living area	0.9980	0.9948	0.9819	0.9215	0.7619	0.5499	0.4031	0.4663	0.7561	0.9650	0.9953	0.9986 (86)
MIT	20.0376	20.1877	20.4358	20.7480	20.9381	20.9926	20.9990	20.9978	20.9569	20.6813	20.3037	20.0145 (87)
Th 2	20.1272	20.1299	20.1325	20.1447	20.1469	20.1576	20.1576	20.1596	20.1535	20.1469	20.1423	20.1375 (88)
util rest of house	0.9973	0.9931	0.9759	0.8981	0.7093	0.4807	0.3265	0.3825	0.6837	0.9497	0.9934	0.9981 (89)
MIT 2	19.2451	19.3967	19.6433	19.9488	20.1085	20.1545	20.1573	20.1590	20.1313	19.8956	19.5230	19.2306 (90)
Living area fraction	19.6782	19.8290	20.0764	20.3856	20.5619	20.6126	20.6174	20.6174	20.5826	20.3250	19.9497	19.6590 (92)
Temperature adjustment												0.0000
adjusted MIT	19.6782	19.8290	20.0764	20.3856	20.5619	20.6126	20.6174	20.6174	20.5826	20.3250	19.9497	19.6590 (93)
8. Space heating requirement												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9969	0.9923	0.9754	0.9053	0.7358	0.5184	0.3684	0.4284	0.7219	0.9534	0.9929	0.9977 (94)
Useful gains	300.9332	347.2447	395.5581	429.5036	389.0762	274.7033	185.0165	193.3728	284.2708	317.7919	293.0456	284.6849 (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	737.2046	713.3035	646.5662	538.6087	414.3632	277.3117	185.2896	194.0204	300.5759	454.7194	604.3720	731.5662 (97)
Month fraction	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	324.5859	245.9915	186.7500	78.5557	18.8136	0.0000	0.0000	0.0000	0.0000	101.8741	224.1551	332.4797 (98)
Space heating												1533.2055 (99)
Space heating per m2											(98) / (4) =	29.9112 (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	433.5471	341.3031	349.6327	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9761	0.9905	0.9830	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	423.1979	338.0470	343.6967	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	683.9285	650.3380	591.9085	0.0000	0.0000	0.0000	0.0000 (103)
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	187.7260	232.3446	184.6695	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												604.7401 (105)
Cooled fraction												1.0000 (105)
Intermittency factor (Table 10b)									FC = cooled area / (4) =			
Space cooling kWh	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	46.9331	58.0861	46.1674	0.0000	0.0000	0.0000	0.0000 (107)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

Space cooling
Space cooling per m2
Energy for space heating
Energy for space cooling
Total
Target Fabric Energy Efficiency (TFEE)

151.1850 (107)
2.9884 (108)
29.9112 (99)
2.9884 (108)
32.8996 (109)
37.8 (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 (m2)	Storey height (m)	Volume (m3)
Ground floor	50.5900 (1b)	x	2.5000 (2b)	= 126.4750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.5900			(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 126.4750 (5)

2. Ventilation rate													m3 per hour														
													total														
													main heating	secondary heating	other												
													0	+	0	+	0	=	0	+	0	=	0	+	0	=	
Number of chimneys													0	+	0	+	0	=	0	+	0	=	0	+	0	=	0.0000 (6a)
Number of open flues													0	+	0	+	0	=	0	+	0	=	0	+	0	=	0.0000 (6b)
Number of intermittent fans																			0	+	0	=	0	+	0	=	0.0000 (7a)
Number of passive vents																			0	+	0	=	0	+	0	=	0.0000 (7b)
Number of flueless gas fires																			0	+	0	=	0	+	0	=	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =													Air changes per hour										0.0000	(/ 5) =	0.0000 (8)		
Pressure test																									Yes		
Measured/design AP50																									4.0000		
Infiltration rate																									0.2000 (18)		
Number of sides sheltered																									2 (19)		
Shelter factor																							(20) = 1 - [0.075 x (19)] =		0.8500 (20)		
Infiltration rate adjusted to include shelter factor																							(21) = (18) x (20) =		0.1700 (21)		
Wind speed													Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
Wind factor													4.6000	4.3000	4.4000	4.0000	4.0000	3.5000	3.6000	3.8000	3.7000	3.9000	3.9000	4.3000 (22)			
Wind factor													1.1500	1.0750	1.1000	1.0000	1.0000	0.8750	0.9000	0.9500	0.9250	0.9750	0.9750	1.0750 (22a)			
Adj infiltr rate													0.1955	0.1828	0.1870	0.1700	0.1700	0.1488	0.1530	0.1615	0.1573	0.1658	0.1658	0.1828 (22b)			
Balanced mechanical ventilation with heat recovery																									0.5000 (23a)		
If mechanical ventilation:																									63.0000 (23c)		
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =																											
Effective ac													0.3805	0.3678	0.3720	0.3550	0.3550	0.3338	0.3380	0.3465	0.3423	0.3508	0.3508	0.3678 (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					
Opening Type 1 (Uw = 0.90)												(27)
External Wall	40.3600	10.7400	29.6200	0.2400	7.1088							(29a)
Total net area of external elements Aum(A, m ²)			40.3600									(31)
Fabric heat loss, W/K = Sum (A x U)								(26) ... (30) + (32) =	16.4389			(33)
Wall to Corridor								22.9300	0.0000	0.0000		(32)
Party Wall								17.5900	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K												250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)												5.6842 (36)
Total fabric heat loss										(33) + (36) =		22.1231 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
Jan	15.8808	15.3487	15.5261	14.8165	14.8165	13.9296	14.1070	14.4618	14.2844	14.6392	14.6392	15.3487 (38)
Heat transfer coeff	38.0039	37.4718	37.6492	36.9397	36.9397	36.0528	36.2301	36.5849	36.4075	36.7623	36.7623	37.4718 (39)
Average = Sum(39)m / 12 =												36.9397 (39)
Jan	0.7512	0.7407	0.7442	0.7302	0.7302	0.7126	0.7162	0.7232	0.7197	0.7267	0.7267	0.7407 (40)
HLP (average)												0.7302 (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											1.7075 (42)	
Average daily hot water use (litres/day)											78.6871 (43)	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use												
	86.5558	83.4083	80.2608	77.1133	73.9658	70.8184	70.8184	73.9658	77.1133	80.2608	83.4083	86.5558 (44)
Energy content	128.3597	112.2642	115.8466	100.9979	96.9099	83.6259	77.4916	88.9228	89.9848	104.8686	114.4723	124.3095 (45)
Energy content (annual)											Total = Sum(43)m =	1238.0538 (45)
Distribution loss (46)m = 0.15 x (45)m												
	19.2540	16.8396	17.3770	15.1497	14.5365	12.5439	11.6237	13.3384	13.4977	15.7303	17.1708	18.6464 (46)
Water storage loss:												
Store volume												3.0000 (47)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF HEAT DEMAND 09 Jan 2014

b) If manufacturer declared loss factor is not known :											
Hot water storage loss factor from Table 2 (kWh/litre/day)											
Volume factor from Table 2a											
Temperature factor from Table 2b											
Enter (49) or (54) in (55)											
Total storage loss											
If cylinder contains dedicated solar storage											
Primary loss											
Total heat required for water heating calculated for each month											
Solar input											
Output from w/h											
RHI water heating demand											
Heat gains from water heating, kWh/month											

5. Internal gains (see Table 5 and 5a)											
Metabolic gains (Table 5), Watts											
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5											
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5											
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5											
Pumps, fans											
Losses e.g. evaporation (negative values) (Table 5)											
Water heating gains (Table 5)											
Total internal gains											

6. Solar gains											
[Jan]											
Northeast											
Southeast											
Solar gains											
Total gains											

7. Mean internal temperature (heating season)											
Temperature during heating periods in the living area from Table 9, Th1 (C)											
Utilisation factor for gains for living area, nli,m (see Table 9a)											
tau											
alpha											
util living area											
MIT											
Th 2											
util rest of house											
MIT 2											
Living area fraction											
MIT											
Temperature adjustment											
adjusted MIT											

8. Space heating requirement											
Utilisation											
Useful gains											
Ext temp											
Heat loss rate W											
Month fracti											
Space heating kWh											
Space heating											
RHI space heating demand											

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF HEAT DEMAND 09 Jan 2014

b) If manufacturer declared loss factor is not known :											
Hot water storage loss factor from Table 2 (kWh/litre/day)											
Volume factor from Table 2a											
Temperature factor from Table 2b											
Enter (49) or (54) in (55)											
Total storage loss											
If cylinder contains dedicated solar storage											
Primary loss											
Total heat required for water heating calculated for each month											
Solar input											
Output from w/h											
RHI water heating demand											
Heat gains from water heating, kWh/month											

5. Internal gains (see Table 5 and 5a)											
Metabolic gains (Table 5), Watts											
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5											
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5											
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5											
Pumps, fans											
Losses e.g. evaporation (negative values) (Table 5)											
Water heating gains (Table 5)											
Total internal gains											

6. Solar gains											
[Jan]											
Northeast											
Southeast											
Solar gains											
Total gains											

7. Mean internal temperature (heating season)											
Temperature during heating periods in the living area from Table 9, Th1 (C)											
Utilisation factor for gains for living area, nli,m (see Table 9a)											
tau											
alpha											
util living area											
MIT											
Th 2											
util rest of house											
MIT 2											
Living area fraction											
MIT											
Temperature adjustment											
adjusted MIT											

8. Space heating requirement											
Utilisation											
Useful gains											
Ext temp											
Heat loss rate W											
Month fracti											
Space heating kWh											
Space heating											
RHI space heating demand											

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		Storey height		Volume									
	(m ²)		(m)		(m ³)									
Ground floor	50.5900		2.5000		126.4750									
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.5900		2.5000		126.4750									
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)		126.4750									

2. Ventilation rate														

	main		secondary		other		total		m ³ per hour					
	heating		heating											
Number of chimneys	0		0		0		0		0.0000 (6a)					
Number of open flues	0		0		0		0		0.0000 (6b)					
Number of intermittent fans	0		0		0		0		0.0000 (7a)					
Number of passive vents	0		0		0		0		0.0000 (7b)					
Number of fuelless gas fires	0		0		0		0		0.0000 (7c)					
										Air changes per hour				
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =							0.0000 / (5) =		0.0000 (8)					
Pressure test									Yes					
Measured/design AP50									4.0000					
Infiltration rate									0.2000 (18)					
Number of sides sheltered									2 (19)					
Shelter factor					(20) = 1 -		(0.075 x (19)) =		0.8500 (20)					
Infiltration rate adjusted to include shelter factor					(21) = (18) x (20) =				0.1700 (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		
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	1.0000	1.0750	1.1250	1.1750	1.2250		
Adj infiltr rate	0.2168	0.2125	0.2083	0.1870	0.1828	0.1615	0.1615	0.1573	0.1700	0.1828	0.1913	0.1998		
Balanced mechanical ventilation with heat recovery														
If mechanical ventilation:	0.5000 (23a)													
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4b) =	63.0000 (23c)													
Effective ac	0.4018	0.3975	0.3933	0.3720	0.3678	0.3465	0.3465	0.3423	0.3550	0.3678	0.3763	0.3848		

3. Heat losses and heat loss parameter														

Element	Gross		Openings		NetArea		U-value		A x U		K-value		A x K	
	m ²		m ²		m ²		W/m ² K		W/K		kJ/m ² K		kJ/K	
Opening Type 1 (Uw = 0.90)	40.3600		10.7400		10.7400		0.8687		9.3301		1.7088		(27)	
External Wall					29.6200		0.2400		7.1088				(29a)	
Total net area of external elements Aum(A, m ²)					40.3600								(31)	
Fabric heat loss, W/K = Sum (A x U)					22.9300		(26) ... (30) + (32) =		16.4389				(33)	
Party Wall					17.5900		0.0000		0.0000				(32)	
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K	250.0000 (35)													
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	5.6842 (36)													
Total fabric heat loss	(33) + (36) =													
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	16.0582 (38)													
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Heat transfer coeff	38.8909	38.7135	38.5361	37.6492	37.4718	36.5849	36.5849	36.4075	36.9397	37.4718	37.8266	38.1813		
Average = Sum(39)m / 12 =	37.6048 (39)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
HLP	0.7687	0.7652	0.7617	0.7442	0.7407	0.7232	0.7232	0.7197	0.7302	0.7407	0.7477	0.7547		
HLP (average)	0.7433 (40)													
Days in month	31	28	31	30	31	30	31	31	30	31	30	31		

4. Water heating energy requirements (kWh/year)														

Assumed occupancy	1.7075 (42)													
Average daily hot water use (litres/day)	78.6871 (43)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Daily hot water use	86.5558	83.4083	80.2608	77.1133	73.9658	70.8184	70.8184	73.9658	77.1133	80.2608	83.4083	86.5558		
Energy cont	128.3597	112.2642	115.8466	100.9979	96.9099	83.6259	77.4916	88.9228	89.9848	104.8686	114.4723	124.3095		
Energy content (annual)	Total = Sum(45)m = 1238.0538 (45)													
Distribution loss (46)m = 0.15 x (45)m	18.6464 (46)													
Water storage loss:														
Water volume	3.0000 (47)													

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (301)
Fraction of space heat from community system	1.0000 (302)
Fraction of heat from community Boilers	0.2500 (303a)
Fraction of heat from community Combined Heat and Power	0.7500 (303b)
Fraction of total space heat from community Boilers	0.2500 (304a)
Fraction of total space heat from community Combined Heat and Power	0.7500 (304b)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.0500 (306)
Space heating:	
Annual space heating requirement	493.5039 (98)
Space heat from Boilers = (98) x 0.25 x 1.00 x 1.05	129.5448 (307a)
Space heat from Combined Heat and Power = (98) x 0.75 x 1.00 x 1.05	388.6343 (307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)	0.0000 (308)
Space heating fuel for secondary/supplementary system	0.0000 (309)
Water heating	
Annual water heating requirement	1591.2525 (64)
Water heat from Boilers = (64) x 0.25 x 1.00 x 1.05	417.7038 (310a)
Water heat from Combined Heat and Power = (64) x 0.75 x 1.00 x 1.05	1253.1113 (310b)
Electricity used for heat distribution	21.8899 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.8000)	
mechanical ventilation fans (SFP = 0.8000)	123.4396 (330a)
Total electricity for the above, kWh/year	123.4396 (331)
Electricity for lighting (calculated in Appendix I)	234.6960 (332)
Total delivered energy for all uses	2547.1298 (338)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating from Boilers	129.5448	4.2400	5.4927 (340a)
Space heating from Combined Heat and Power	388.6343	2.9700	11.5424 (340b)
Space heating - secondary	0.0000	0.0000	0.0000 (341)
Water heating from Boilers	417.7038	4.2400	17.7106 (342a)
Water heating from Combined Heat and Power	1253.1113	2.9700	37.2174 (342b)
Mechanical ventilation fans	123.4396	13.1900	16.2817 (349)
Pumps and fans for heating	0.0000	0.0000	0.0000 (349)
Energy for lighting	234.6960	13.1900	30.9564 (350)
Additional standing charges			120.0000 (351)
Total energy cost			239.2013 (355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):	0.4200 (356)
Energy cost factor (ECF)	1.0510 (357)
SAP value	85.3386
SAP rating (Section 12)	85 (358)
SAP band	B

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Boilers			95.0000 (367a)
Space heating from Boilers	576.0511	0.2160	124.4270 (367)
Electrical efficiency of CHP unit			38.3000 (361)
Heat efficiency of CHP unit			40.6000 (362)
Space heating from Combined Heat and Power	957.2274	0.2160	206.7611 (363)
less credit emissions for electricity	-366.6181	0.5190	-190.2748 (364)
Water heating from Combined Heat and Power	3086.4811	0.2160	666.6799 (365)
less credit emissions for electricity	-1182.1223	0.5190	-613.5214 (366)
Electrical energy for heat distribution	21.8899	0.5190	11.3609 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			205.4327 (373)
Space and water heating			205.4327 (376)
Pumps and fans	123.4396	0.5190	64.0652 (378)
Energy for lighting	234.6960	0.5190	121.8072 (379)
Total kg/year			391.3051 (383)
CO2 emissions per m2			7.7300 (384)
EI value			94.5146 (384a)
EI rating			95 (385)
EI band			A

Calculation of stars for heating and DHW

Space heating energy efficiency	0.25 x 4.240 x 1.05
0.75 x 2.970 x 1.05	

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS 09 Jan 2014

= 3.452, stars = 5
Space heating environmental impact 0.25 x 0.216 x 1.05 / 0.9500
0.75 x (0.216 - 0.383 x 0.519) x 1.05 / 0.406
= 0.0931, stars = 5
Water heating energy efficiency
Water heating environmental impact

