

# FULL SAP CALCULATION PRINTOUT

## Calculation Type: New Build (As Designed)

Property Reference	010562			Issued on Date	10/02/2022
Assessment Reference	B09-TY-02_2	Prop Type Ref	B09-TY-02		
Property	London				
SAP Rating	84 B	DER	15.66	TER	15.09
Environmental	86 B	% DER<TER	-3.79		
CO <sub>2</sub> Emissions (t/year)	1.46	DFEE	47.16	TFEE	47.90
General Requirements Compliance	Fail	% DFEE<TFEE	1.53		
Assessor Details	Miss Emma Jolly, Emma Jolly, Tel: 01454806691, emmajolly@hoarelea.com			Assessor ID	T689-0001
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 111 m<sup>2</sup>

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) 15.09 kgCO<sub>2</sub>/m<sup>2</sup>  
Dwelling Carbon Dioxide Emission Rate (DER) 15.66 kgCO<sub>2</sub>/m<sup>2</sup>Fail  
Excess emissions =0.57 kgCO<sub>2</sub>/m<sup>2</sup> (3.8%)

#### 1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)47.9 kWh/m<sup>2</sup>/yr  
Dwelling Fabric Energy Efficiency (DFEE)47.2 kWh/m<sup>2</sup>/yrOK

#### 2 Fabric U-values

Element	Average	Highest	
External wall	0.16 (max. 0.30)	0.20 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor (no floor)			
Roof (no roof)			
Openings	1.30 (max. 2.00)	1.40 (max. 3.30)	OK

#### 2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

#### 3 Air permeability

Air permeability at 50 pascals:	3.00 (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: 0.10 kWh/day	
Permitted by DBSCG 0.29	OK	
Primary pipework insulated:	Yes (assumed)	OK

#### 6 Controls

Space heating controls:	Flat rate charging, programmer and TRVs	OK
Hot water controls:	No cylinderstat	Fail

#### 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:	0.63	
Maximum	1.5	OK
MVHR efficiency:	90%	
Minimum:	70%	OK

#### 9 Summertime temperature

Overheating risk (Thames Valley):	Medium	OK
Based on:		
Overshading:	Average	
Windows facing North:	14.61 m <sup>2</sup> , No overhang	
Windows facing West:	24.67 m <sup>2</sup> , No overhang	
Air change rate:	2.50 ach	
Blinds/curtains:	Dark-coloured curtain or roller blind, closed 100% of daylight hours	

#### 10 Key features

External wall U-value	0.12 W/m <sup>2</sup> K
External wall U-value	0.12 W/m <sup>2</sup> K
Party wall U-value	0.00 W/m <sup>2</sup> K
Party wall U-value	0.00 W/m <sup>2</sup> K
Air permeability	3.0 m <sup>3</sup> /m <sup>2</sup> h

# 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 <sup>2</sup> )	Storey height (m)	Volume (m <sup>3</sup> )
Ground floor	111.4000 (1b)	x 2.6000 (2b)	= 289.6400 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	111.4000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 289.6400 (5)

#### 2. Ventilation rate

	main heating	secondary heating	other	total	m <sup>3</sup> 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)
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				3.0000	
Infiltration rate				0.1500	(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) =		0.1275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (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	0.2801	0.2769	0.2737	0.2578	0.2546	0.2386	0.2386	0.2354	0.2450	0.2546	0.2609	0.2673 (25)

