

# FULL SAP CALCULATION PRINTOUT

## Calculation Type: New Build (As Designed)

Property Reference	010582		Issued on Date	10/02/2022	
Assessment Reference	B08-TR-02	Prop Type Ref	8.TY.02		
Property					
SAP Rating	85 B	DER	9.78	TER	21.73
Environmental	92 A	% DER<TER	55.00		
CO <sub>2</sub> Emissions (t/year)	0.76	DFEE	42.41	TFEE	42.46
General Requirements Compliance	Pass	% DFEE<TFEE	0.14		
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 99 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:Electricity (c)  
Fuel factor:1.55 (electricity)  
Target Carbon Dioxide Emission Rate (TER) 21.73 kgCO<sub>2</sub>/m<sup>2</sup>  
Dwelling Carbon Dioxide Emission Rate (DER) 9.78 kgCO<sub>2</sub>/m<sup>2</sup>OK

#### 1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)42.5 kWh/m<sup>2</sup>/yr  
Dwelling Fabric Energy Efficiency (DFEE)42.4 kWh/m<sup>2</sup>/yrOK

#### 2 Fabric U-values

Element	Average	Highest	
External wall	0.14 (max. 0.30)	0.18 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	(no floor)		
Roof	(no roof)		
Openings	1.20 (max. 2.00)	1.20 (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 No cylinder

#### 6 Controls

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

Hot water controls: No cylinder

#### 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: 0.55  
Maximum 1.5 OK  
MVHR efficiency: 92%  
Minimum: 70% OK

#### 9 Summertime temperature

Overheating risk (Thames Valley): Slight OK  
Based on:  
Overshading: Average  
Windows facing North East: 11.45 m<sup>2</sup>, No overhang  
Windows facing South East: 15.34 m<sup>2</sup>, No overhang  
Windows facing South West: 2.12 m<sup>2</sup>, No overhang  
Windows facing North West: 2.07 m<sup>2</sup>, No overhang  
Air change rate: 4.00 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  
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  
Photovoltaic array 350.00 kWh/Year

# 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	99.0000 (1b)	x 2.5000 (2b)	= 247.5000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	99.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 247.5000 (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)
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) =												78.2000 (23c)
Effective ac	0.2716	0.2684	0.2652	0.2493	0.2461	0.2301	0.2301	0.2269	0.2365	0.2461	0.2524	0.2588 (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 = 1.20)			30.9800	1.1450	35.4733		(27)
External Wall 1	69.6800	30.9800	38.7000	0.1200	4.6440		(29a)
External Wall 2	9.6500		9.6500	0.1842	1.7772		(29a)
External Wall 3	15.1500		15.1500	0.1695	2.5678		(29a)
Total net area of external elements Aum(A, m2)			94.4800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	44.4622		(33)
Party Wall 1			12.1000	0.0000	0.0000		(32)
Party Floor 1			99.0000				(32d)
Party Ceilings 1			99.0000				(32b)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							14.3430 (36)
Total fabric heat loss						(33) + (36) =	58.8052 (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	22.1799	21.9195	21.6592	20.3575	20.0972	18.7955	18.7955	18.5351	19.3161	20.0972	20.6178	21.1385 (38)
Average = Sum(39)m / 12 =	80.9851	80.7248	80.4644	79.1627	78.9024	77.6007	77.6007	77.3404	78.1214	78.9024	79.4231	79.9438 (39)
												79.0977 (39)
HLP	0.8180	0.8154	0.8128	0.7996	0.7970	0.7838	0.7838	0.7812	0.7891	0.7970	0.8023	0.8075 (40)
HLP (average)												0.7990 (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												2.7301 (42)
Average daily hot water use (litres/day)												99.0393 (43)
Daily hot water use	108.9432	104.9816	101.0200	97.0585	93.0969	89.1353	89.1353	93.0969	97.0585	101.0200	104.9816	108.9432 (44)
Energy conte	161.5596	141.3010	145.8100	127.1207	121.9753	105.2555	97.5346	111.9224	113.2591	131.9926	144.0803	156.4618 (45)
Energy content (annual)												Total = Sum(45)m = 1558.2731 (45)
Distribution loss (46)m = 0.15 x (45)m												