3.452, stars = 5
0.0931, stars = 5

HODKINSON

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

1. Overall dwelling dimensions						
	Area (m ²)		Storey height (m)		Volume (m ³)	
Ground floor	50.5900	1(b)	x	2.5000	1(b) - (3b)	=
Total floor area TFA = (la)+(lb)+(lc)+(ld)+(le)...(ln)	50.5900	(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	126,4750	(1b) - (3b)	=
Dwelling volume				126.4750	(4)	

	main		secondary		other	total	m3 per hour
	heating		heating				
Number of chimneys	0	+	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open fires	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)
							Air changes per hour
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =					0.0000 / 5 =	0.0000 (8)
Pressure test							Year
Measured/design AP50							4.0000
Infiltration rate							0.2000 (18)
Number of sides sheltered							2 (19)
Shelter factor						(20) = 1 - (0.075 x (19)) =	0.8500 (20)
Infiltration rate adjusted to include shelter factor						(21) = (18) x (20) =	0.1700 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.6000	4.3000	4.4000	4.0000	4.0000	3.5000	3.6000	3.8000	3.7000	3.9000	3.9000	4.3000 (22)
Wind factor	1.1500	1.0750	1.1000	1.0000	1.0000	0.8750	0.9000	0.9500	0.9250	0.9750	0.9750	1.0750 (22a)
Adj infiltr rate												
	0.1955	0.1828	0.1870	0.1700	0.1700	0.1488	0.1530	0.1615	0.1573	0.1658	0.1658	0.1828 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												
												0.5000 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4x) =												
												63.0000 (23c)
Effective ac	0.3805	0.3678	0.3720	0.3350	0.3350	0.3338	0.3380	0.3465	0.3423	0.3508	0.3508	0.3678 (25)

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
Opening Type 1 (Uw = 0.90)			10.7400	0.8887	9.5301		(27)
External Wall	40.3600	10.7400	29.6200	0.2400	7.1088		(28)
Total net area of external elements Aum(A, m ²)			40.3600				(31)
Fabric heat loss, W/K = Sum (A x U)					16.6389		(32)
Wall to Corridor			22.9300	0.0000	0.0000		(33)
Party Wall			17.5900	0.0000	0.0000		(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K													250,000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)													5.6842 (36)
Total fabric heat loss	(33) + (36) =												22.1231 (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	15.8808	15.3487	15.5261	14.8165	14.8165	13.9296	14.1070	14.4618	14.2844	14.6392	14.6392	15.3487	(38)
Heat transfer coeff													
	38.0039	37.4718	37.6492	36.9397	36.9397	36.0528	36.2301	36.5849	36.4075	36.7623	36.7623	37.4718	(39)
Average = Sum(39)m / 12 =													36.9397 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.7512	0.7407	0.7442	0.7302	0.7302	0.7126	0.7162	0.7232	0.7197	0.7267	0.7267	0.7407	(40)
HLP (average)													0.7302 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31	(41)

[illegible]

b) If manufacturer declared loss factor is not known :											0.0212 (51)
Hot water storage loss factor from Table 2 (kWh/litre/day)											3.4000 (52)
Volume factor from Table 2a											1.0000 (53)
Temperature factor from Table 2b											0.2173 (55)
Enter (49) or (54) in (55)											
Total storage loss											6.7353 (56)
If cylinder contains dedicated solar storage											6.7353 (56)
6.7353 6.0835 6.7353 6.5180 6.7353 6.5180 6.7353 6.7353 6.5180 6.7353 6.5180											6.7353 (56)
Primary loss											23.2624 (59)
23.2624 21.0112 23.2624 22.5120 23.2624 22.5120 23.2624 22.5120 23.2624 22.5120											23.2624 (59)
Total heat required for water heating calculated for each month											
Solar input											158.3574 139.3589 145.8443 130.0279 126.9076 112.6559 107.4893 118.9205 119.0148 134.8663 143.5023 154.3072 (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)=											0.0000 (63)
Output from w/h											158.3574 139.3589 145.8443 130.0279 126.9076 112.6559 107.4893 118.9205 119.0148 134.8663 143.5023 154.3072 (64)
Heat gains from water heating, kWh/month											158.3574 139.3589 145.8443 130.0279 126.9076 112.6559 107.4893 118.9205 119.0148 134.8663 143.5023 154.3072 (64)
66.6778 59.0036 62.5172 56.8058 56.2207 51.0296 49.7641 53.5650 53.1440 58.8670 61.2861 65.3331 (65)											65.3331 (65)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66m)	102.4489	102.4489	102.4489	102.4489	102.4489	102.4489	102.4489	102.4489	102.4489	102.4489	102.4489	102.4489 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	12.3890	12.3890	12.3890	12.3890	12.3890	12.3890	12.3890	12.3890	12.3890	12.3890	12.3890	12.3890
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	222.0391	222.0391	222.0391	222.0391	222.0391	222.0391	222.0391	222.0391	222.0391	222.0391	222.0391	222.0391
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	46.9524	46.9524	46.9524	46.9524	46.9524	46.9524	46.9524	46.9524	46.9524	46.9524	46.9524	46.9524 (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)	-68.2993	-68.2993	-68.2993	-68.2993	-68.2993	-68.2993	-68.2993	-68.2993	-68.2993	-68.2993	-68.2993	-68.2993 (71)
Water heating gains (Table 5)	89.6206	87.8030	84.0284	78.8970	75.5654	70.8745	66.8873	71.9959	73.8111	79.1223	85.1195	87.8016 (72)
Total internal gains	423.9854	422.7571	407.6657	384.3436	360.8216	339.5056	326.4986	330.0991	346.1411	369.6430	395.8307	415.3018 (73)

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	PF Specific data or Table 6c	Access factor Table 6d	Gains W
Northeast	8.2600	12.4928	0.4000	0.8000	0.7700	22.8835 (75)
Southeast	2.4800	39.1209	0.4000	0.8000	0.7700	21.5151 (77)

Solar gains	44.3986	74.9192	121.4973	188.4137	231.8483	259.8175	245.7949	208.4425	157.1172	95.9096	56.3900	37.9788 (83)
Total gains	470.3840	497.6763	529.1630	572.7573	592.6699	599.1680	572.2846	541.4516	503.2583	465.5526	452.2207	453.2806 (84)

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 ² (see Table 5a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	92.423	93.7557	93.3140	95.1063	95.1063	97.4459	96.9688	96.0285	96.4964	95.5652	95.5652	93.7557
alpha	7.1629	7.2504	7.2209	7.3404	7.3404	7.4964	7.4646	7.4019	7.4331	7.3710	7.3710	7.2504
util living area	0.9536	0.9293	0.8281	0.6754	0.4727	0.2768	0.1583	0.1824	0.3904	0.6864	0.8941	0.9536 (86)
MIT	20.7111	20.7852	20.9044	20.9831	20.9988	21.0000	21.0000	21.0000	20.9998	20.9847	20.8742	20.6998 (87)
T	20.2958	20.3050	20.3020	20.3143	20.3143	20.3297	20.3266	20.3204	20.3235	20.3173	20.3173	20.3050 (88)
util rest of house	0.9424	0.9138	0.8212	0.6364	0.4304	0.2365	0.1156	0.1365	0.3416	0.6392	0.8700	0.9495 (89)
MIT 2	19.9358	20.0443	20.1959	20.2983	20.3134	20.3297	20.3266	20.3204	20.3234	20.3041	20.1749	19.9285 (90)
util living area fraction	0.9414	0.9138	0.8212	0.6364	0.4304	0.2365	0.1156	0.1365	0.3416	0.6392	0.8700	0.9495 (91)
MIT	20.3596	20.4493	20.5981	20.6725	20.6880	20.6960	20.6946	20.6918	20.6931	20.6761	20.5571	20.3501 (92)
Temperature adjustment												0.0000
adjusted MIT	20.4493	20.5981	20.6725	20.6880	20.6880	20.6960	20.6946	20.6918	20.6931	20.6761	20.5571	20.3501 (93)

[illegible]

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



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

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)
Fraction of space heat from community system
Fraction of heat from community Boilers
Fraction of heat from community Combined Heat and Power
Fraction of total space heat from community Boilers
Fraction of total space heat from community Combined Heat and Power
Factor for control and charging method (Table 4c(3)) for community space heating
Factor for control and charging method (Table 4c(3)) for community water heating
Distribution loss factor (Table 12c) for community heating system
Space heating:
Annual space heating requirement
Space heat from Boilers = (98) x 0.25 x 1.00 x 1.05
Space heat from Combined Heat and Power = (98) x 0.75 x 1.00 x 1.05
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)
Space heating fuel for secondary/supplementary system
Water heating
Annual water heating requirement
Water heat from Boilers = (64) x 0.25 x 1.00 x 1.05
Water heat from Combined Heat and Power = (64) x 0.75 x 1.00 x 1.05
Electricity used for heat distribution
Annual totals kWh/year
Electricity for pumps and fans:
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.8000)
mechanical ventilation fans (SFP = 0.8000)
Total electricity for the above, kWh/year
Electricity for lighting (calculated in Appendix I)
Total delivered energy for all uses

10b. Fuel costs - using BDEF prices (495)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating from Boilers	86.4569	4.4300	3.8300 (340a)
Space heating from Combined Heat and Power	259.3706	3.1000	8.0405 (340b)
Space heating - secondary	0.0000	0.0000	0.0000 (341)
Water heating from Boilers	417.7038	4.4300	18.5043 (342a)
Water heating from Combined Heat and Power	1253.1113	3.1000	38.8465 (342b)
Mechanical ventilation fans	123.4396	19.4400	23.9967 (349)
Pumps and fans for heating	0.0000	0.0000	0.0000 (349)
Energy for lighting	234.6960	19.4400	45.6249 (350)
Additional standing charges			95.0000 (351)
Total energy cost			233.8428 (355)

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Boilers			95.0000 (367a)
Space heating from Boilers	530.6954	0.2160	114.6302 (367)
Electrical efficiency of CHP unit			38.3000 (361)
Heat efficiency of CHP unit			40.6000 (362)
Space heating from Combined Heat and Power	638.8439	0.2160	137.9903 (363)
less credit emissions for electricity	-244.6772	0.5190	-126.9875 (364)
Water heating from Combined Heat and Power	3086.4811	0.2160	666.6799 (365)
less credit emissions for electricity	-1182.1223	0.5190	-613.5214 (366)
Electrical energy for heat distribution	20.1664	0.5190	10.4664 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEF)			189.2579 (373)
Space and water heating			189.2579 (376)
Pumps and fans	123.4396	0.5190	64.0652 (378)
Energy for lighting	234.6960	0.5190	121.8072 (379)
Total kg/year			375.1302 (383)

13b. Primary energy - Community heating scheme

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Efficiency of heat source Boilers			95.0000 (367a)
Space heating from Boilers	530.6954	1.2200	647.4484 (367)
Electrical efficiency of CHP unit			38.3000 (361)
Heat efficiency of CHP unit			40.6000 (362)
Space heating from Combined Heat and Power	638.8439	1.2200	779.3895 (363)
less credit emissions for electricity	-244.6772	3.0700	-751.1590 (364)
Water heating from Combined Heat and Power	3086.4811	1.2200	3765.5069 (365)
less credit emissions for electricity	-1182.1223	3.0700	-3629.1153 (366)
Electrical energy for heat distribution	20.1664	3.0700	61.9109 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEF)			873.9814 (373)
Space and water heating			873.9814 (376)
Pumps and fans	123.4396	3.0700	378.9596 (378)
Energy for lighting	234.6960	3.0700	720.5168 (379)
Primary energy kWh/year			1973.4578 (383)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



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

Primary energy kWh/m²/year

39.0089 (384)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating: B 85
Current environmental impact rating: A 95

(For testing purposes):

A	Not considered
B	Not considered
C	Not considered
D	Not considered
E	Low energy lighting
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
O	Not applicable
P	Not considered
R	Not considered
S	Not considered
T	Not considered
U	Solar photovoltaic panels
A2	Not considered
A3	Not considered
T2	Not considered
W	Not considered
X	Not considered
V	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
L2	Not considered
Q3	Not considered
Q3	Not considered

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

Recommended measures	Typical annual savings	Energy efficiency	Environmental impact
(none)			

Total Savings £0 0.00 kg/m²

Potential energy efficiency rating: B 85
Potential environmental impact rating: A 95

Fuel prices for cost data on this page from database revision number 495 TEST (29 Apr 2022)
Recommendation texts revision number 4.9c (22 Feb 2014)

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

	Current	Potential	Saving
Electricity	£70	£70	£0
Community scheme	£164	£164	£0
Space heating	£131	£131	£0
Water heating	£57	£57	£0
Lighting	£46	£46	£0
Total cost of fuels	£234	£234	£0
Total cost of uses	£234	£234	£0
Delivered energy	47 kWh/m ²	47 kWh/m ²	0 kWh/m ²
Carbon dioxide emissions	0.4 tonnes	0.4 tonnes	0.0 tonnes
CO2 emissions per m ²	7 kg/m ²	7 kg/m ²	0 kg/m ²
Primary energy	39 kWh/m ²	39 kWh/m ²	0 kWh/m ²



FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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

No improvements selected / applicable

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

No improvements selected / applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



Property Reference	Flat Type T39 - TOP				Issued on Date	01/06/2022
Assessment Reference	BE CLEAN DLF 1.05	Prop Type Ref	07th Floor - 2B3P			
Property	Flat Type T39, London , N8					
SAP Rating	85 B	DER	8.77	TER	17.50	
Environmental	94 A	% DER<TER	49.89			
CO ₂ Emissions (t/year)	0.48	DFEE	37.37	TFEE	47.18	
General Requirements Compliance	Pass	% DFEE<TFEE	20.78			
Assessor Details	Mr. Michael Wride, Michael Wride, Tel: 02036 031 600, Michael@hodkinsonconsultancy.com				Assessor ID	R572-0001
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

Top-floor flat, total floor area 63 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:Mains gas (c)
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 17.50 kgCO₂/m²/yr
Dwelling Carbon Dioxide Emission Rate (DER) 8.77 kgCO₂/m²/yrOK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)47.2 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)37.4 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.24 (max. 0.30)	0.24 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor (no floor)			
Roof	0.14 (max. 0.20)	0.14 (max. 0.35)	OK
Openings	0.90 (max. 2.00)	0.90 (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:	4.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system: Community heating scheme -

Secondary heating system: None

5 Cylinder insulation

Hot water storage: Nominal cylinder loss: 0.22 kWh/day

Permitted by DBSCG 0.35 OK

Primary pipework insulated: No primary pipework

6 Controls

Space heating controls: Charging system linked to use of community heating, programmer and TRVsOK

Hot water controls: No cylinderstat

7 Low energy lights

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

8 Mechanical ventilation

Continuous supply and extract system		
Specific fan power:	0.72	
Maximum	1.5	OK
WWR efficiency:	90%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley): Slight OK

Based on:

Overshading: Average
Windows facing South East: 8.14 m², No overhang
Windows facing South West: 4.96 m², No overhang
Air change rate: 4.00 ach

Blinds/curtains: None

10 Key features

Party wall U-value	0.00 W/m ² K
Party wall U-value	0.00 W/m ² K
Window U-value	0.90 W/m ² K
Community CHP, Mains gas	