#### 3. Heat losses and heat loss parameter

Element	Gross m <sup>2</sup>	Openings m <sup>2</sup>	NetArea m <sup>2</sup>	U-value W/m <sup>2</sup> K	A x U W/K	K-value kJ/m <sup>2</sup> K	A x K kJ/K
Opening Type 1 (Uw = 1.30)			39.2800	1.2357	48.5399		(27)
Opening Type 9			1.8000	1.4000	2.5200		(26)
External 1	53.5600	24.6700	28.8900	0.1200	3.4668		(29a)
External 2	19.5000	14.6100	4.8900	0.1200	0.5868		(29a)
Sheltered 1	7.0200		7.0200	0.2000	1.4040		(29a)
Sheltered 2	26.5200	1.8000	24.7200	0.2000	4.9440		(29a)
Total net area of external elements Aum(A, m <sup>2</sup> )			106.6000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	61.4615		(33)
Part 2			19.7600	0.0000	0.0000		(32)
Party 1			11.4400	0.0000	0.0000		(32)
Party Floor 1			111.4000				(32d)
Party Ceiling 1			111.4000				(32b)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m <sup>2</sup> K							100.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							13.6528 (36)
Total fabric heat loss						(33) + (36) =	75.1143 (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	26.7687	26.4640	26.1594	24.6361	24.3314	22.8081	22.8081	22.5034	23.4174	24.3314	24.9407	25.5500 (38)
Average = Sum(39)m / 12 =	101.8830	101.5784	101.2737	99.7504	99.4457	97.9224	97.9224	97.6177	98.5317	99.4457	100.0550	100.6644 (39)
HLP	0.9146	0.9118	0.9091	0.8954	0.8927	0.8790	0.8790	0.8763	0.8845	0.8927	0.8982	0.9036 (40)
HLP (average)												0.8947 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

#### 4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.8230 (42)
Average daily hot water use (litres/day)												101.2456 (43)
Daily hot water use	111.3702	107.3204	103.2705	99.2207	95.1709	91.1211	91.1211	95.1709	99.2207	103.2705	107.3204	111.3702 (44)

# FULL SAP CALCULATION PRINTOUT

## Calculation Type: New Build (As Designed)

### CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Energy content (annual)	165.1588	144.4489	149.0583	129.9527	124.6927	107.6003	99.7075	114.4158	115.7823	134.9331	147.2900	159.9474 (45)
Distribution loss (46)m = 0.15 x (45)m												1592.9878 (45)
Water storage loss:												
Store volume												1.0000 (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												4.9324 (52)
Temperature factor from Table 2b												0.7800 (53)
Enter (49) or (54) in (55)												0.0815 (55)
Total storage loss												
	2.5256	2.2812	2.5256	2.4442	2.5256	2.4442	2.5256	2.5256	2.4442	2.5256	2.4442	2.5256 (56)
If cylinder contains dedicated solar storage												
	2.5256	2.2812	2.5256	2.4442	2.5256	2.4442	2.5256	2.5256	2.4442	2.5256	2.4442	2.5256 (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												
Solar input	190.9468	167.7413	174.8464	154.9088	150.4807	132.5565	125.4955	140.2038	140.7385	160.7211	172.2462	185.7355 (62)
Solar input (sum of months) = Sum(63)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 (63)
Output from w/h	190.9468	167.7413	174.8464	154.9088	150.4807	132.5565	125.4955	140.2038	140.7385	160.7211	172.2462	185.7355 (64)
Total per year (kWh/year) = Sum(64)m =	75.5457	66.6632	70.1923	63.1742	62.0907	55.7420	53.7832	58.6737	58.4625	65.4957	68.9389	73.8129 (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	141.1487	141.1487	141.1487	141.1487	141.1487	141.1487	141.1487	141.1487	141.1487	141.1487	141.1487	141.1487 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	24.3874	21.6607	17.6156	13.3362	9.9689	8.4162	9.0940	11.8207	15.8658	20.1452	23.5124	25.0652 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	273.5523	276.3909	269.2377	254.0093	234.7862	216.7192	204.6494	201.8108	208.9640	224.1924	243.4154	261.4824 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.1149	37.1149	37.1149	37.1149	37.1149	37.1149	37.1149	37.1149	37.1149	37.1149	37.1149	37.1149 (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)	-112.9189	-112.9189	-112.9189	-112.9189	-112.9189	-112.9189	-112.9189	-112.9189	-112.9189	-112.9189	-112.9189	-112.9189 (71)
Water heating gains (Table 5)	101.5399	99.2012	94.3445	87.7419	83.4553	77.4195	72.2892	78.8625	81.1980	88.0318	95.7484	99.2110 (72)
Total internal gains	464.8242	462.5973	446.5424	420.4320	393.5551	367.8995	351.3772	357.8386	371.3723	397.7140	428.0209	451.1032 (73)

#### 6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains						
	m2	Table 6a	Specific data	Specific data	factor	W						
		W/m2	or Table 6b	or Table 6c	Table 6d							
North	14.6100	10.6334	0.2900	0.8000	0.7700	24.9772 (74)						
West	24.6700	19.6403	0.2900	0.8000	0.7700	77.9000 (80)						
Solar gains	102.8772	200.1217	332.0724	496.2971	624.0671	647.0663	612.5741	514.6829	389.4002	237.6419	127.9447	84.8834 (83)
Total gains	567.7014	662.7190	778.6148	916.7291	1017.6222	1014.9659	963.9513	872.5215	760.7725	635.3559	555.9657	535.9866 (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	30.3725	30.4636	30.5533	31.0219	31.1169	31.6010	31.6010	31.6996	31.4056	31.1169	30.9274	30.7402
alpha	3.0248	3.0309	3.0370	3.0681	3.0745	3.1067	3.1067	3.1133	3.0937	3.0745	3.0618	3.0493
util living area	0.9756	0.9605	0.9259	0.8464	0.7174	0.5562	0.4259	0.4809	0.7117	0.9000	0.9629	0.9793 (86)
MIT	18.9961	19.2540	19.6919	20.2419	20.6570	20.8899	20.9641	20.9478	20.7555	20.1859	19.4969	18.9550 (87)
Th 2	20.1551	20.1575	20.1598	20.1714	20.1737	20.1854	20.1854	20.1877	20.1807	20.1737	20.1691	20.1644 (88)
util rest of house	0.9722	0.9549	0.9154	0.8250	0.6795	0.4993	0.3540	0.4064	0.6594	0.8812	0.9568	0.9763 (89)
MIT 2	18.2981	18.5546	18.9863	19.5241	19.9074	20.1144	20.1680	20.1609	20.0086	19.4832	18.8061	18.2641 (90)
Living area fraction												0.4847 (91)
MIT	18.6365	18.8936	19.3283	19.8720	20.2708	20.4903	20.5539	20.5423	20.3706	19.8238	19.1410	18.5990 (92)
Temperature adjustment												0.0000
adjusted MIT	18.6365	18.8936	19.3283	19.8720	20.2708	20.4903	20.5539	20.5423	20.3706	19.8238	19.1410	18.5990 (93)

#### 8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9641	0.9446	0.9031	0.8165	0.6842	0.5213	0.3872	0.4398	0.6724	0.8719	0.9473	0.9691 (94)
Ext temp.	547.3439	626.0113	703.1677	748.4666	696.2389	529.0835	373.2268	383.6954	511.5119	553.9887	526.6482	519.4303 (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	1460.6410	1421.4471	1299.1718	1094.4658	852.3272	576.7938	387.1748	404.3630	617.8578	917.2674	1204.7603	1449.4673 (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)
	679.4931	534.5329	443.4271	249.1194	116.1297	0.0000	0.0000	0.0000	0.0000	270.2793	488.2407	691.9475 (98)

# FULL SAP CALCULATION PRINTOUT

## Calculation Type: New Build (As Designed)

### CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Space heating 3473.1696 (98)  
 Space heating per m2 (98) / (4) = 31.1775 (99)