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	Storey height		Volume																	
				(m2)	(m)		(m3)																	
Ground floor				63.0700	(1b)	x	2.5000	(2b)	=	157.6750	(1b) - (3b)													
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)				63.0700																				
Dwelling volume						(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	157.6750	(5)															
2. Ventilation rate																								
				main	secondary	other		total	m3 per hour															
				heating	heating																			
				0	+	0	+	0	=	0 * 40 =	0.0000	(6a)												
Number of chimneys				0	+	0	+	0	=	0 * 20 =	0.0000	(6b)												
Number of open flues				0	+	0	+	0	=	0 * 10 =	0.0000	(7a)												
Number of intermittent fans				0	+	0	+	0	=	0 * 10 =	0.0000	(7b)												
Number of passive vents				0	+	0	+	0	=	0 * 10 =	0.0000	(7b)												
Number of fireless gas fires				0	+	0	+	0	=	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		4.0000														
Infiltration rate								0.2000		(18)														
Number of sides sheltered								2		(19)														
Shelter factor								(20) = 1 - [0.075 x (19)] =		0.8500 (20)														
Infiltration rate adjusted to include shelter factor								(21) = (18) x (20) =		0.1700 (21)														
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec												
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)											
Adj infiltr rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)											
Balanced mechanical ventilation with heat recovery				0.2168	0.2125	0.2083	0.1870	0.1828	0.1615	0.1615	0.1573	0.1700	0.1913											
If mechanical ventilation with heat recovery								0.5000		(23a)														
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =								63.0000		(23c)														
Effective ac				0.4018	0.3975	0.3933	0.3720	0.3678	0.3465	0.3465	0.3423	0.3550	0.3678											
								0.3763		0.3848 (25)														
3. Heat losses and heat loss parameter																								
Element				Gross	Openings	NetArea	U-value	A x U	K-value	A x K														
				m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K														
Opening Type 1 (Uw = 0.90)				13.1000		13.1000	0.8687	11.3803			(27)													
External Wall				43.5900	13.1000	30.4900	0.2400	7.3176			(29a)													
Roof				63.0700		63.0700	0.1400	8.8298			(30)													
Total net area of external elements Aum(A, m2)								106.6600	(26)...(30) + (32) =		27.5277													
Fabric heat loss, W/K = Sum (A x U)								8.2200	0.0000		(31)													
Wall to Corridor								33.5100	0.0000		(32)													
Party Wall								0.0000	0.0000		(32)													
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000		(35)														
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								10.3290		(36)														
Total fabric heat loss								(33) + (36) =		37.8567 (37)														
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)								20.0196		(38)														
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec												
Heat transfer coeff	58.7609	20.6830	20.4619	19.3562	19.1350	18.0293	18.0293	17.8082	18.4716	19.1350	19.5773	20.0196	(38)											
Average = Sum(39)m / 12 =				58.7609	58.5397	58.3186	57.2129	56.9918	55.8861	55.8861	55.6649	56.3283	56.9918											
							57.2129	56.9918	55.8861	55.8861	55.6649	56.3283	56.9918											
							57.2129	56.9918	55.8861	55.8861	55.6649	56.3283	56.9918											
							57.2129	56.9918	55.8861	55.8861	55.6649	56.3283	56.9918											
							57.2129	56.9918	55.8861	55.8861	55.6649	56.3283	56.9918											
							57.2129	56.9918	55.8861	55.8861	55.6649	56.3283	56.9918											
							57.2129	56.9918	55.8861	55.8861	55.6649	56.3283	56.9918											
							57.2129	56.9918	55.8861	55.8861	55.6649	56.3283	56.9918											
							57.2129	56.9918	55.8861	55.8861	55.6649	56.3283	56.9918											
							57.2129	56.9918	55.8861	55.8861	55.6649	56.3283	56.9918											
							57.2129	56.9918	55.8861	55.8861	55.6649	56.3283	56.9918											
							57.2129	56.9918	55.8861	55.8861	55.6649	56.3283	56.9918											
							57.2129	56.9918	55.8861	55.8861	55.6649	56.3283	56.9918											
							57.2129	56.9918	55.8861	55.8861	55.6649	56.3283	56.9918											
							57.2129	56.9918	55.8861	55.8861	55.6649	56.3283	56.9918											
							57.2129	56.9918	55.8861	55.8861	55.6649	56.3283	56.9918											
							57.2129	56.9918	55.8861	55.8861	55.6649	56.3283	56.9918											
							57.2129	56.9918	55.8861	55.8861	55.6649	56.3283	56.9918											
							57.2129	56.9918	55.8861	55.8861	55.6649	56.3283	56.9918											
							57.2129	56.9918	55.8861	55.8861	55.6649	56.3283	56.9918											
							57.2129	56.9918	55.8861	55.8861	55.6649	56.3283	56.9918											
							57.2129	56.9918	55.8861	55.8861	55.6649	56.3283	56.9918											
							57.2129	56.9918	55.8861	55.8861	55.6649	56.3283	56.9918											
							57.2129	56.9918	55.8861	55.8861	55.6649	56.3283	56.9918											
							57.2129	56.9918	55.8861	55.8861	55.6649	56.3283	56.9918											
							57.2129	56.9918	55.8861	55.8861	55.6649	56.3283	56.9918											
							57.2129	56.9918	55.8861	55.8861	55.6649	56.3283	56.9918											
							57.2129	56.9918	55.8861	55.8861	55.6649	56.3283	56.9918											
							57.2129	56.9918	55.8861	55.8861	55.6649	56.3283	56.9918											
							57.2129	56.9918	55.8861	55.8861	55.6649	56.3283	56.9918											
							57.2129	56.9918	55.8861	55.8861	55.6649	56.3283	56.9918											
							57.2129	56.9918	55.8861	55.8861	55.6649	56.3283	56.9918											
							57.2129	56.9918	55.8861	55.8861	55.6649	56.3283	56.9918											
							57.2129	56.9918	55.8861	55.8861	55.6649	56.3283	56.9918											
							57.2129	56.9918	55.8861	55.8861	55.6649	56.3283	56.9918											
							57.2129	56.9918	55.8861	55.8861	55.6649	56.3283	56.9918											
							57.2129	56.9918	55.8861	55.8861	55.6649	56.3283	56.9918											
							57.2129	56.9918	55.8861	55.8861	55.6649	56.3283	56.9918											
							57.2129	56.9918	55.8861	55.8861	55.6649</													

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

8c. Space cooling requirement

Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)

Fraction of space heat from community system

Fraction of heat from community Boilers

Fraction of heat from community Combined Heat and Power

Fraction of total space heat from community Boilers

Fraction of total space heat from community Combined Heat and Power

Factor for control and charging method (Table 4c(3)) for community space heating

Factor for control and charging method (Table 4c(3)) for community water heating

Distribution loss factor (Table 12c) for community heating system

Space heating:

Annual space heating requirement

Space heat from Boilers = (98) x 0.25 x 1.00 x 1.05

Space heat from Combined Heat and Power = (98) x 0.75 x 1.00 x 1.05

Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)

Space heating fuel for secondary/supplementary system

Water heating

Annual water heating requirement

Water heat from Boilers = (64) x 0.25 x 1.00 x 1.05

Water heat from Combined Heat and Power = (64) x 0.75 x 1.00 x 1.05

Electricity used for heat distribution

Annual totals kWh/year

Electricity for pumps and fans:

(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.9000)

mechanical ventilation fans (SFP = 0.9000)

Total electricity for the above, kWh/year

Electricity for lighting (calculated in Appendix L)

Total delivered energy for all uses

0.0000 (301)

1.0000 (302)

0.2500 (303a)

0.7500 (303b)

0.2500 (304a)

0.7500 (304b)

1.0000 (305)

1.0000 (305a)

1.0500 (306)

1463.4496 (98)

384.1555 (307a)

1152.4665 (307b)

0.0000 (308)

0.0000 (309)

1732.6568 (64)

454.8224 (310a)

1364.4673 (310b)

33.5591 (313)

173.1272 (330a)

173.1272 (331)

285.3829 (332)

3814.4218 (338)

12b. Carbon dioxide emissions - Community heating scheme

Energy kWh/year

Emission factor kg CO2/kWh

Emissions kg CO2/year

Efficiency of heat source Boilers

Space heating from Boilers

Electrical efficiency of CHP unit

Heat efficiency of CHP unit

Space heating from Combined Heat and Power

less credit emissions for electricity

Water heating from Combined Heat and Power

less credit emissions for electricity

Electrical energy for heat distribution

Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)

Space and water heating

Pumps and fans

Energy for lighting

Total CO2, kg/year

Dwelling Carbon Dioxide Emission Rate (DER)

893.1347

0.2160

95.0000 (367a)

190.7571 (367)

38.3000 (361)

40.6000 (362)

613.1349 (363)

-564.2459 (364)

725.9235 (365)

-1287.1699

0.5190

-668.0412 (366)

17.4172 (372)

314.9456 (373)

314.9456 (376)

89.8530 (378)

148.1137 (379)

552.9123 (383)

6.7700 (384)

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

DER

Total Floor Area

Assumed number of occupants

CO2 emission factor in Table 12 for electricity displaced from grid

CO2 emissions from appliances, equation (L14)

CO2 emissions from cooking, equation (L16)

Total CO2 emissions

Residual CO2 emissions offset from biofuel CHP

Additional allowable electricity generation, kWh/m²/year

Resulting CO2 emissions offset from additional allowable electricity generation

Net CO2 emissions

8.7700 ZC1

63.0700

2.0670

N

0.5190

16.9701 ZC2

2.6733 ZC3

28.4134 ZC4

0.0000 ZC5

0.0000 ZC6

0.0000 ZC7

28.4134 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

Ground floor

Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)

Dwelling volume

Storey height (m)

Area (m²)

Volume (m³)

(3a)+(3b)+(3c)+(3d)+(3e)...(3n)

2. Ventilation rate

Number of chimneys

Number of open flues

Number of intermittent fans

Number of passive vents

Number of flueless gas fires

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =

Pressure test

Measured/design APS0

Infiltration rate

Number of sides sheltered

Shelter factor

Infiltration rate adjusted to include shelter factor

Air changes per hour

Yes

2

0.8500 (20)

0.3203 (21)

Wind speed

Wind factor

Adj infiltr rate

Effective ac

Jan

Feb

Mar

Apr

May

Jun

Jul

Aug

Sep

Oct

Nov

Dec

4.7000 (22)

1.1750 (22a)

0.3764 (22b)

0.5708 (25)

3. Heat losses and heat loss parameter

Element

Gross m²

Openings m²

NetArea m²

U-value W/m²K

A x U W/K

K-value kJ/m²K

A x K kJ/K

TER Opening Type (Uw = 1.40)

External Wall

Roof

Total net area of external elements Aum(A, m²)

Fabric heat loss, W/K = Sum (A x U)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K

Thermal bridges (Sum(L x Psi) calculated using Appendix K)

Total fabric heat loss

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

(38)m

Heat transfer coeff

Average = Sum(39)m / 12 =

Jan

Feb

Mar

Apr

May

Jun

Jul

Aug

Sep

Oct

Nov

Dec

250.0000 (35)

13.7203 (36)

44.7750 (37)

29.7018 (38)

74.4768 (39)

74.0206 (39)

1.1809 (40)

1.1736 (40)

HLP

HLP (average)

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

Average daily hot water use (litres/day)

Daily hot water use

Energy conte

Energy content (annual)

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

Water storage loss:

Store volume

a) If manufacturer declared loss factor is known (kWh/day):

Temperature factor from Table 2b

Enter (49) or (54) in (55)

Total storage loss

2.0670 (42)

83.2906 (43)

81.6196

135.8693

20.3804

18.3936

16.0360

15.3869

13.2777

12.3038

14.1188

14.2874

16.6506

18.1754

19.7373 (46)

3.0000 (47)

0.2602 (48)

0.5400 (49)

0.1405 (55)

4.3553

3.9338

4.3553

4.2148

4.3553

4.2148

4.3553

4.3553

4.2148

4.3553

4.2148

4.3553 (56)

1	cylinder contents and solar storage	4.3553	4.3538	4.3553	4.2148	4.3553	4.2148	4.3553	4.2148	4.3553	4.2148	4.3553 (57)	
2	Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624	22.5120	23.2624 (62)	
3	Total heat required for water heating calculated for each month												
4	Solar input	163.4870	143.7771	150.2418	133.6335	130.1972	115.2451	109.4269	121.7428	121.9761	138.6216	147.8962	159.1998 (62)
5	Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)	
6									Solar input (sum of months)	=Sum(63m)	=	0.0000 (63)	
7		163.4870	143.7771	150.2418	133.6335	130.1972	115.2451	109.4269	121.7428	121.9761	138.6216	147.8962	159.1998 (64)
8	Heat gains from water heating, kWh/month								Total per year (kWh/year)	=Sum(64m)	=	1635.6611 (64)	
9		61.2070	55.4677	62.8667	56.9279	56.2018	50.8138	49.3675	53.3908	53.0518	59.0029	61.7003	65.8452 (66)

[illegible]

[Jan]		Area	Solar flux	g	FF	Access	Gains					
		m2	Table 5a	or Table 5b	Specific data or Table 6c	Factor Table 6d	W					

Southeast		8.1400	36.7938	0.6300	0.7000	0.7700	91.5316 (77)					
Southwest		4.9600	36.7938	0.6300	0.7000	0.7700	55.7736 (79)					

Total gains	147.3052	250.9153	343.3132	425.3818	476.6430	473.0175	456.0393	417.9304	371.7356	277.3149	176.4377	126.0626 (83)
Total gains	491.5048	593.2583	674.2576	738.0039	770.6352	749.2663	720.5475	687.7787	650.9086	575.0002	495.3947	460.8260 (84)

Temperature during heating periods in the living area (see Table 9), T _l (°C)												21.0000 (85)
Utilisation factor for gains for living area, n _{l,m} (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	0.8295	0.84275	0.8556	0.8687	0.8825	0.8938	0.8938	0.8936	0.9218	0.89265	0.90518	0.88084
alpha	0.4864	0.4952	0.4908	0.4943	0.4964	0.4989	0.4989	0.4957	0.4748	0.4954	0.4968	0.4206
util living area	0.9937	0.9840	0.9609	0.9012	0.7809	0.6013	0.4425	0.4817	0.7147	0.9271	0.9859	0.9954 (86)
MIT	19.8675	20.0786	20.3540	20.6581	20.9730	20.9733	20.9952	20.9928	20.9381	20.6511	20.1959	19.8265 (87)
T _h 2	19.9270	19.9292	19.9313	19.9411	19.8436	19.9516	19.9516	19.9532	19.9483	19.9430	19.9393	19.9353 (88)
util rest of house	0.9917	0.9790	0.9403	0.8712	0.7217	0.5128	0.3395	0.3957	0.6290	0.8981	0.9805	0.9389 (89)
MIT	18.4406	18.7471	19.1403	19.5626	19.8283	19.9353	19.9500	19.9500	19.9044	19.9070	19.9266	19.9076 (90)
Living area fraction	0.19223	0.19289	0.19351	0.20092	0.25444	0.3584	0.3761	0.3754	0.3258	0.20079	0.14440	0.19738 (92)
temperature adjustment	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
adjusted MIT	19.19223	19.2889	19.6351	20.0092	20.2544	20.3584	20.3761	20.3754	20.3258	20.0079	19.4440	19.7378 (93)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilization	0.9894	0.9752	0.9445	0.8734	0.7403	0.5482	0.3816	0.4191	0.6615	0.9002	0.9773	0.9919 (94)
Useful gains	486.2756	578.5214	636.8094	644.9535	570.5288	410.7189	274.9747	288.2429	430.6502	517.5949	484.1392	457.1062 (95)
Est. loss rate	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.2400	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate												
Month factor	1.016,0961	1.078,6972	982.4638	822.3147	631.9646	421.5204	276.4097	290.5019	457.3518	695.0228	915.5159	1100.3030 (97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000 (97a)
Space heating kWh	461.486	336.1182	257.1668	127.9809	45.7084	0.0000	0.0000	0.0000	0.0000	132.0663	310.6171	478.5384 (98)
Space heating per m2												
												(98) / (4) = 34.0778 (99)

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	2798.7003	(211)

[illegible]

	Energy kWh/year	Emission factor kg CO ₂ /kWh	Emissions kg CO ₂ /year
Space heating - main system 1	2298,7003	0,2160	496,5193 (261)
Space heating - secondary	0,0000	0,0000	0,0000 (263)
Water heating (other fuel)	1945,5874	0,2160	420,2469 (264)
Space and water heating			916,7662 (265)
Pumps and fans	75,0000	0,5190	39,9250 (267)
Energy for lighting	285,3829	0,5190	148,1137 (268)
Total CO ₂ , kg/m ² /year			1103,8049 (272)
Emissions per m ² for space and water heating			14,5357 (272)
Fuel factor (main gas)			1,0000
Emissions per m ² for lighting			2,3848 (272)
Emissions per m ² for pumps and fans			0,6172 (272)
Target Carbon Dioxide Emission Rate (TER) = (14.5357 * 1.00) + 2.3848 + 0.6172, rounded to 2 d.p.			17,5000 (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 (m2)	Storey height (m)	Volume (m3)
Ground floor	63.0700 (1b)	2.5000 (2b)	157.6750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	63.0700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	157.6750 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour
Number of chimneys	0	0	0	0	0 * 40 = 0.0000 (6a)
Number of open flues	0	0	0	0	0 * 20 = 0.0000 (6b)
Number of intermittent fans	0	0	0	0	2 * 10 = 20.0000 (7a)
Number of passive vents	0	0	0	0	0 * 10 = 0.0000 (7b)
Number of fuelless gas fires	0	0	0	0	0 * 40 = 0.0000 (7c)

Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.1268 (8)
Pressure test		Yes	0.0000
Measured/design AP50		0.3268 (18)	2 (19)
Infiltration rate		0.3268 (18)	2 (19)
Number of sides sheltered		2 (19)	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2778 (21)	0.2778 (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 infiltr rate	0.3542	0.3473	0.3403	0.3056	0.2987	0.2639	0.2639	0.2570	0.2778	0.2987	0.3125	0.3264 (22b)
Effective ac	0.5627	0.5603	0.5579	0.5467	0.5446	0.5348	0.5348	0.5330	0.5386	0.5446	0.5488	0.5533 (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
Opening Type 1 (Uw = 0.90)			13.1000	0.8687	11.3803		(27)
External Wall	43.5900	13.1000	30.4900	0.2400	7.3176		(29a)
Roof	63.0700		63.0700	0.1400	8.8298		(30)
Total net area of external elements Aum(A, m2)			106.6600				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...	(30) + (32) =	27.5277		(33)
Wall to Corridor			8.2200	0.0000	0.0000		(32)
Party Wall			33.5100	0.0000	0.0000		(32)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)	10.3290 (36)
Total fabric heat loss	(33) + (36) = 37.8567 (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	29.2806	29.1539	29.0296	28.4461	28.3369	27.8286	27.8286	27.7345	28.0244	28.3369	28.5577	28.7887 (38)
	67.1373	67.0106	66.8863	66.3028	66.1936	65.6853	65.6853	65.5912	65.8811	66.1936	66.4145	66.6454 (39)
Average = Sum(39)m / 12 =												66.3022 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.0645	1.0625	1.0605	1.0513	1.0495	1.0415	1.0415	1.0400	1.0446	1.0495	1.0530	1.0567 (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	2.0670 (42)
Average daily hot water use (litres/day)	87.6743 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	96.4417	92.9348	89.4278	85.9208	82.4138	78.9069	78.9069	82.4138	85.9208	89.4278	92.9348	96.4417 (44)
Energy conte	143.0203	125.0865	129.0780	112.5334	107.9784	93.1772	86.3424	99.0791	100.2624	116.8462	127.5468	138.5075 (45)
Energy content (annual)												Total = Sum(45)m = 1379.4582 (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	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)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF FABRIC ENERGY EFFICIENCY 09 Jan 2014