-----  
 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	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	1.0500 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0500 (305a)
Distribution loss factor (Table 12c) for community heating system	1.0500 (306)
Space heating:	
Annual space heating requirement	3473.1696 (98)
Space heat from Boilers = (98) x 1.00 x 1.05 x 1.05	3829.1695 (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	1896.6211 (64)
Water heat from Boilers = (64) x 1.00 x 1.05 x 1.05	2091.0247 (310a)
Electricity used for heat distribution	59.2019 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.7875)	
mechanical ventilation fans (SFP = 0.7875)	278.2716 (330a)
Total electricity for the above, kWh/year	278.2716 (331)
Electricity for lighting (calculated in Appendix L)	430.6888 (332)
Total delivered energy for all uses	6629.1547 (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			95.0000 (367a)
Space heating from Boilers	6231.7834	0.2160	1346.0652 (367)
Electrical energy for heat distribution	59.2019	0.5190	30.7258 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			1376.7910 (373)
Space and water heating			1376.7910 (376)
Pumps and fans	278.2716	0.5190	144.4230 (378)
Energy for lighting	430.6888	0.5190	223.5275 (379)
Total CO2, kg/year			1744.7415 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			15.6600 (384)

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

DER	15.6600 ZC1
Total Floor Area	TFA 111.4000
Assumed number of occupants	N 2.8230
CO2 emission factor in Table 12 for electricity displaced from grid	EF 0.5190
CO2 emissions from appliances, equation (L14)	14.5513 ZC2
CO2 emissions from cooking, equation (L16)	1.6764 ZC3
Total CO2 emissions	31.8877 ZC4
Residual CO2 emissions offset from biofuel CHP	0.0000 ZC5
Additional allowable electricity generation, kWh/m <sup>2</sup> /year	0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation	0.0000 ZC7
Net CO2 emissions	31.8877 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 (m2)	Storey height (m)	Volume (m3)
Ground floor	111.4000 (1b)	x 2.6000 (2b)	= 289.6400 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	111.4000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 289.6400 (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				4 * 10 =	40.0000 (7a)
Number of passive vents				0 * 10 =	0.0000 (7b)
Number of flueless gas fires				0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				40.0000 / (5) =	0.1381 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3881 (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) =		0.3299 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4206	0.4124	0.4041	0.3629	0.3546	0.3134	0.3134	0.3051	0.3299	0.3546	0.3711	0.3876 (22b)
Effective ac	0.5885	0.5850	0.5817	0.5658	0.5629	0.5491	0.5491	0.5466	0.5544	0.5629	0.5689	0.5751 (25)

#### 3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Opaque door			1.8000	1.0000	1.8000		(26)					
TER Opening Type (Uw = 1.40)			26.0400	1.3258	34.5227		(27)					
External 1	53.5600	16.3500	37.2100	0.1800	6.6978		(29a)					
External 2	19.5000	9.6900	9.8100	0.1800	1.7658		(29a)					
Sheltered 1	7.0200		7.0200	0.1800	1.2636		(29a)					
Sheltered 2	26.5200	1.8000	24.7200	0.1800	4.4496		(29a)					
Total net area of external elements Aum(A, m2)			106.6000				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	50.4995	(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.4750 (36)					
Total fabric heat loss						(33) + (36) =	59.9745 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	56.2452	55.9169	55.5951	54.0836	53.8008	52.4844	52.4844	52.2406	52.9914	53.8008	54.3729	54.9710 (38)
Heat transfer coeff	116.2197	115.8914	115.5696	114.0581	113.7753	112.4589	112.4589	112.2151	112.9660	113.7753	114.3474	114.9455 (39)
Average = Sum(39)m / 12 =												114.0568 (39)
HLP	1.0433	1.0403	1.0374	1.0239	1.0213	1.0095	1.0095	1.0073	1.0141	1.0213	1.0265	1.0318 (40)
HLP (average)												1.0238 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

#### 4. Water heating energy requirements (kWh/year)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Assumed occupancy												2.8230 (42)
Average daily hot water use (litres/day)												101.2456 (43)
Daily hot water use	111.3702	107.3204	103.2705	99.2207	95.1709	91.1211	91.1211	95.1709	99.2207	103.2705	107.3204	111.3702 (44)
Energy conte	165.1588	144.4489	149.0583	129.9527	124.6927	107.6003	99.7075	114.4158	115.7823	134.9331	147.2900	159.9474 (45)
Energy content (annual)												Total = Sum(45)m = 1592.9878 (45)
Distribution loss (46)m = 0.15 x (45)m												
24.7738	21.6673	22.3587	19.4929	18.7039	16.1400	14.9561	17.1624	17.3673	20.2400	22.0935	23.9921 (46)	
Water storage loss:												
Store volume												1.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												0.2134 (48)
Temperature factor from Table 2b												0.5400 (49)