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	10.3918	26.5859	27.4291	23.9133	22.9454	19.8002	18.3478	21.0543	21.3058	24.8298	27.1037	29.4329 (65)

5. Internal gains (see Table 5 and Sa)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	103.3486	103.3486	103.3486	103.3486	103.3486	103.3486	103.3486	103.3486	103.3486	103.3486	103.3486	103.3486 (66)
Lighting gains (calculated in Appendix L, equation L19 or L9a), also see Table 5	16.1596	14.3528	11.6725	8.8368	6.6056	5.5767	6.0259	7.8326	10.5130	13.3486	15.5798	16.6087 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	33.3349	33.3349	33.3349	33.3349	33.3349	33.3349	33.3349	33.3349	33.3349	33.3349	33.3349	33.3349 (69)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	180.6179	182.4921	177.7651	167.7143	155.0219	143.0928	135.1235	133.2492	137.9723	148.0271	160.7195	172.6485 (68)
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)	-82.6789	-82.6789	-82.6789	-82.6789	-82.6789	-82.6789	-82.6789	-82.6789	-82.6789	-82.6789	-82.6789	-82.6789 (71)
Water heating gains (Table 5)	40.8492	39.5549	36.8670	33.2130	30.8406	27.5002	24.6610	28.2988	29.5913	33.3734	37.6440	39.5603 (72)
Total internal gains	291.6312	290.4043	280.3132	263.7686	246.4727	230.1744	219.8149	223.3853	232.0812	248.7537	267.9479	282.8221 (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
South-east		8.1400	36.7938	0.4000	0.8000	0.7700	66.4175 (77)
South-west		4.9600	36.7938	0.4000	0.8000	0.7700	40.4706 (79)
Solar gains	106.8881	182.0701	249.1162	308.6670	345.7328	343.2326	330.9129
Total gains	398.5194	472.4744	529.4293	572.4357	592.2055	573.4070	550.7278
					526.6454	501.8213	449.9799
						395.9752	374.2961 (83)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation factor for gains for living area, nilym (see Table 9a)	65.2373	65.3607	65.4821	66.0585	66.1675	66.6795	66.6795	66.7752	66.4813	66.1675	65.9474	65.7189
tau	5.3492	5.3574	5.3655	5.4039	5.4112	5.4453	5.4453	5.4517	5.4321	5.4112	5.3965	5.3813
alpha	0.9974	0.9932	0.9820	0.9478	0.8599	0.6914	0.5172	0.5608	0.7999	0.9629	0.9940	0.9982 (86)
util living area	19.9053	20.0776	20.3189	20.6062	20.8387	20.9636	20.9937	20.9903	20.9193	20.6130	20.1973	19.8699 (87)
MIT	20.0299	20.0316	20.0332	20.0408	20.0423	20.0489	20.0489	20.0502	20.0464	20.0423	20.0394	20.0364 (88)
Th1 rest of house	0.9966	0.9910	0.9758	0.9295	0.8131	0.6053	0.4094	0.4512	0.7247	0.9461	0.9917	0.9976 (89)
MIT 2	19.0333	19.2058	19.4451	19.7276	19.9350	20.0324	20.0473	20.0474	20.0037	19.7400	19.3320	19.0032 (90)
Living area fraction	19.3887	19.5611	19.8013	20.0857	20.3034	20.4120	20.4331	20.4318	20.3769	20.0959	19.6847	19.3565 (92)
Temperature adjustment	19.3887	19.5611	19.8013	20.0857	20.3034	20.4120	20.4331	20.4318	20.3769	20.0959	19.6847	19.3565 (93)
adjusted MIT	19.3887	19.5611	19.8013	20.0857	20.3034	20.4120	20.4331	20.4318	20.3769	20.0959	19.6847	19.3565 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	396.8704	467.5711	515.6911	532.6308	489.7851	366.7483	249.8386	261.3349	377.8126	426.2434	392.2454	373.1668 (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	1013.0185	982.4516	889.6724	741.6433	569.4887	381.7654	251.7774	264.4508	413.5312	628.5651	835.8070	1010.1105 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	458.4142	345.9997	278.2421	150.4890	59.2995	0.0000	0.0000	0.0000	0.0000	150.5273	319.3643	473.8862 (98)
Space heating per m2										(98) / (4) =		35.4562 (99)

8c. Space cooling requirement

Ext. temp.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9131	0.9582	0.9468	0.0000	0.0000	0.0000	0.0000 (100)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	563.7592	465.7638	471.9853	0.0000	0.0000	0.0000	0.0000 (101)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	747.0627	718.9920	692.0281	0.0000	0.0000	0.0000	0.0000 (103)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000 (103a)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	131.9353	188.4018	163.7118	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												484.0490 (104)
Cooled fraction												1.0000 (105)
Intermittency factor (Table 10b)												

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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	63.0700	x	2.5000	157.6750
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	63.0700			157.6750 (1b) - (3b)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	157.6750 (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							2 * 10 =	20.0000 (7a)				
Number of passive vents							0 * 10 =	0.0000 (7b)				
Number of flueless gas fires							0 * 40 =	0.0000 (7c)				
								Air changes per hour				
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =								20.0000 / (5) =	0.1268 (8)			
Pressure test									Yes			
Measured/design AP50									5.0000			
Infiltration rate									0.3768 (18)			
Number of sides sheltered									2 (19)			
Shelter factor								(20) = 1 - [0.075 x (19)] =	0.8500 (20)			
Infiltration rate adjusted to include shelter factor								(21) = (18) x (20) =	0.3203 (21)			
Wind speed	Jan 5.1000	Feb 5.9000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.7000	Dec 4.8000
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 infiltr rate	0.4084	0.4004	0.3924	0.3523	0.3443	0.3043	0.3043	0.2963	0.3203	0.3443	0.3604	0.3764 (22b)
Effective ac	0.5834	0.5802	0.5770	0.5621	0.5593	0.5463	0.5463	0.5439	0.5513	0.5593	0.5649	0.5708 (22b)

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 k3/m ² K	A x K k3/K
TER Opening Type (Uw = 1.40)												
External Wall	43.5900		13.1000		30.4900		0.1800		5.4882			(27)
Roof	63.0700				63.0700		0.1300		8.1991			(294)
Total net area of external elements Aum(A, m ²)					106.6600							(31)
Fabric heat loss, W/K = Sum (A x U)					(26) ... (30) + (32) =				31.0547			(33)
Thermal mass parameter (TMP = Cm / TPA) in kJ/m ² K												250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)												13.7203 (36)
Total fabric heat loss											(33) + (36) =	44.7750 (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	30.3557	30.1872	30.0221	29.2463	29.1011	28.4255	28.4255	28.3003	28.6857	29.1011	29.3948	29.7018 (38)
	75.1308	74.9623	74.7971	74.0213	73.8762	73.2005	73.2005	73.0754	73.4608	73.8762	74.1698	74.4768 (39)
Average = Sum(39) / 12 =												74.0206 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1912	1.1886	1.1859	1.1736	1.1713	1.1606	1.1606	1.1586	1.1647	1.1713	1.1760	1.1809 (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												
Average daily hot water use (litres/day)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	81.6196	88.2880	84.9564	81.6248	78.2932	74.9615	74.9615	78.2932	81.6248	84.9564	88.2880	91.6196 (44)
Energy content	135.8693	118.8321	122.6241	106.9067	102.5795	88.5183	82.0252	94.1252	95.2493	111.0039	121.1694	131.5822 (45)
Energy content (annual)	Total = Sum(45)m =											131.5822 (45)
Distribution loss (40m = 0.15 x (45)m)												130.4853 (45)
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss												0.0000 (46)
	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 (58)
Heat gains from water heating, kWh/month												0.0000 (59)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY 09 Jan 2014

28.8722 25.2518 26.0576 22.7177 21.7981 18.8101 17.4304 20.0016 20.2405 23.5883 25.7485 27.9612 (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	103.3486	103.3486	103.3486	103.3486	103.3486	103.3486	103.3486	103.3486	103.3486	103.3486	103.3486	103.3486 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	16.1596	14.3528	11.6725	8.8368	6.6056	5.5767	6.0259	7.8326	10.5130	13.3486	15.5798	16.6087 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	180.6179	182.4921	177.7691	167.7143	155.0219	143.0928	135.1235	133.2492	137.9723	148.0271	160.7195	172.6485 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.3349	33.3349	33.3349	33.3349	33.3349	33.3349	33.3349	33.3349	33.3349	33.3349	33.3349	33.3349 (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)	-82.6789	-82.6789	-82.6789	-82.6789	-82.6789	-82.6789	-82.6789	-82.6789	-82.6789	-82.6789	-82.6789	-82.6789 (71)
Water heating gains (Table 5)	38.8068	37.5771	35.0237	31.5523	29.2986	26.1252	23.4279	26.8839	28.1118	31.7047	35.7618	37.5823 (72)
Total internal gains	289.5888	288.4266	278.4698	262.1080	244.9307	228.7993	218.5818	221.9703	230.6016	247.0850	266.0657	280.8441 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	q Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W

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	58.2965	58.4275	58.5566	59.1703	59.2865	59.8338	59.8338	59.9362	59.6218	59.2865	59.0518	58.8084
alpha	4.8864	4.8952	4.9038	4.9447	4.9524	4.9889	4.9889	4.9957	4.9748	4.9524	4.9368	4.9206
util living area	0.9962	0.9892	0.9710	0.9207	0.8111	0.6351	0.4711	0.5151	0.7537	0.9466	0.9912	0.9973 (86)
MIT	19.7889	20.0043	20.2887	20.6105	20.8488	20.9662	20.9937	20.9903	20.9214	20.5967	20.1221	19.7482 (87)
Th 2	19.9270	19.9292	19.9313	19.9411	19.9430	19.9516	19.9516	19.9532	19.9483	19.9430	19.9393	19.9353 (88)
util rest of house	0.9950	0.9857	0.9615	0.8949	0.7547	0.5443	0.3622	0.4031	0.6693	0.9235	0.9877	0.9964 (89)
MIT 2	19.8342	19.0493	19.3295	19.6415	19.8472	19.9372	19.9501	19.9507	19.9090	19.6375	19.1757	18.8004 (90)
Living area fraction	19.2234	19.4386	19.7205	20.0365	20.2555	20.3566	20.3755	20.3745	20.3217	20.0285	19.5615	19.1867 (92)
adjusted MIT	19.2234	19.4386	19.7205	20.0365	20.2555	20.3566	20.3755	20.3745	20.3217	20.0285	19.5615	19.1867 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	434.2174	530.4968	596.4205	617.0304	557.3982	407.5209	274.4598	287.3432	422.4817	485.4366	436.3475	405.0981 (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	1121.2065	1089.8462	988.8556	824.3409	632.0485	421.3882	276.3702	290.4358	457.0518	696.5417	924.2641	1116.1645 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	511.1199	375.8828	291.9717	149.2636	55.5398	0.0000	0.0000	0.0000	0.0000	157.0622	351.2999	529.0334 (98)
Space heating												2421.1734 (98)
Space heating per m2										(98) / (4) =		38.3887 (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	688.0846	541.6836	555.3728	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9221	0.9613	0.9500	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	634.4910	520.7302	527.6112	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	897.3243	864.0107	824.6433	0.0000	0.0000	0.0000	0.0000 (103)
Month fracti	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000 (103a)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	189.2399	255.4007	220.9919	0.0000	0.0000	0.0000	0.0000 (104)
Space cooling												665.6325 (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												

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 47.3100 63.8502 55.2480 0.0000 0.0000 0.0000 0.0000 0.0000 (107)

Space cooling 0.0000 0.0000 0.0000 0.0000 47.3100 63.8502 55.2480 0.0000 0.0000 0.0000 0.0000 0.0000 (107)
Space cooling per m2 166.4081 (107)
Energy for space heating 2.6385 (108)
Energy for space cooling 38.3887 (99)
Total 2.6385 (108)
Target Fabric Energy Efficiency (TFEE) 41.0271 (109)
47.2 (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																					
Ground floor	Area (m2)			Storey height (m)			Volume (m3)														
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	63.0700			2.5000 (2b)			157.6750 (1b) - (3b)			(4)											
Dwelling volume				(3a)+(3b)+(3c)+(3d)+(3e)...(3n)			157.6750 (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 fireless gas fires										0 * 40 =			0.0000 (7c)								
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =										Air changes per hour			0.0000 (8)								
Pressure test										Yes											
Measured/design AFS0										4.0000											
Infiltration rate										0.2000 (18)											
Number of sides sheltered										2 (19)											
Shelter factor							(20) = 1 - [0.075 x (19)] =			0.8500 (20)											
Infiltration rate adjusted to include shelter factor							(21) = (18) x (20) =			0.1700 (21)											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec										
Wind speed	4.6000	4.3000	4.4000	4.0000	4.0000	3.5000	3.6000	3.8000	3.7000	3.9000	3.9000	4.3000 (22)									
Wind factor	1.1500	1.0750	1.1000	1.0000	1.0000	0.8750	0.9000	0.9500	0.9250	0.9750	0.9750	1.0750 (22a)									
Adj infiltr rate	0.1955	0.1828	0.1870	0.1700	0.1700	0.1488	0.1530	0.1615	0.1573	0.1658	0.1658	0.1828 (22b)									
Balanced mechanical ventilation with heat recovery													0.5000 (23a)								
If mechanical ventilation:													63.0000 (23c)								
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =																					
Effective ac	0.3805	0.3678	0.3720	0.3550	0.3550	0.3338	0.3380	0.3465	0.3423	0.3508	0.3508	0.3678 (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		
Opening Type 1 (Uw = 0.90)													11.3803						(27)		
External Wall	43.5900			13.1000			30.4900			0.2400			7.3176			8.8298			(29a)		
Roof	63.0700						63.0700			0.1400			8.8298						(30)		
Total net area of external elements Aum(A, m2)							106.6600												(31)		
Fabric heat loss, W/K = Sum (A x U)							(26)...(30) + (32) =			27.5277						(33)					
Wall to Corridor							8.2200			0.0000			0.0000						(32)		
Party Wall							33.5100			0.0000			0.0000						(32)		
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K																250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)																10.3290 (36)					
Total fabric heat loss													(33) + (36) =			37.8567 (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	19.7985	19.1350	19.3562	18.4716	18.4716	17.3659	17.5871	18.0293	17.8082	18.2505	18.2505	19.1350 (38)									
Average = Sum(39)m / 12 =	57.6552	56.9918	57.2129	56.3283	56.3283	55.2226	55.4438	55.8861	55.6649	56.1072	56.1072	56.9918 (39)									
HLP	0.9141	0.9036	0.9071	0.8931	0.8931	0.8756	0.8791	0.8861	0.8826	0.8896	0.8896	0.9036 (40)									
HLP (average)													0.8931 (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													2.0670 (42)								
Average daily hot water use (litres/day)													87.6743 (43)								
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec									
Energy conte	96.4417	92.9348	89.4278	85.9208	82.4138	78.9069	78.9069	82.4138	85.9208	89.4278	92.9348	96.4417 (44)									
Energy content (annual)	143.0203	125.0865	129.0780	112.5334	107.9784	93.1772	86.3424	99.0791	100.2624	116.8462	127.5468	138.5075 (45)									
Distribution loss (46)m = 0.15 x (45)m													20.7761 (46)								
Water storage loss:																					



FULL SAP CALCULATION PRINTOUT

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CALCULATION OF HEAT DEMAND 09 Jan 2014