# FULL SAP CALCULATION PRINTOUT

## Calculation Type: New Build (As Designed)

### CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Enter (49) or (54) in (55)												0.1152 (55)
Total storage loss												
	3.5715	3.2259	3.5715	3.4563	3.5715	3.4563	3.5715	3.5715	3.4563	3.5715	3.4563	3.5715 (56)
If cylinder contains dedicated solar storage												
	3.5715	3.2259	3.5715	3.4563	3.5715	3.4563	3.5715	3.5715	3.4563	3.5715	3.4563	3.5715 (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	23.2624 (59)
Total heat required for water heating calculated for each month												
	191.9926	168.6860	175.8922	155.9209	151.5266	133.5686	126.5414	141.2497	141.7506	161.7670	173.2583	186.7813 (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												
	191.9926	168.6860	175.8922	155.9209	151.5266	133.5686	126.5414	141.2497	141.7506	161.7670	173.2583	186.7813 (64)
												Total per year (kWh/year) = Sum(64)m = 1908.9351 (64)
Heat gains from water heating, kWh/month												
	76.3824	67.4189	71.0290	63.9839	62.9274	56.5517	54.6198	59.5104	59.2722	66.3324	69.7486	74.6496 (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	141.1487	141.1487	141.1487	141.1487	141.1487	141.1487	141.1487	141.1487	141.1487	141.1487	141.1487	141.1487 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	24.3874	21.6607	17.6156	13.3362	9.9689	8.4162	9.0940	11.8207	15.8658	20.1452	23.5124	25.0652 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	273.5523	276.3909	269.2377	254.0093	234.7862	216.7192	204.6494	201.8108	208.9640	224.1924	243.4154	261.4824 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.1149	37.1149	37.1149	37.1149	37.1149	37.1149	37.1149	37.1149	37.1149	37.1149	37.1149	37.1149 (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)	-112.9189	-112.9189	-112.9189	-112.9189	-112.9189	-112.9189	-112.9189	-112.9189	-112.9189	-112.9189	-112.9189	-112.9189 (71)
Water heating gains (Table 5)	102.6645	100.3257	95.4691	88.8665	84.5799	78.5440	73.4138	79.9870	82.3225	89.1564	96.8730	100.3355 (72)
Total internal gains	468.9488	466.7219	450.6670	424.5566	397.6796	372.0241	355.5018	361.9631	375.4969	401.8386	432.1455	455.2277 (73)

#### 6. Solar gains

[Jan]	Area m <sup>2</sup>	Solar flux Table 6a W/m <sup>2</sup>	Specific data or Table 6b	g	Specific data or Table 6c	FF	Access factor Table 6d	Gains W				
North	9.6900	10.6334	0.6300	0.6300	0.7000	0.7000	31.4896 (74)					
West	16.3500	19.6403	0.6300	0.6300	0.7000	0.7700	98.1379 (80)					
Solar gains	129.6275	252.1569	418.4190	625.3545	786.3609	815.3469	771.8820	648.5252	490.6556	299.4332	161.2130	106.9552 (83)
Total gains	598.5763	718.8788	869.0860	1049.9111	1184.0406	1187.3709	1127.3838	1010.4883	866.1525	701.2718	593.3584	562.1829 (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)												21.0000 (85)
tau	66.5645	66.7531	66.9390	67.8260	67.9946	68.7906	68.7906	68.9400	68.4818	67.9946	67.6544	67.3024
alpha	5.4376	5.4502	5.4626	5.5217	5.5330	5.5860	5.5860	5.5960	5.5655	5.5330	5.5103	5.4868
util living area	0.9988	0.9966	0.9865	0.9365	0.7956	0.5910	0.4364	0.5049	0.7997	0.9767	0.9972	0.9992 (86)
MIT	19.8453	20.0112	20.2956	20.6575	20.8998	20.9845	20.9976	20.9948	20.9249	20.5698	20.1395	19.8202 (87)
Th 2	20.0474	20.0499	20.0523	20.0635	20.0656	20.0754	20.0754	20.0772	20.0716	20.0656	20.0613	20.0569 (88)
util rest of house	0.9985	0.9954	0.9818	0.9155	0.7419	0.5121	0.3461	0.4067	0.7257	0.9654	0.9961	0.9989 (89)
MIT 2	18.4954	18.7394	19.1534	19.6691	19.9728	20.0657	20.0745	20.0752	20.0133	19.5599	18.9358	18.4655 (90)
Living area fraction												fLA = Living area / (4) = 0.4847 (91)
MIT	19.1498	19.3559	19.7071	20.1482	20.4221	20.5111	20.5220	20.5210	20.4552	20.0494	19.5193	19.1221 (92)
Temperature adjustment												0.0000
adjusted MIT	19.1498	19.3559	19.7071	20.1482	20.4221	20.5111	20.5220	20.5210	20.4552	20.0494	19.5193	19.1221 (93)