Store volume													3.0000 (47)	
b) If manufacturer declared loss factor is not known :														
Hot water storage loss factor from Table 2 (kWh/litre/day)														
Volume factor from Table 2a														
Temperature factor from Table 2b														
Enter (49) or (54) in (55)														
Total storage loss														
	6.7353	6.0835	6.7353	6.5180	6.7353	6.5180	6.7353	6.7353	6.5180	6.7353	6.5180	6.7353	(56)	
If cylinder contains dedicated solar storage														
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														
	173.0180	152.1812	159.0757	141.5634	137.9761	122.2072	116.3400	129.0768	129.2925	146.8439	156.5768	168.5052	(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 =														
Output from w/h	173.0180	152.1812	159.0757	141.5634	137.9761	122.2072	116.3400	129.0768	129.2925	146.8439	156.5768	168.5052	(64)	
Total per year (kWh/year) = Sum(64)m =														
RH water heating demand													1732.6568 (64)	
Heat gains from water heating, kWh/month														
	71.5524	63.2670	66.9166	60.6414	59.9010	54.2054	52.7070	56.9420	56.5613	62.8495	65.6333	70.0519	(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	124.0183	124.0183	124.0183	124.0183	124.0183	124.0183	124.0183	124.0183	124.0183	124.0183	124.0183	124.0183	(66)	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5														
	40.3989	35.8819	29.1812	22.0920	16.5140	13.9418	15.0647	19.5816	26.2824	33.3715	38.9495	41.5217	(67)	
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5														
	269.5789	272.3763	265.3270	250.3198	231.3759	213.5714	201.6768	198.8795	205.9288	220.9360	239.8798	257.6844	(68)	
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5														
	49.4688	49.4688	49.4688	49.4688	49.4688	49.4688	49.4688	49.4688	49.4688	49.4688	49.4688	49.4688	(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)														
	-82.6789	-82.6789	-82.6789	-82.6789	-82.6789	-82.6789	-82.6789	-82.6789	-82.6789	-82.6789	-82.6789	-82.6789	(71)	
Water heating gains (Table 5)														
	96.1726	94.1473	89.9417	84.2241	80.5121	75.2853	70.8427	76.5349	78.5573	84.4752	91.1574	94.1558	(72)	
Total internal gains														
	486.9586	493.1473	475.2580	447.4442	419.2103	393.6068	378.3925	385.8042	401.5768	429.5909	460.7950	484.1701	(73)	
6. Solar gains														
[Jan]	Area m2			Solar flux Table 6a		Specific data a or Table 6b		Specific data b or Table 6c		FF factor Table 6d		Access factor Table 6e		Gains W
Southeast	8.1400			39.1209		0.4000		0.8000		0.7700				70.6182 (77)
Southwest	4.9600			39.1209		0.4000		0.8000		0.7700				43.0303 (79)
Solar gains														
	113.6485	137.7185	238.3903	308.9567	336.2886	358.9744	346.6650	323.1165	286.6976	209.7334	140.5420	99.6648	(83)	
Total gains	610.6071	666.9323	714.1620	756.4009	755.4989	752.5812	725.0575	708.9207	688.2743	639.3243	601.3369	583.8349	(84)	
7. Mean internal temperature (heating season)														
Temperature during heating periods in the living area from Table 9, Th1 (C)														
Utilisation factor for gains for living area, nil/m (see Table 9a)														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	21.0000 (85)	
tau	75.6664	76.8508	76.5537	77.7559	77.7559	78.3128	78.9964	78.3713	78.6826	78.0624	78.0624	76.9580		
alpha	0.0644	6.1234	6.1036	6.1837	6.1837	6.2875	6.2664	6.2248	6.2455	6.2042	6.2042	6.1234		
util living area	0.9672	0.9451	0.8821	0.7474	0.5592	0.3373	0.1912	0.2128	0.4355	0.7367	0.9228	0.9725	(86)	
MIT	20.5195	20.6321	20.8024	20.9416	20.9912	20.9997	21.0000	21.0000	20.9985	20.9556	20.7536	20.4991	(87)	
Th 2	20.1555	20.1644	20.1614	20.1734	20.1734	20.1883	20.1853	20.1793	20.1823	20.1763	20.1763	20.1644	(88)	
util rest of house	0.9582	0.9312	0.8550	0.7026	0.5013	0.2779	0.1289	0.1482	0.3701	0.6822	0.9013	0.9647	(89)	
MIT 2	19.5501	19.7132	19.9410	20.1169	20.1670	20.1882	20.1853	20.1793	20.1816	20.1374	19.8916	19.5292	(90)	
Living area fraction	0.9453	0.9078	0.8293	0.6831	0.5030	0.2889	0.1374	0.1519	0.3416	0.6409	0.8937	0.9676	(91)	
Temperature adjustment	19.9453	20.0878	20.2931	20.4531	20.5030	20.5190	20.5174	20.5139	20.5146	20.4709	20.2430	19.9245	(92)	
adjusted MIT	19.9453	20.0878	20.2931	20.4531	20.5030	20.5190	20.5174	20.5139	20.5146	20.4709	20.2430	19.9245	(93)	
8. Space heating requirement														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation	0.9556	0.9298	0.8596	0.7183	0.5246	0.3021	0.1543	0.1745	0.3967	0.7024	0.9032	0.9621	(94)	
Useful gains	583.4876	620.0845	615.8860	543.3126	396.3658	227.3766	111.8522	123.7223	273.0512	449.0361	543.1319	561.7081	(95)	
Ext temp.	5.4000	8.8000	7.8000	10.3000	13.4000	16.4000	18.5000	18.5000	18.5000	18.5000	18.5000	18.5000	(96)	
Heat loss rate W	838.0167	814.2857	714.7666	571.3052	400.0898	227.4642	111.8530	123.7243	273.7031	469.6693	670.0857	827.7790	(97)	
Month factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	(98)	
Space heating kWh	189.8116	130.5033	75.0552	20.5867	2.7774	0.0000	0.0000	0.0000	0.0000	15.3511	91.4067	197.9567	(98)	
Space heating													723 (98)	
RH space heating demand													123.4487 (98)	

4. Water heating energy requirements (kWh/year)												

Assumed occupancy											2.0670 (42)	
Average daily hot water use (litres/day)											87.6743 (43)	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	96.4417	92.9348	89.4278	85.9208	82.4138	78.9069	78.9069	82.4138	85.9208	89.4278	92.9348	96.4417 (44)
Energy costs	143.0203	125.0865	129.0780	112.5334	107.9784	93.1772	86.3424	89.0791	100.2624	116.8462	127.5468	138.5075 (45)
Energy content (annual)											Total = Sum(45)m =	1379.4582 (45)
Distribution loss (46)m = 0.15 x (45)m												
	2.2530	18.7630	19.3617	16.8800	16.1968	13.9766	12.9514	14.8619	15.0394	17.5269	19.1320	20.7761 (46)
Water storage loss:												

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Store volume												3.0000 (47)
b) If manufacturer declared loss factor is not known :												
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0212 (51)
Volume factor from Table 2a												3.4200 (52)
Temperature factor from Table 2b												1.0000 (53)
Enter (49) or (54) in (55)												0.2173 (55)
Total storage loss	6.7353	6.0835	6.7353	6.5180	6.7353	6.5180	6.7353	6.7353	6.5180	6.7353	6.5180	6.7353 (56)
If cylinder contains dedicated solar storage	6.7353	6.0835	6.7353	6.5180	6.7353	6.5180	6.7353	6.7353	6.5180	6.7353	6.5180	6.7353 (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	173.0180	152.1812	159.0757	141.5634	137.9761	122.2072	116.3400	129.0768	129.2925	146.8439	156.5768	168.5052 (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	173.0180	152.1812	159.0757	141.5634	137.9761	122.2072	116.3400	129.0768	129.2925	146.8439	156.5768	168.5052 (64)
Heat gains from water heating, kWh/month	71.5524	63.2670	66.9166	60.6414	59.9010	54.2054	52.7070	56.9420	56.5613	62.8495	65.6333	70.0519 (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	124.0183	124.0183	124.0183	124.0183	124.0183	124.0183	124.0183	124.0183	124.0183	124.0183	124.0183	124.0183	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	40.3989	35.8819	29.1812	22.0920	16.5140	13.9418	15.0647	19.5816	26.2824	33.3715	38.9495	41.5217	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	269.5789	272.3763	265.3270	250.1198	231.3759	213.5714	201.6768	198.8795	205.9288	220.9360	239.8798	257.6844	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	49.4688	49.4688	49.4688	49.4688	49.4688	49.4688	49.4688	49.4688	49.4688	49.4688	49.4688	49.4688	(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)	-82.6789	-82.6789	-82.6789	-82.6789	-82.6789	-82.6789	-82.6789	-82.6789	-82.6789	-82.6789	-82.6789	-82.6789	(71)
Water heating gains (Table 5)	96.1726	94.1473	89.9417	84.2241	80.5121	75.2853	70.8427	74.5373	78.5573	84.4752	91.1574	94.1558	(72)
Total internal gains	496.9586	493.2138	475.2580	447.4442	419.2103	393.6068	378.3925	385.8042	401.5768	429.5909	460.7950	484.1701	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	q Specific data or Table 6b	FP Specific data or Table 6c	Access factor Table 6d	Gains W
South-east	8.1400	36.7938	0.4000	0.8000	0.7700	66.4175 (77)
South-west	4.9600	36.7938	0.4000	0.8000	0.7700	40.4706 (79)
Solar gains	106.8881	182.0701	249.1162	308.6670	345.7328	343.2326
Total gains	603.8468	675.2839	724.3742	756.1112	764.9431	736.8395

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, n11,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	74.5370	74.8186	75.1023	76.5537	76.8508	78.3713	78.6826	77.7559	76.8508	76.2590	75.6762	75.6762	
alpha	5.9691	5.9879	6.0068	6.1036	6.1234	6.2248	6.2248	6.2455	6.1837	6.1234	6.0839	6.0451	
util living area	0.9781	0.9573	0.9145	0.8187	0.6886	0.4826	0.3464	0.3711	0.5705	0.8315	0.9534	0.9824 (86)	
MIT	20.3941	20.5407	20.7136	20.8858	20.9710	20.9968	20.9997	20.9995	20.9911	20.8937	20.6311	20.3675 (87)	
Th 2	20.1407	20.1436	20.1466	20.1614	20.1644	20.1793	20.1793	20.1823	20.1734	20.1644	20.1585	20.1525 (88)	
util rest of house	0.9721	0.9465	0.8943	0.7823	0.6163	0.4220	0.2819	0.3054	0.5057	0.7899	0.9399	0.9775 (89)	
MIT 2	19.3598	19.5682	19.8099	20.0409	20.1393	20.1774	20.1792	20.1821	20.1674	20.0575	19.7102	19.3314 (90)	
Living area fraction	19.7814	19.9646	20.1791	20.3853	20.4784	20.5114	20.5137	20.5153	L5A = Living area / (4) =				0.4076 (91)
MIT	19.7814	19.9646	20.1791	20.3853	20.4784	20.5114	20.5137	20.5153	20.5032	20.3983	20.0856	19.7538 (92)	
Temperature adjustment												0.0000 (93)	
adjusted MIT	19.7814	19.9646	20.1791	20.3853	20.4784	20.5114	20.5137	20.5153	20.5032	20.3983	20.0856	19.7538 (93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	585.1862	637.4277	648.4246	599.2091	486.7817	329.1250	218.6191	228.9208	357.0587	506.0761	552.6078	561.1138	(95)
Ext temp	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.4000	16.4000	14.1000	11.1000	8.2000	6.2000	(96)
Heat loss rate W	909.7007	881.8785	797.7448	657.1090	500.2936	330.3650	218.7189	229.0784	360.6798	556.4248	745.8137	900.1937	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	241.4388	164.2709	111.0943	41.6879	10.0528	0.0000	0.0000	0.0000	0.0000	38.9474	139.1082	252.2755	(98)
Space heating													
Space heating per m2										(98) / (4) =			

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8c. Space cooling requirement		
Not applicable		
9b. Energy requirements		
Fraction of space heat from secondary/supplementary system (Table 11)		0.0000 (301)
Fraction of space heat from community system		1.0000 (302)
Fraction of heat from community Boilers		0.2500 (303a)
Fraction of heat from community Combined Heat and Power		0.7500 (303b)
Fraction of total space heat from community Boilers		0.2500 (304a)
Fraction of total space heat from community Combined Heat and Power		0.7500 (304b)
Factor for control and charging method (Table 4c(3)) for community space heating		1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating		1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system		1.0500 (306)
Space heating:		
Annual space heating requirement		998.8759 (98)
Space heat from Boilers = (98) x 0.25 x 1.00 x 1.05		262.2049 (307a)
Space heat from Combined Heat and Power = (98) x 0.75 x 1.00 x 1.05		786.6147 (307b)
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)		0.0000 (308)
Space heating fuel for secondary/supplementary system		0.0000 (309)

Water heating		
Annual water heating requirement		1732.6568 (64)
Water heat from Boilers = (64) x 0.25 x 1.00 x 1.05		454.8224 (310a)
Water heat from Combined Heat and Power = (64) x 0.75 x 1.00 x 1.05		1364.4673 (310b)
Electricity used for heat distribution		28.6811 (313)
Annual totals kWh/year		
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.9000)		
Mechanical ventilation fans (SFP = 0.9000)		
Total electricity for the above, kWh/year		173.1272 (330a)
Electricity for lighting (calculated in Appendix L)		173.1272 (331)
Total delivered energy for all uses		285.3829 (332)
		3526.6194 (332)

10b. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating from Boilers	262.2049	4.2400	11.1175 (340a)
Space heating from Combined Heat and Power	786.6147	2.9700	23.3625 (340b)
Space heating - secondary	0.0000	0.0000	0.0000 (341)
Water heating from Boilers	454.8224	4.2400	19.2845 (342a)
Water heating from Combined Heat and Power	1364.4673	2.9700	40.5247 (342b)
Mechanical ventilation fans	173.1272	13.1900	22.8355 (349)
Pumps and fans for heating	0.0000	0.0000	0.0000 (349)
Energy for lighting	285.3829	13.1900	37.6420 (350)
Additional standing charges			120.0000 (351)
Total energy cost			274.7666 (355)

11b. SAP rating - Community heating scheme

Energy cost deflator (Table 12):		0.4200 (356)
Energy cost factor (ECF)		1.0678 (357)
SAP value		85.1036
SAP rating (Section 12)		B
SAP band		B

12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Boilers			95.0000 (367a)
Space heating from Boilers	754.7656	0.2160	163.0294 (367)
Electrical efficiency of CHP unit			38.3000 (361)
Heat efficiency of CHP unit			40.6000 (362)
Space heating from Combined Heat and Power	1937.4747	0.2160	418.4945 (363)
less credit emissions for electricity	-742.0528	0.5190	-385.1254 (364)
Water heating from Combined Heat and Power	3360.7568	0.2160	725.9235 (365)
less credit emissions for electricity	-1287.1699	0.5190	-668.0412 (366)
Electrical energy for heat distribution	28.6811	0.5190	14.8855 (372)
Total CO2 associated with community systems			269.1663 (373)
(negative value allowed since DFEE <= TFEE)			
Space and water heating			269.1663 (376)
Pumps and fans	173.1272	0.5190	89.8530 (378)
Energy for lighting	285.3829	0.5190	148.1137 (379)
Total kg/year			507.1330 (383)
CO2 emissions per m2			8.0400 (384)
EI value			93.7119 (384a)
EI rating			94 (385)
EI band			A

Calculation of stars for heating and DHW

Space heating energy efficiency	0.25 x 4.240 x 1.05
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0.75 x 2.970 x 1.05
= 3.452, stars = 5
Space heating environmental impact 0.25 x 0.216 x 1.05 / 0.9500
0.75 x (0.216 - 0.383 x 0.519) x 1.05 / 0.406
= 0.0931, stars = 5
Water heating energy efficiency
Water heating environmental impact

3.452, stars = 5
0.0931, stars = 5

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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 (m2)	Storey height (m)	Volume (m3)
Ground floor	63.0700 (1b)	x 2.5000 (2b)	= 157.6750 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	63.0700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 157.6750 (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)					
							Air changes per hour					
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =						0.0000 / (5) =	0.0000 (8)					
Pressure test						Yes						
Measured/design AP50						4.0000						
Infiltration rate						0.2000 (18)						
Number of sides sheltered						2 (19)						
Shelter factor						(20) = 1 - [0.075 x (19)] =	0.8500 (20)					
Infiltration rate adjusted to include shelter factor						(21) = (18) x (20) =	0.1700 (21)					
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	4.6000	4.3000	4.4000	4.0000	4.0000	3.5000	3.6000	3.8000	3.7000	3.9000	3.9000	4.3000 (22)
Adj infiltr rate	1.1500	1.0750	1.1000	1.0000	1.0000	0.8750	0.9000	0.9500	0.9250	0.9750	0.9750	1.0750 (22a)
	0.1955	0.1828	0.1870	0.1700	0.1700	0.1488	0.1530	0.1615	0.1573	0.1658	0.1658	0.1828 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.3805	0.3678	0.3720	0.3550	0.3550	0.3338	0.3380	0.3465	0.3423	0.3508	0.3508	0.3678 (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/h					
Opening Type 1 (Uw = 0.90)			13.1000	0.8687	11.3803		(27)					
External Wall	43.5900	13.1000	30.4900	0.2600	7.3176		(29a)					
Roof	63.0700		63.0700	0.1400	8.8298		(30)					
Total net area of external elements Aum(A, m2)			106.6600				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		27.5277		(33)					
Wall to Corridor			8.2200	0.0000	0.0000		(32)					
Party Wall			33.5100	0.0000	0.0000		(32)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.3290 (36)					
Total fabric heat loss						(33) + (36) =	37.8567 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 19.7985	Feb 19.1350	Mar 19.3562	Apr 18.4716	May 18.4716	Jun 17.3659	Jul 17.5871	Aug 18.0293	Sep 17.8082	Oct 18.2505	Nov 18.2505	Dec 19.1350 (38)
Heat transfer coeff	57.6552	56.9918	57.2129	56.3283	56.3283	55.2226	55.4438	55.8861	55.6649	56.1072	56.1072	56.9918 (39)
Average = Sum(39)m / 12 =												56.3283 (39)
HLP	Jan 0.9141	Feb 0.9036	Mar 0.9071	Apr 0.8931	May 0.8931	Jun 0.8756	Jul 0.8791	Aug 0.8861	Sep 0.8826	Oct 0.8896	Nov 0.8896	Dec 0.9036 (40)
HLP (average)												0.8931 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

												2.0670 (42)
Assumed occupancy												87.6743 (43)
Average daily hot water use (litres/day)												
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	96.4417	92.9348	89.4278	85.9208	82.4138	78.9069	78.9069	82.4138	85.9208	89.4278	92.9348	96.4417 (44)
Energy content (annual)	143.0203	125.0865	129.0780	112.5334	107.9784	93.1772	86.3424	99.0791	100.2624	116.8462	127.5468	138.5075 (45)
Energy content (annual)										Total =	Sum(45m)	1379.4582 (45)
Distribution loss (46)m = 0.15 x (45)m												
Water storage loss:	21.4530	18.7630	19.3617	16.8800	16.1968	13.9766	12.9514	14.8619	15.0394	17.5269	19.1320	20.7761 (46)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



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

Store volume
b) If manufacturer declared loss factor is not known :
Hot water storage loss factor from Table 2 (kWh/litre/day)
Volume factor from Table 2a
Temperature factor from Table 2b
Enter (49) or (54) in (55)
Total storage loss

6.7353 6.0835 6.7353 6.5180 6.7353 6.5180 6.7353 6.7353 6.5180 6.7353 6.5180 6.7353 (56)
If cylinder contains dedicated solar storage
6.7353 6.0835 6.7353 6.5180 6.7353 6.5180 6.7353 6.7353 6.5180 6.7353 6.5180 6.7353 (57)
Primary loss 23.2624 21.0112 23.2624 22.5120 23.2624 22.5120 23.2624 22.5120 23.2624 22.5120 23.2624 (59)
Total heat required for water heating calculated for each month
173.0180 152.1812 159.0757 141.5634 137.9761 122.2072 116.3400 129.0768 129.2925 146.8439 156.5768 168.5052 (62)
Solar input 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (63)
Solar input (sum of months) = Sum (63)m = 0.0000 (63)

Output from w/h
173.0180 152.1812 159.0757 141.5634 137.9761 122.2072 116.3400 129.0768 129.2925 146.8439 156.5768 168.5052 (64)
Total per year (kWh/year) = Sum (64)m = 1732.6568 (64)
Heat gains from water heating, kWh/month
71.5524 63.2670 66.9166 60.6414 59.9010 54.2054 52.7070 56.9420 56.5613 62.8495 65.6333 70.0519 (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 124.0183 124.0183 124.0183 124.0183 124.0183 124.0183 124.0183 124.0183 124.0183 124.0183 124.0183 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5
40.3989 35.8819 29.1812 22.0920 16.5140 13.9418 15.0647 19.5816 26.2824 33.3715 38.9495 41.5217 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
269.5789 272.3763 265.3270 250.1198 231.3759 213.5714 201.6768 198.8795 205.9288 220.9360 239.8798 257.6844 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
49.4688 49.4688 49.4688 49.4688 49.4688 49.4688 49.4688 49.4688 49.4688 49.4688 49.4688 49.4688 (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)
-82.6789 -82.6789 -82.6789 -82.6789 -82.6789 -82.6789 -82.6789 -82.6789 -82.6789 -82.6789 -82.6789 -82.6789 (71)
Water heating gains (Table 5)
96.1726 94.1473 89.9417 84.2241 80.5121 75.2853 70.8427 76.5349 78.5373 84.4752 91.1574 94.1558 (72)
Total internal gains
496.9586 493.2138 475.2580 447.4442 419.2103 393.6068 378.3925 385.8042 401.5768 429.5909 460.7950 484.1701 (73)

6. Solar gains

[Jan] Area Solar flux g FP Access Gains
m2 Table 6a W/m2 or Table 6b or Table 6c Table 6d W
Southeast 8.1400 39.1209 0.4000 0.7700 70.6182 (77)
Southwest 4.9600 39.1209 0.4000 0.7700 43.0303 (79)
Total gains 113.6485 173.7185 238.9039 308.9567 336.2886 358.9744 346.6650 323.1165 286.6976 209.7334 140.5420 99.6648 (83)
Solar gains 610.6071 666.9323 714.1620 756.4009 755.4989 752.5812 725.0575 688.2743 639.3243 601.3369 583.8349 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)
Utilisation factor for gains for living area, n11,m (see Table 9a)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
tau 75.9665 76.8508 76.5537 77.7559 77.7559 79.3128 78.9964 78.3713 78.6826 78.0624 78.0624 76.8508
alpha 6.0644 6.1234 6.1036 6.1837 6.1837 6.2875 6.2664 6.2248 6.2455 6.2042 6.2042 6.1234
util living area 0.9672 0.9451 0.8821 0.7474 0.5592 0.3373 0.1912 0.2128 0.4353 0.7367 0.9228 0.9725 (86)
MIT 20.5195 20.6321 20.8048 20.9416 20.9912 20.9997 21.0000 21.0000 20.9956 20.7536 20.4991 (87)
Th 2 20.1555 20.1644 20.1614 20.1734 20.1734 20.1883 20.1853 20.1793 20.1823 20.1763 20.1763 20.1644 (88)
util rest of house 0.9582 0.9312 0.8550 0.7026 0.5013 0.2779 0.1289 0.1482 0.3701 0.6822 0.9013 0.9647 (89)
MIT 2 19.5501 19.7132 19.9410 20.1169 20.1670 20.1882 20.1853 20.1793 20.1816 20.1374 19.8916 19.5292 (90)
Living area fraction 5.4000 5.8000 7.8000 10.3000 13.4000 16.4000 18.5000 18.3000 15.6000 12.1000 8.3000 5.4000 (91)
MIT 19.9453 20.0878 20.2931 20.4531 20.5030 20.5190 20.5174 20.5139 20.5146 20.4709 20.2430 19.9245 (92)
Temperature adjustment
adjusted MIT 19.9453 20.0878 20.2931 20.4531 20.5030 20.5190 20.5174 20.5139 20.5146 20.4709 20.2430 19.9245 (93)

8. Space heating requirement

Utilisation 0.9556 0.9298 0.8596 0.7183 0.5246 0.3021 0.1543 0.1745 0.3967 0.7024 0.9032 0.9621 (94)
Useful gains 583.4876 620.0845 613.8860 543.3126 396.3658 227.3766 111.8522 123.7223 273.0512 449.0361 543.1319 561.7081 (95)
Ext temp 5.4000 5.8000 7.8000 10.3000 13.4000 16.4000 18.5000 18.3000 15.6000 12.1000 8.3000 5.4000 (96)
Heat loss rate W 838.6107 814.2857 714.7666 571.9052 400.0989 227.4624 111.8530 123.7243 273.5701 469.6693 570.0857 627.7790 (97)
Month fracti 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 1.0000 (98)
Space heating kWh 189.8116 130.5033 75.0552 20.5867 2.7774 0.0000 0.0000 0.0000 0.0000 15.3511 91.4067 197.9567 (99)
Space heating
Space heating per m2 (98) / (4) = 11.4706 (99)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



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

8c. Space cooling requirement
Not applicable

9b. Energy requirements

Fraction of space heat from secondary/supplementary system (Table 11)
Fraction of space heat from community system
Fraction of heat from community Boilers
Fraction of heat from community Combined Heat and Power
Fraction of total space heat from community Boilers
Fraction of total space heat from community Combined Heat and Power
Factor for control and charging method (Table 4c(3)) for community space heating
Factor for control and charging method (Table 4c(3)) for community water heating
Distribution loss factor (Table 12c) for community heating system
Space heating:
Annual space heating requirement
Space heat from Boilers = (98) x 0.25 x 1.00 x 1.05
Space heat from Combined Heat and Power = (98) x 0.75 x 1.00 x 1.05
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)
Space heating fuel for secondary/supplementary system

Water heating
Annual water heating requirement
Water heat from Boilers = (64) x 0.25 x 1.00 x 1.05
Water heat from Combined Heat and Power = (64) x 0.75 x 1.00 x 1.05
Electricity used for heat distribution
Annual totals kWh/year
Electricity for pumps and fans:
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.9000)
Mechanical ventilation fans (SFP = 0.9000)
Total electricity for the above, kWh/year
Electricity for lighting (calculated in Appendix L)
Total delivered energy for all uses

10b. Fuel costs - using BREF prices (495)

Fuel Fuel price Fuel cost
kWh/year p/kWh £/year
Space heating from Boilers 189.9053 4.4300 8.4128 (340a)
Space heating from Combined Heat and Power 569.7158 3.1000 17.4612 (340b)
Space heating - secondary 0.0000 0.0000 0.0000 (341)
Water heating from Boilers 454.8224 4.4300 20.1486 (342a)
Water heating from Combined Heat and Power 1364.4673 3.1000 42.2985 (342b)
Mechanical ventilation fans 173.1272 19.4400 33.6559 (349)
Pumps and fans for heating 0.0000 0.0000 0.0000 (349)
Energy for lighting 285.3829 19.4400 55.4784 (350)
Additional standing charges 95.0000 0.0000 95.0000 (351)
Total energy cost 272.6555 (355)

12b. Carbon dioxide emissions - Community heating scheme

Energy Emission factor Emissions
kWh/year kg CO2/kWh kg CO2/year
Efficiency of heat source Boilers
Space heating from Boilers 678.6607 0.2160 146.5907 (367)
Electrical efficiency of CHP unit
Heat efficiency of CHP unit
Space heating from Combined Heat and Power
less credit emissions for electricity
Water heating from Combined Heat and Power
less credit emissions for electricity
Electrical energy for heat distribution
Total CO2 associated with community systems
(negative value allowed since DFEE <= TFEF)
Space and water heating
Pumps and fans
Energy for lighting
Total kg/year

13b. Primary energy - Community heating scheme

Energy Primary energy factor Primary energy
kWh/year kg CO2/kWh kWh/year
Efficiency of heat source Boilers
Space heating from Boilers 678.6607 1.2200 827.9661 (367)
Electrical efficiency of CHP unit
Heat efficiency of CHP unit
Space heating from Combined Heat and Power
less credit emissions for electricity
Water heating from Combined Heat and Power
less credit emissions for electricity
Electrical energy for heat distribution
Total CO2 associated with community systems
(negative value allowed since DFEE <= TFEF)
Space and water heating
Pumps and fans
Energy for lighting

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



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

Primary energy kWh/year
Primary energy kWh/m²/year

2525.2855 (383)
40.0394 (384)

SAP 2012 EPC IMPROVEMENTS

Current energy efficiency rating: B 85
Current environmental impact rating: A 94

(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	Not applicable		
O	Not considered		
P	Not considered		
R	Not considered		
S	Not considered		
T	Not considered		
U Solar photovoltaic panels	Not applicable		
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
(none)			

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

Potential energy efficiency rating: B 85
Potential environmental impact rating: A 94

Fuel prices for cost data on this page from database revision number 495 TEST (29 Apr 2022)
Recommendation texts revision number 4.9c (22 Feb 2014)

Typical heating and lighting costs of this home (per year, Thames Valley):			
	Current	Potential	Saving
Electricity	£89	£89	£0
Community scheme	£184	£184	£0
Space heating	£155	£155	£0
Water heating	£62	£62	£0
Lighting	£55	£55	£0
Total cost of fuels	£273	£273	£0
Total cost of uses	£272	£272	£0
Delivered energy	48 kWh/m ²	48 kWh/m ²	0 kWh/m ²
Carbon dioxide emissions	0.5 tonnes	0.5 tonnes	0.0 tonnes
CO2 emissions per m ²	8 kg/m ²	8 kg/m ²	0 kg/m ²
Primary energy	40 kWh/m ²	40 kWh/m ²	0 kWh/m ²

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)



CALCULATION OF ENERGY RATINGS FOR IMPROVED DWELLING 09 Jan 2014

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

No improvements selected / applicable

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

No improvements selected / applicable

Appendix I

BRUKL Outputs – *Be Clean*

BRUKL Output Document

Compliance with England Building Regulations Part L 2013



HM Government

Project name

Shell and Core

Clarendon Cafe Be Clean

As designed

Date: Wed Dec 05 18:03:56 2018

Administrative information

Building Details

Address: Clarendon Cafe, London, N22

Certification tool

Calculation engine: SBEM

Calculation engine version: v5.4.b.0

Interface to calculation engine: DesignBuilder SBEM

Interface to calculation engine version: v5.4.0

BRUKL compliance check version: v5.4.b.0

Owner Details

Name:

Telephone number:

Address: , ,

Certifier details

Name:

Telephone number:

Address: , ,

Criterion 1: The calculated CO₂ emission rate for the building must not exceed the target

CO ₂ emission rate from the notional building, kgCO ₂ /m ² .annum	80
Target CO ₂ emission rate (TER), kgCO ₂ /m ² .annum	80
Building CO ₂ emission rate (BER), kgCO ₂ /m ² .annum	59
Are emissions from the building less than or equal to the target?	BER =< TER
Are as built details the same as used in the BER calculations?	Separate submission

Criterion 2: The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Values which do not achieve the standards in the Non-Domestic Building Services Compliance Guide and Part L are displayed in red.

Building fabric

Element	U _a -Limit	U _a -Calc	U _i -Calc	Surface where the maximum value occurs*
Wall**	0.35	0.25	0.25	02 Lower Ground Floor - Kitchen_P_8
Floor	0.25	0.14	0.14	02 Lower Ground Floor - Kitchen_S_3
Roof	0.25	0.14	0.14	02 Lower Ground Floor - Cafe_R_5
Windows***, roof windows, and rooflights	2.2	1.4	1.4	02 Lower Ground Floor - Cafe_G_7
Personnel doors	2.2	-	-	"No external personnel doors"
Vehicle access & similar large doors	1.5	-	-	"No external vehicle access doors"
High usage entrance doors	3.5	-	-	"No external high usage entrance doors"
U _a -Limit = Limiting area-weighted average U-values [W/(m ² K)] U _a -Calc = Calculated area-weighted average U-values [W/(m ² K)] U _i -Calc = Calculated maximum individual element U-values [W/(m ² K)]				
* There might be more than one surface where the maximum U-value occurs. ** Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows. *** Display windows and similar glazing are excluded from the U-value check. N.B.: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.				

Air Permeability	Worst acceptable standard	This building
m ³ /(h.m ²) at 50 Pa	10	5

Building services

The standard values listed below are minimum values for efficiencies and maximum values for SFPs. Refer to the Non-Domestic Building Services Compliance Guide for details.

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

1- Project HVAC

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	2.5	2.5	-	-	-
Standard value	2.5*	N/A	N/A	N/A	N/A

Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system

NO

* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps. For types <=12 kW output, refer to EN 14825 for limiting standards.

1- Project DHW

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	Hot water provided by HVAC system	0.004
Standard value	N/A	N/A

1- CHP 1

	CHPQA quality index	CHP electrical efficiency
This building	110	0.4
Standard value	105	0.2

Local mechanical ventilation, exhaust, and terminal units

ID	System type in Non-domestic Building Services Compliance Guide
A	Local supply or extract ventilation units serving a single area
B	Zonal supply system where the fan is remote from the zone
C	Zonal extract system where the fan is remote from the zone
D	Zonal supply and extract ventilation units serving a single room or zone with heating and heat recovery
E	Local supply and extract ventilation system serving a single area with heating and heat recovery
F	Other local ventilation units
G	Fan-assisted terminal VAV unit
H	Fan coil units
I	Zonal extract system where the fan is remote from the zone with grease filter

Zone name	SFP [W/(l/s)]										HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		Zone	Standard
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1			
02 Lower Ground Floor - Kitchen	0.3	-	-	-	-	-	-	-	-	-	-	N/A
02 Lower Ground Floor - WCs	0.3	-	-	-	-	-	-	-	-	-	-	N/A
02 Lower Ground Floor - Cafe	-	-	-	1.5	-	-	-	-	-	-	0.85	0.5

Shell and core configuration

Zone	Assumed shell?
02 Lower Ground Floor - Kitchen	NO
02 Lower Ground Floor - WCs	NO
02 Lower Ground Floor - Cafe	NO

General lighting and display lighting		Luminous efficacy [lm/W]			General lighting [W]
Zone name		Luminaire	Lamp	Display lamp	
	Standard value	60	60	22	
02 Lower Ground Floor - Kitchen	-	100	-		338
02 Lower Ground Floor - WCs	-	100	-		58
02 Lower Ground Floor - Cafe	-	100	50		557

Criterion 3: The spaces in the building should have appropriate passive control measures to limit solar gains

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
02 Lower Ground Floor - Kitchen	N/A	N/A
02 Lower Ground Floor - WCs	N/A	N/A
02 Lower Ground Floor - Cafe	NO (-15.5%)	NO

Criterion 4: The performance of the building, as built, should be consistent with the calculated BER

Separate submission

Criterion 5: The necessary provisions for enabling energy-efficient operation of the building should be in place

Separate submission

EPBD (Recast): Consideration of alternative energy systems

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

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters			Building Use	
	Actual	Notional	% Area	Building Type
Area [m ²]	279.1	279.1		A1/A2 Retail/Financial and Professional services
External area [m ²]	617	617	100	A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways
Weather	LON	LON		B1 Offices and Workshop businesses
Infiltration [m ³ /hm ² @ 50Pa]	5	3		B2 to B7 General Industrial and Special Industrial Groups
Average conductance [W/K]	262.97	255.52		B8 Storage or Distribution
Average U-value [W/m ² K]	0.43	0.41		C1 Hotels
Alpha value* [%]	13.21	12.51		C2 Residential Institutions: Hospitals and Care Homes
				C2 Residential Institutions: Residential schools
				C2 Residential Institutions: Universities and colleges
				C2A Secure Residential Institutions
				Residential spaces
				D1 Non-residential Institutions: Community/Day Centre
				D1 Non-residential Institutions: Libraries, Museums, and Galleries
				D1 Non-residential Institutions: Education
				D1 Non-residential Institutions: Primary Health Care Building
				D1 Non-residential Institutions: Crown and County Courts
				D2 General Assembly and Leisure, Night Clubs, and Theatres
				Others: Passenger terminals
				Others: Emergency services
				Others: Miscellaneous 24hr activities
				Others: Car Parks 24 hrs
				Others: Stand alone utility block

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

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	5.08	6.53
Cooling	50.97	35.97
Auxiliary	11.99	8.5
Lighting	28.12	56.95
Hot water	192.31	117.6
Equipment*	129.28	129.28
TOTAL**	225.98	225.54

* Energy used by equipment does not count towards the total for consumption or calculating emissions.
** Total is net of any electrical energy displaced by CHP generators, if applicable.