#### 8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9979	0.9943	0.9796	0.9177	0.7635	0.5500	0.3900	0.4545	0.7584	0.9652	0.9952	0.9985 (94)
Useful gains	597.3405	714.7820	851.3598	963.4815	904.0308	653.0398	439.6382	459.2578	656.9042	676.8451	590.5308	561.3518 (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	1725.8361	1675.3126	1526.3378	1282.9519	992.3635	664.7512	441.0610	462.4356	717.9248	1075.1141	1420.1133	1715.2330 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	839.6007	645.4766	502.1836	230.0187	65.7195	0.0000	0.0000	0.0000	0.0000	296.3121	597.2994	858.4876 (98)
Space heating												4035.0983 (98)
Space heating per m <sup>2</sup>												(98) / (4) = 36.2217 (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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													4315.6131 (211)
Space heating requirement	839.6007	645.4766	502.1836	230.0187	65.7195	0.0000	0.0000	0.0000	0.0000	296.3121	597.2994	858.4876	(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)	897.9687	690.3493	537.0948	246.0093	70.2883	0.0000	0.0000	0.0000	0.0000	316.9114	638.8229	918.1686	(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	191.9926	168.6860	175.8922	155.9209	151.5266	133.5686	126.5414	141.2497	141.7506	161.7670	173.2583	186.7813	(64)
Efficiency of water heater (217)m	88.2966	88.0538	87.4581	85.8495	82.7600	79.8000	79.8000	79.8000	79.8000	86.4085	87.8514	88.3824	(216)
Fuel for water heating, kWh/month	217.4407	191.5715	201.1160	181.6213	183.0914	167.3792	158.5731	177.0046	177.6323	187.2120	197.2175	211.3332	(219)
Water heating fuel used													2251.1929 (219)
Annual totals kWh/year													
Space heating fuel - main system													4315.6131 (211)
Space heating fuel - secondary													0.0000 (215)
Electricity for pumps and fans:													
central heating pump													30.0000 (230c)
main heating flue fan													45.0000 (230e)
Total electricity for the above, kWh/year													75.0000 (231)
Electricity for lighting (calculated in Appendix L)													430.6888 (232)
Total delivered energy for all uses													7072.4948 (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	4315.6131	0.2160	932.1724	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2251.1929	0.2160	486.2577	(264)
Space and water heating			1418.4301	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	430.6888	0.5190	223.5275	(268)
Total CO2, kg/m2/year			1680.8826	(272)
Emissions per m2 for space and water heating			12.7328	(272a)
Fuel factor (mains gas)			1.0000	
Emissions per m2 for lighting			2.0065	(272b)
Emissions per m2 for pumps and fans			0.3494	(272c)
Target Carbon Dioxide Emission Rate (TER) = (12.7328 * 1.00) + 2.0065 + 0.3494, rounded to 2 d.p.			15.0900	(273)