Energy Production by Technology [kWh/m²]

	Actual	Notional
Photovoltaic systems	0	0
Wind turbines	0	0
CHP generators	62.5	0
Solar thermal systems	0	0

Energy & CO₂ Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m ²]	368.3	523.27
Primary energy* [kWh/m ²]	337.98	466.57
Total emissions [kg/m ²]	59	80

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

HVAC Systems Performance									
System Type	Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEFF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Split or multi-split system, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity									
Actual	42.6	325.7	5.1	51	12	2.33	1.78	2.5	2.5
Notional	57.1	466.2	6.5	36	8.5	2.43	3.6	----	----

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

Key Features

The Building Control Body is advised to give particular attention to items whose specifications are better than typically expected.

Building fabric			
Element	U _{i-Typ}	U _{i-Min}	Surface where the minimum value occurs*
Wall	0.23	0.24	02 Lower Ground Floor - Cafe_W_6
Floor	0.2	0.14	02 Lower Ground Floor - Kitchen_S_3
Roof	0.15	0.14	02 Lower Ground Floor - Cafe_R_5
Windows, roof windows, and rooflights	1.5	1.4	02 Lower Ground Floor - Cafe_G_7
Personnel doors	1.5	-	"No external personnel doors"
Vehicle access & similar large doors	1.5	-	"No external vehicle access doors"
High usage entrance doors	1.5	-	"No external high usage entrance doors"
U _{i-Typ} = Typical individual element U-values [W/(m²K)]		U _{i-Min} = Minimum individual element U-values [W/(m²K)]	
* There might be more than one surface where the minimum U-value occurs.			

Air Permeability	Typical value	This building
m³/(h.m²) at 50 Pa	5	5

BRUKL Output Document



Compliance with England Building Regulations Part L 2013

Project name

Shell and Core

Clarendon Offices Be Clean

As designed

Date: Wed Dec 05 17:43:54 2018

Administrative information

Building Details

Address: Clarendon Offices, London, N22

Certification tool

Calculation engine: SBEM

Calculation engine version: v5.4.b.0

Interface to calculation engine: DesignBuilder SBEM

Interface to calculation engine version: v5.4.0

BRUKL compliance check version: v5.4.b.0

Owner Details

Name:

Telephone number:

Address: , ,

Certifier details

Name:

Telephone number:

Address: , ,

Criterion 1: The calculated CO₂ emission rate for the building must not exceed the target

CO ₂ emission rate from the notional building, kgCO ₂ /m ² .annum	19.6
Target CO ₂ emission rate (TER), kgCO ₂ /m ² .annum	19.6
Building CO ₂ emission rate (BER), kgCO ₂ /m ² .annum	17.6
Are emissions from the building less than or equal to the target?	BER <= TER
Are as built details the same as used in the BER calculations?	Separate submission

Criterion 2: The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Values which do not achieve the standards in the Non-Domestic Building Services Compliance Guide and Part L are displayed in red.

Building fabric

Element	U _a -Limit	U _a -Calc	U _i -Calc	Surface where the maximum value occurs*
Wall**	0.35	0.24	0.25	01 Lower Ground Floor - Offices 1_P_6
Floor	0.25	0.16	0.25	03 First Floor 1 - Offices 1_F_4
Roof	0.25	0.14	0.14	01 Lower Ground Floor - Offices_R_5
Windows***, roof windows, and rooflights	2.2	1.4	1.4	01 Lower Ground Floor - Offices 1_G_8
Personnel doors	2.2	-	-	"No external personnel doors"
Vehicle access & similar large doors	1.5	-	-	"No external vehicle access doors"
High usage entrance doors	3.5	-	-	"No external high usage entrance doors"
U _a -Limit = Limiting area-weighted average U-values [W/(m ² K)] U _a -Calc = Calculated area-weighted average U-values [W/(m ² K)] U _i -Calc = Calculated maximum individual element U-values [W/(m ² K)]				
* There might be more than one surface where the maximum U-value occurs. ** Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows. *** Display windows and similar glazing are excluded from the U-value check. N.B.: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.				

Air Permeability	Worst acceptable standard	This building
m ³ /(h.m ²) at 50 Pa	10	5

Building services

The standard values listed below are minimum values for efficiencies and maximum values for SFPs. Refer to the Non-Domestic Building Services Compliance Guide for details.

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

1- Project HVAC

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	2.5	2.5	-	-	-
Standard value	2.5*	N/A	N/A	N/A	N/A

Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system

NO

* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps. For types <=12 kW output, refer to EN 14825 for limiting standards.

1- Project DHW

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	Hot water provided by HVAC system	0.006
Standard value	N/A	N/A

1- CHP 1

	CHPQA quality index	CHP electrical efficiency
This building	110	0.4
Standard value	105	0.2

Local mechanical ventilation, exhaust, and terminal units

ID	System type in Non-domestic Building Services Compliance Guide
A	Local supply or extract ventilation units serving a single area
B	Zonal supply system where the fan is remote from the zone
C	Zonal extract system where the fan is remote from the zone
D	Zonal supply and extract ventilation units serving a single room or zone with heating and heat recovery
E	Local supply and extract ventilation system serving a single area with heating and heat recovery
F	Other local ventilation units
G	Fan-assisted terminal VAV unit
H	Fan coil units
I	Zonal extract system where the fan is remote from the zone with grease filter

Zone name	ID of system type	SFP [W/(l/s)]									HR efficiency	
		A	B	C	D	E	F	G	H	I	Zone	Standard
01 Lower Ground Floor - Offices 1		-	-	-	1.5	-	-	-	-	-	0.85	0.5
01 Lower Ground Floor - Offices		-	-	-	1.5	-	-	-	-	-	0.85	0.5
03 First Floor 1 - Offices 1		-	-	-	1.5	-	-	-	-	-	0.85	0.5
03 First Floor 1 - Offices 2		-	-	-	1.5	-	-	-	-	-	0.85	0.5
03 First Floor 1 - Offices 3		-	-	-	1.5	-	-	-	-	-	0.85	0.5
03 First Floor 1 - Offices		-	-	-	1.5	-	-	-	-	-	0.85	0.5

Shell and core configuration

Zone	Assumed shell?
01 Lower Ground Floor - Offices 1	NO
01 Lower Ground Floor - Offices	NO
03 First Floor 1 - Offices 1	NO
03 First Floor 1 - Offices 2	NO

Shell and core configuration

Zone	Assumed shell?
03 First Floor 1 - Offices 3	NO
03 First Floor 1 - Offices	NO

General lighting and display lighting

Zone name	Standard value	Luminous efficacy [lm/W]			General lighting [W]
		Luminaire	Lamp	Display lamp	
01 Lower Ground Floor - Offices 1		100	-	-	1918
01 Lower Ground Floor - Offices		100	-	-	2264
03 First Floor 1 - Offices 1		100	-	-	1167
03 First Floor 1 - Offices 2		100	-	-	1195
03 First Floor 1 - Offices 3		100	-	-	2648
03 First Floor 1 - Offices		100	-	-	1086

Criterion 3: The spaces in the building should have appropriate passive control measures to limit solar gains

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
01 Lower Ground Floor - Offices 1	NO (-17.7%)	NO
01 Lower Ground Floor - Offices	NO (-13.7%)	NO
03 First Floor 1 - Offices 1	NO (-13.6%)	NO
03 First Floor 1 - Offices 2	NO (-41.1%)	NO
03 First Floor 1 - Offices 3	NO (-23.2%)	NO
03 First Floor 1 - Offices	NO (-31.5%)	NO

Criterion 4: The performance of the building, as built, should be consistent with the calculated BER

Separate submission

Criterion 5: The necessary provisions for enabling energy-efficient operation of the building should be in place

Separate submission

EPBD (Recast): Consideration of alternative energy systems

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

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters			Building Use	
	Actual	Notional	% Area	Building Type
Area [m ²]	1680.7	1680.7		A1/A2 Retail/Financial and Professional services
External area [m ²]	2181.1	2181.1		A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways
Weather	LON	LON	100	B1 Offices and Workshop businesses
Infiltration [m ³ /hm ² @ 50Pa]	5	3		B2 to B7 General Industrial and Special Industrial Groups
Average conductance [W/K]	896.2	832.27		B8 Storage or Distribution
Average U-value [W/m ² K]	0.41	0.38		C1 Hotels
Alpha value* [%]	11.49	11.2		C2 Residential Institutions: Hospitals and Care Homes
* Percentage of the building's average heat transfer coefficient which is due to thermal bridging				C2 Residential Institutions: Residential schools
				C2 Residential Institutions: Universities and colleges
				C2A Secure Residential Institutions
				Residential spaces
				D1 Non-residential Institutions: Community/Day Centre
				D1 Non-residential Institutions: Libraries, Museums, and Galleries
				D1 Non-residential Institutions: Education
				D1 Non-residential Institutions: Primary Health Care Building
				D1 Non-residential Institutions: Crown and County Courts
				D2 General Assembly and Leisure, Night Clubs, and Theatres
				Others: Passenger terminals
				Others: Emergency services
				Others: Miscellaneous 24hr activities
				Others: Car Parks 24 hrs
				Others: Stand alone utility block

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	2.35	1.31
Cooling	12.3	9.08
Auxiliary	4.5	2.7
Lighting	13.81	24.3
Hot water	6.39	3.34
Equipment*	42.19	42.19
TOTAL**	37.57	40.72

* Energy used by equipment does not count towards the total for consumption or calculating emissions.
 ** Total is net of any electrical energy displaced by CHP generators, if applicable.

Energy Production by Technology [kWh/m²]

	Actual	Notional
Photovoltaic systems	0	0
Wind turbines	0	0
CHP generators	1.77	0
Solar thermal systems	0	0

Energy & CO₂ Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m ²]	98.28	129.12
Primary energy* [kWh/m ²]	103.52	115.97
Total emissions [kg/m ²]	17.6	19.6

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

HVAC Systems Performance									
System Type	Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Split or multi-split system, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity									
Actual	19.7	78.6	2.4	12.3	4.5	2.33	1.78	2.5	2.5
Notional	11.5	117.6	1.3	9.1	2.7	2.43	3.6	----	----

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

Key Features

The Building Control Body is advised to give particular attention to items whose specifications are better than typically expected.

Building fabric

Element	U _{i-Typ}	U _{i-Min}	Surface where the minimum value occurs*
Wall	0.23	0.24	01 Lower Ground Floor - Offices 1_W_7
Floor	0.2	0.14	01 Lower Ground Floor - Offices 1_S_3
Roof	0.15	0.14	01 Lower Ground Floor - Offices_R_5
Windows, roof windows, and rooflights	1.5	1.4	01 Lower Ground Floor - Offices 1_G_8
Personnel doors	1.5	-	"No external personnel doors"
Vehicle access & similar large doors	1.5	-	"No external vehicle access doors"
High usage entrance doors	1.5	-	"No external high usage entrance doors"
U _{i-Typ} = Typical individual element U-values [W/(m²K)]			U _{i-Min} = Minimum individual element U-values [W/(m²K)]
* There might be more than one surface where the minimum U-value occurs.			

Air Permeability	Typical value	This building
m³/(h.m²) at 50 Pa	5	5

Appendix J

Low Carbon and Renewable Energy Technologies Summary

Appendix J - Low Carbon and Renewable Energy Technology Feasibility Study

Feasibility Study Table									
Technology	Sufficient Energy Generated?	Payback	Land Use Issues	Local Planning Requirements	Noise	Carbon Payback	Available Grants	Feasible?	Reason not Feasible or Selected
Combined Heat & Power (CHP)	Yes	Medium	Air quality in residential area	Encouraged for large scale developments	In Plant Room	Yes	Tax Relief - ECA, RHI	Yes	Selected
Biomass	Yes	None	Air quality in residential area	Encouraged for large scale developments	In Plant Room	Yes	RHI; Bio-energy Capital Grants Scheme	No	Conflict with selected technology (CHP) - Both supply space heating and hot water but CHP higher on Energy Hierarchy
Solar Thermal	Yes	High	Sufficient roof space required	Encouraged	None	~2 years	RHI	No	Conflict with selected technology (CHP) - Dependant on Hot water demand which is supplied by CHP
Solar Photovoltaic (PV)	Yes	Very High	Usable roof space is limited	Encouraged	None	2-5 years	FiT	Yes	Roof Space would not provide the carbon reductions required - conflicts with other roof space use
Ground Source Heat Pumps (GSHPs)	Yes	High	Requires large area for coils or borehole	Encouraged	None	Low	RHI	No	No suitable space
Air Source Heat Pumps (ASHPs)	Yes	Very High	Visual intrusion of external units	None	Low	Low	RHI	Yes	Conflict with selected technology (CHP) - Both supply space heating and hot water but CHP higher on Energy Hierarchy
Wind Power	No	Low	Urban Area - low and turbulent wind; Visual impact	Encouraged for large scale developments	Yes	~1 year	FiT	Yes	Wind speeds in area insufficient
Hydro Power	No	Medium	Requires suitable water resource; Visual impact	None	Low	~1 year	FiT	No	No nearby sources

Appendix K

Summary CO₂ Emissions Rates – *Be Green*

CO₂ Emissions at Be Green Stage

Unit Type Description	Individual			Total				Emissions Rate Improvement
	Unit Floor Area	Dwelling Emissions Rate	Target Emissions Rate	Number of Units	Total Floor Area	Dwelling Emissions Rate	Target Emissions Rate	
Domestic	m ²	kg CO ₂ /m ² /year	kg CO ₂ /m ² /year		m ²	kg CO ₂ /year	kg CO ₂ /year	-
Flat Type T27 - MID 03rd Floor - 2B3P	73	7.3	14.6	95	6,897	50,279	100,558	50.0%
Flat Type T43 - MID 03rd Floor - 2B3P	63	8.1	15.9	95	6,012	48,814	95,464	48.9%
Flat Type T22 - TOP 13th Floor - 1B2P	50	9.4	19.7	25	1,258	11,795	24,748	52.3%
Flat Type T25 - MID 03rd Floor - 1B-MAN	39	8.4	17.4	20	784	6,574	13,635	51.8%
Flat Type T27 - HLF 02nd Floor - 2B3P	73	8.6	17.3	25	1,815	15,609	31,418	50.3%
Flat Type T33 - MID 03rd Floor - 1B2P	51	8.5	16.8	99	5,008	42,321	83,891	49.6%
Flat Type T39 - TOP 07th Floor - 2B3P	63	8.8	17.5	40	2,523	22,125	44,149	49.9%
			Subtotal	399	24,296	197,518	393,862	49.9%
Non-Domestic								
Café	2,996	42.6	80.0	1	2,996	127,623	239,668	46.8%
Office	2,996	13.4	19.6	1	2,996	40,144	58,719	31.6%
			Subtotal		5,992	167,767	298,386	43.8%
Total for All Units					30,288	365,285	692,248	47.2%

CO₂ Emissions at Be Green Stage

Unit Type Description	Unit Floor Area	Individual		Number of Units	Total			Emissions Rate Improvement
		Dwelling Emissions Rate	Target Emissions Rate		Total Floor Area	Dwelling Emissions Rate	Target Emissions Rate	
Domestic	m ²	kg CO ₂ /m ² /year	kg CO ₂ /m ² /year		m ²	kg CO ₂ /year	kg CO ₂ /year	-
Flat Type T27 - MID 03rd Floor - 2B3P	73	7.3	14.6	75	5,445	39,694	79,388	50.0%
Flat Type T43 - MID 03rd Floor - 2B3P	63	8.1	15.9	77	4,873	39,565	77,376	48.9%
Flat Type T22 - TOP 13th Floor - 1B2P	50	9.4	19.7	30	1,509	14,154	29,697	52.3%
Flat Type T25 - MID 03rd Floor - 1B-MAN	39	8.4	17.4	24	940	7,889	16,362	51.8%
Flat Type T27 - HLF 02nd Floor - 2B3P	73	8.6	17.3	42	3,049	26,223	52,782	50.3%
Flat Type T33 - MID 03rd Floor - 1B2P	51	8.5	16.8	89	4,503	38,046	75,417	49.6%
Flat Type T39 - TOP 07th Floor - 2B3P	63	8.8	17.5	38	2,397	21,019	41,942	49.9%
			Subtotal	375	22,715	186,591	372,963	50.0%
Non-Domestic								
Café	1,050	42.6	80.0	1	1,050	44,722	83,984	46.8%
Office	1,050	13.4	19.6	1	1,050	14,067	20,576	31.6%
			Subtotal		2,100	58,789	104,561	43.8%
Total for All Units					24,815	245,380	477,524	48.6%

Appendix L

BRUKL Outputs – *Be Green*

BRUKL Output Document



Compliance with England Building Regulations Part L 2013

Project name

Shell and Core

Clarendon Cafe Be Green

As designed

Date: Wed Dec 05 18:02:33 2018

Administrative information

Building Details

Address: Clarendon Cafe, London, N22

Certification tool

Calculation engine: SBEM

Calculation engine version: v5.4.b.0

Interface to calculation engine: DesignBuilder SBEM

Interface to calculation engine version: v5.4.0

BRUKL compliance check version: v5.4.b.0

Owner Details

Name:

Telephone number:

Address: , ,

Certifier details

Name:

Telephone number:

Address: , ,

Criterion 1: The calculated CO₂ emission rate for the building must not exceed the target

CO ₂ emission rate from the notional building, kgCO ₂ /m ² .annum	80
Target CO ₂ emission rate (TER), kgCO ₂ /m ² .annum	80
Building CO ₂ emission rate (BER), kgCO ₂ /m ² .annum	42.6
Are emissions from the building less than or equal to the target?	BER =< TER
Are as built details the same as used in the BER calculations?	Separate submission

Criterion 2: The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Values which do not achieve the standards in the Non-Domestic Building Services Compliance Guide and Part L are displayed in red.

Building fabric

Element	U _a -Limit	U _a -Calc	U _i -Calc	Surface where the maximum value occurs*
Wall**	0.35	0.25	0.25	02 Lower Ground Floor - Kitchen_P_8
Floor	0.25	0.14	0.14	02 Lower Ground Floor - Kitchen_S_3
Roof	0.25	0.14	0.14	02 Lower Ground Floor - Cafe_R_5
Windows***, roof windows, and rooflights	2.2	1.4	1.4	02 Lower Ground Floor - Cafe_G_7
Personnel doors	2.2	-	-	"No external personnel doors"
Vehicle access & similar large doors	1.5	-	-	"No external vehicle access doors"
High usage entrance doors	3.5	-	-	"No external high usage entrance doors"
U _a -Limit = Limiting area-weighted average U-values [W/(m ² K)] U _a -Calc = Calculated area-weighted average U-values [W/(m ² K)] U _i -Calc = Calculated maximum individual element U-values [W/(m ² K)]				
* There might be more than one surface where the maximum U-value occurs. ** Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows. *** Display windows and similar glazing are excluded from the U-value check. N.B.: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.				

Air Permeability	Worst acceptable standard	This building
m ³ /(h.m ²) at 50 Pa	10	5

Building services

The standard values listed below are minimum values for efficiencies and maximum values for SFPs. Refer to the Non-Domestic Building Services Compliance Guide for details.

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

1- Project HVAC

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4	3.5	-	-	-
Standard value	2.5*	N/A	N/A	N/A	N/A

Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system

NO

* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps. For types <=12 kW output, refer to EN 14825 for limiting standards.

1- Project DHW

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	Hot water provided by HVAC system	0.004
Standard value	N/A	N/A

1- CHP 1

	CHPQA quality index	CHP electrical efficiency
This building	110	0.4
Standard value	105	0.2

Local mechanical ventilation, exhaust, and terminal units

ID	System type in Non-domestic Building Services Compliance Guide
A	Local supply or extract ventilation units serving a single area
B	Zonal supply system where the fan is remote from the zone
C	Zonal extract system where the fan is remote from the zone
D	Zonal supply and extract ventilation units serving a single room or zone with heating and heat recovery
E	Local supply and extract ventilation system serving a single area with heating and heat recovery
F	Other local ventilation units
G	Fan-assisted terminal VAV unit
H	Fan coil units
I	Zonal extract system where the fan is remote from the zone with grease filter

Zone name	SFP [W/(l/s)]										HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		Zone	Standard
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1			
02 Lower Ground Floor - Kitchen	0.3	-	-	-	-	-	-	-	-	-	-	N/A
02 Lower Ground Floor - WCs	0.3	-	-	-	-	-	-	-	-	-	-	N/A
02 Lower Ground Floor - Cafe	-	-	-	1.5	-	-	-	-	-	-	0.85	0.5

Shell and core configuration

Zone	Assumed shell?
02 Lower Ground Floor - Kitchen	NO
02 Lower Ground Floor - WCs	NO
02 Lower Ground Floor - Cafe	NO

General lighting and display lighting		Luminous efficacy [lm/W]			General lighting [W]
Zone name		Luminaire	Lamp	Display lamp	
	Standard value	60	60	22	
02 Lower Ground Floor - Kitchen	-	100	-		338
02 Lower Ground Floor - WCs	-	100	-		58
02 Lower Ground Floor - Cafe	-	100	50		557

Criterion 3: The spaces in the building should have appropriate passive control measures to limit solar gains

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
02 Lower Ground Floor - Kitchen	N/A	N/A
02 Lower Ground Floor - WCs	N/A	N/A
02 Lower Ground Floor - Cafe	NO (-15.5%)	NO

Criterion 4: The performance of the building, as built, should be consistent with the calculated BER

Separate submission

Criterion 5: The necessary provisions for enabling energy-efficient operation of the building should be in place

Separate submission

EPBD (Recast): Consideration of alternative energy systems

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

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters			Building Use	
	Actual	Notional	% Area	Building Type
Area [m ²]	279.1	279.1		A1/A2 Retail/Financial and Professional services
External area [m ²]	617	617	100	A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways
Weather	LON	LON		B1 Offices and Workshop businesses
Infiltration [m ³ /hm ² @ 50Pa]	5	3		B2 to B7 General Industrial and Special Industrial Groups
Average conductance [W/K]	262.97	255.52		B8 Storage or Distribution
Average U-value [W/m ² K]	0.43	0.41		C1 Hotels
Alpha value* [%]	13.21	12.51		C2 Residential Institutions: Hospitals and Care Homes
				C2 Residential Institutions: Residential schools
				C2 Residential Institutions: Universities and colleges
				C2A Secure Residential Institutions
				Residential spaces
				D1 Non-residential Institutions: Community/Day Centre
				D1 Non-residential Institutions: Libraries, Museums, and Galleries
				D1 Non-residential Institutions: Education
				D1 Non-residential Institutions: Primary Health Care Building
				D1 Non-residential Institutions: Crown and County Courts
				D2 General Assembly and Leisure, Night Clubs, and Theatres
				Others: Passenger terminals
				Others: Emergency services
				Others: Miscellaneous 24hr activities
				Others: Car Parks 24 hrs
				Others: Stand alone utility block

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

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	3.17	6.53
Cooling	21.24	35.97
Auxiliary	11.99	8.5
Lighting	28.12	56.95
Hot water	192.31	117.6
Equipment*	129.28	129.28
TOTAL**	194.34	225.54

* Energy used by equipment does not count towards the total for consumption or calculating emissions.
** Total is net of any electrical energy displaced by CHP generators, if applicable.

Energy Production by Technology [kWh/m²]

	Actual	Notional
Photovoltaic systems	0	0
Wind turbines	0	0
CHP generators	62.5	0
Solar thermal systems	0	0

Energy & CO₂ Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m ²]	368.3	523.27
Primary energy* [kWh/m ²]	240.85	466.57
Total emissions [kg/m ²]	42.6	80

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

HVAC Systems Performance									
System Type	Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Split or multi-split system, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity									
Actual	42.6	325.7	3.2	21.2	12	3.73	4.26	4	6
Notional	57.1	466.2	6.5	36	8.5	2.43	3.6	----	----

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

Key Features

The Building Control Body is advised to give particular attention to items whose specifications are better than typically expected.

Building fabric

Element	U _{i-Typ}	U _{i-Min}	Surface where the minimum value occurs*
Wall	0.23	0.24	02 Lower Ground Floor - Cafe_W_6
Floor	0.2	0.14	02 Lower Ground Floor - Kitchen_S_3
Roof	0.15	0.14	02 Lower Ground Floor - Cafe_R_5
Windows, roof windows, and rooflights	1.5	1.4	02 Lower Ground Floor - Cafe_G_7
Personnel doors	1.5	-	"No external personnel doors"
Vehicle access & similar large doors	1.5	-	"No external vehicle access doors"
High usage entrance doors	1.5	-	"No external high usage entrance doors"
U _{i-Typ} = Typical individual element U-values [W/(m²K)]			U _{i-Min} = Minimum individual element U-values [W/(m²K)]
* There might be more than one surface where the minimum U-value occurs.			

Air Permeability	Typical value	This building
m³/(h.m²) at 50 Pa	5	5

BRUKL Output Document



Compliance with England Building Regulations Part L 2013

Project name

Shell and Core

Clarendon Offices Be Green

As designed

Date: Wed Dec 05 17:41:10 2018

Administrative information

Building Details

Address: Clarendon Offices, London, N22

Certification tool

Calculation engine: SBEM

Calculation engine version: v5.4.b.0

Interface to calculation engine: DesignBuilder SBEM

Interface to calculation engine version: v5.4.0

BRUKL compliance check version: v5.4.b.0

Owner Details

Name:

Telephone number:

Address: , ,

Certifier details

Name:

Telephone number:

Address: , ,

Criterion 1: The calculated CO₂ emission rate for the building must not exceed the target

CO ₂ emission rate from the notional building, kgCO ₂ /m ² .annum	19.6
Target CO ₂ emission rate (TER), kgCO ₂ /m ² .annum	19.6
Building CO ₂ emission rate (BER), kgCO ₂ /m ² .annum	13.4
Are emissions from the building less than or equal to the target?	BER <= TER
Are as built details the same as used in the BER calculations?	Separate submission

Criterion 2: The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Values which do not achieve the standards in the Non-Domestic Building Services Compliance Guide and Part L are displayed in red.

Building fabric

Element	U _a -Limit	U _a -Calc	U _i -Calc	Surface where the maximum value occurs*
Wall**	0.35	0.24	0.25	01 Lower Ground Floor - Offices 1_P_6
Floor	0.25	0.16	0.25	03 First Floor 1 - Offices 1_F_4
Roof	0.25	0.14	0.14	01 Lower Ground Floor - Offices_R_5
Windows***, roof windows, and rooflights	2.2	1.4	1.4	01 Lower Ground Floor - Offices 1_G_8
Personnel doors	2.2	-	-	"No external personnel doors"
Vehicle access & similar large doors	1.5	-	-	"No external vehicle access doors"
High usage entrance doors	3.5	-	-	"No external high usage entrance doors"
U _a -Limit = Limiting area-weighted average U-values [W/(m ² K)] U _a -Calc = Calculated area-weighted average U-values [W/(m ² K)] U _i -Calc = Calculated maximum individual element U-values [W/(m ² K)]				
* There might be more than one surface where the maximum U-value occurs. ** Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows. *** Display windows and similar glazing are excluded from the U-value check. N.B.: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.				

Air Permeability	Worst acceptable standard	This building
m ³ /(h.m ²) at 50 Pa	10	5

Building services

The standard values listed below are minimum values for efficiencies and maximum values for SFPs. Refer to the Non-Domestic Building Services Compliance Guide for details.

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

1- Project HVAC

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4	3.5	-	-	-
Standard value	2.5*	N/A	N/A	N/A	N/A

Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system

NO

* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps. For types <=12 kW output, refer to EN 14825 for limiting standards.

1- Project DHW

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	Hot water provided by HVAC system	0.006
Standard value	N/A	N/A

1- CHP 1

	CHPQA quality index	CHP electrical efficiency
This building	110	0.4
Standard value	105	0.2

Local mechanical ventilation, exhaust, and terminal units

ID	System type in Non-domestic Building Services Compliance Guide
A	Local supply or extract ventilation units serving a single area
B	Zonal supply system where the fan is remote from the zone
C	Zonal extract system where the fan is remote from the zone
D	Zonal supply and extract ventilation units serving a single room or zone with heating and heat recovery
E	Local supply and extract ventilation system serving a single area with heating and heat recovery
F	Other local ventilation units
G	Fan-assisted terminal VAV unit
H	Fan coil units
I	Zonal extract system where the fan is remote from the zone with grease filter

Zone name	ID of system type	SFP [W/(l/s)]									HR efficiency	
		A	B	C	D	E	F	G	H	I	Zone	Standard
01 Lower Ground Floor - Offices 1		-	-	-	1.5	-	-	-	-	-	0.85	0.5
01 Lower Ground Floor - Offices		-	-	-	1.5	-	-	-	-	-	0.85	0.5
03 First Floor 1 - Offices 1		-	-	-	1.5	-	-	-	-	-	0.85	0.5
03 First Floor 1 - Offices 2		-	-	-	1.5	-	-	-	-	-	0.85	0.5
03 First Floor 1 - Offices 3		-	-	-	1.5	-	-	-	-	-	0.85	0.5
03 First Floor 1 - Offices		-	-	-	1.5	-	-	-	-	-	0.85	0.5

Shell and core configuration

Zone	Assumed shell?
01 Lower Ground Floor - Offices 1	NO
01 Lower Ground Floor - Offices	NO
03 First Floor 1 - Offices 1	NO
03 First Floor 1 - Offices 2	NO

Shell and core configuration

Zone	Assumed shell?
03 First Floor 1 - Offices 3	NO
03 First Floor 1 - Offices	NO

General lighting and display lighting

Zone name	Standard value	Luminous efficacy [lm/W]			General lighting [W]
		Luminaire	Lamp	Display lamp	
01 Lower Ground Floor - Offices 1		100	-	-	1918
01 Lower Ground Floor - Offices		100	-	-	2264
03 First Floor 1 - Offices 1		100	-	-	1167
03 First Floor 1 - Offices 2		100	-	-	1195
03 First Floor 1 - Offices 3		100	-	-	2648
03 First Floor 1 - Offices		100	-	-	1086

Criterion 3: The spaces in the building should have appropriate passive control measures to limit solar gains

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
01 Lower Ground Floor - Offices 1	NO (-17.7%)	NO
01 Lower Ground Floor - Offices	NO (-13.7%)	NO
03 First Floor 1 - Offices 1	NO (-13.6%)	NO
03 First Floor 1 - Offices 2	NO (-41.1%)	NO
03 First Floor 1 - Offices 3	NO (-23.2%)	NO
03 First Floor 1 - Offices	NO (-31.5%)	NO

Criterion 4: The performance of the building, as built, should be consistent with the calculated BER

Separate submission

Criterion 5: The necessary provisions for enabling energy-efficient operation of the building should be in place

Separate submission

EPBD (Recast): Consideration of alternative energy systems

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

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters			Building Use	
	Actual	Notional	% Area	Building Type
Area [m ²]	1680.7	1680.7		A1/A2 Retail/Financial and Professional services
External area [m ²]	2181.1	2181.1		A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways
Weather	LON	LON	100	B1 Offices and Workshop businesses
Infiltration [m ³ /hm ² @ 50Pa]	5	3		B2 to B7 General Industrial and Special Industrial Groups
Average conductance [W/K]	896.2	832.27		B8 Storage or Distribution
Average U-value [W/m ² K]	0.41	0.38		C1 Hotels
Alpha value* [%]	11.49	11.2		C2 Residential Institutions: Hospitals and Care Homes
* Percentage of the building's average heat transfer coefficient which is due to thermal bridging				C2 Residential Institutions: Residential schools
				C2 Residential Institutions: Universities and colleges
				C2A Secure Residential Institutions
				Residential spaces
				D1 Non-residential Institutions: Community/Day Centre
				D1 Non-residential Institutions: Libraries, Museums, and Galleries
				D1 Non-residential Institutions: Education
				D1 Non-residential Institutions: Primary Health Care Building
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				Others: Passenger terminals
				Others: Emergency services
				Others: Miscellaneous 24hr activities
				Others: Car Parks 24 hrs
				Others: Stand alone utility block

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	1.47	1.31
Cooling	5.12	9.08
Auxiliary	4.5	2.7
Lighting	13.81	24.3
Hot water	6.39	3.34
Equipment*	42.19	42.19
TOTAL**	29.52	40.72

* Energy used by equipment does not count towards the total for consumption or calculating emissions.
 ** Total is net of any electrical energy displaced by CHP generators, if applicable.

Energy Production by Technology [kWh/m²]

	Actual	Notional
Photovoltaic systems	0	0
Wind turbines	0	0
CHP generators	1.77	0
Solar thermal systems	0	0

Energy & CO₂ Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m ²]	98.28	129.12
Primary energy* [kWh/m ²]	78.79	115.97
Total emissions [kg/m ²]	13.4	19.6

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

HVAC Systems Performance									
System Type	Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEFF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Split or multi-split system, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity									
Actual	19.7	78.6	1.5	5.1	4.5	3.73	4.26	4	6
Notional	11.5	117.6	1.3	9.1	2.7	2.43	3.6	----	----

Key to terms	
Heat dem [MJ/m2]	= Heating energy demand
Cool dem [MJ/m2]	= Cooling energy demand
Heat con [kWh/m2]	= Heating energy consumption
Cool con [kWh/m2]	= Cooling energy consumption
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* There might be more than one surface where the minimum U-value occurs.			

Air Permeability	Typical value	This building
m³/(h.m²) at 50 Pa	5	5