# FULL SAP CALCULATION PRINTOUT

## Calculation Type: New Build (As Designed)

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

Water storage loss:	24.2339	21.1952	21.8715	19.0681	18.2963	15.7883	14.6302	16.7884	16.9889	19.7989	21.6120	23.4693 (46)
Store volume												110.0000 (47)
b) If manufacturer declared loss factor is not known :												
Hot water storage loss factor from Table 2 (kWh/litre/day)												0.0152 (51)
Volume factor from Table 2a												1.0294 (52)
Temperature factor from Table 2b												0.6000 (53)
Enter (49) or (54) in (55)												1.0327 (55)
Total storage loss	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (56)
If cylinder contains dedicated solar storage	32.0144	28.9162	32.0144	30.9817	32.0144	30.9817	32.0144	32.0144	30.9817	32.0144	30.9817	32.0144 (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	216.8364	191.2285	201.0868	180.6144	177.2522	158.7491	152.8115	167.1992	166.7528	187.2694	197.5739	211.7386 (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	216.8364	191.2285	201.0868	180.6144	177.2522	158.7491	152.8115	167.1992	166.7528	187.2694	197.5739	211.7386 (64)
Heat gains from water heating, kWh/month	97.9400	86.9245	92.7033	85.0626	84.7782	77.7924	76.6517	81.4357	80.4536	88.1090	90.7016	96.2450 (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	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	22.7068	20.1680	16.4017	12.4171	9.2819	7.8362	8.4673	11.0061	14.7724	18.7569	21.8921	23.3379 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	254.7009	257.3439	250.6836	236.5047	218.6064	201.7844	190.5464	187.9034	194.5636	208.7426	226.6409	243.4628 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504 (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)	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030 (71)
Water heating gains (Table 5)	131.6398	129.3520	124.6012	118.1425	113.9493	108.0450	103.0265	109.4565	111.7411	118.4261	125.9745	129.3616 (72)
Total internal gains	472.9986	470.8150	455.6376	431.0154	405.7887	381.6167	365.9913	372.3171	385.0283	409.8767	438.4586	460.1134 (73)

#### 6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains						
	m <sup>2</sup>	Table 6a	Specific data	Specific data	factor	W						
		W/m <sup>2</sup>	or Table 6b	or Table 6c	Table 6d							
Northeast	11.4500	11.2829	0.2900	0.7000	0.7700	18.1743 (75)						
Southeast	15.3400	36.7938	0.2900	0.7000	0.7700	79.4017 (77)						
Southwest	2.1200	36.7938	0.2900	0.7000	0.7700	10.9734 (79)						
Northwest	2.0700	11.2829	0.2900	0.7000	0.7700	3.2857 (81)						
Solar gains	111.8350	197.6245	289.3320	390.2319	466.0590	475.4302	453.0630	394.5446	323.9673	223.5221	135.2506	94.8675 (83)
Total gains	584.8336	668.4394	744.9696	821.2473	871.8477	857.0469	819.0543	766.8618	708.9955	633.3988	573.7093	554.9808 (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	84.8921	85.1659	85.4415	86.8464	87.1330	88.5946	88.5946	88.8928	88.0041	87.1330	86.5617	85.9980
alpha	6.6595	6.6777	6.6961	6.7898	6.8089	6.9063	6.9063	6.9262	6.8669	6.8089	6.7708	6.7332
util living area	0.9979	0.9942	0.9815	0.9282	0.7859	0.5738	0.4163	0.4627	0.7289	0.9549	0.9943	0.9985 (86)
MIT	20.2237	20.3584	20.5598	20.8018	20.9508	20.9950	20.9995	20.9990	20.9774	20.7813	20.4596	20.2018 (87)
Th 2	20.2377	20.2400	20.2423	20.2537	20.2559	20.2674	20.2674	20.2696	20.2628	20.2559	20.2514	20.2468 (88)
util rest of house	0.9972	0.9924	0.9757	0.9074	0.7389	0.5106	0.3473	0.3899	0.6630	0.9372	0.9921	0.9980 (89)
MIT 2	19.1914	19.3893	19.6813	20.0257	20.2101	20.2642	20.2672	20.2692	20.2459	20.0061	19.5463	19.1666 (90)
Living area fraction												fLA = Living area / (4) =
MIT	19.7023	19.8690	20.1161	20.4098	20.5767	20.6259	20.6296	20.6305	20.6079	20.3898	19.9983	19.6790 (92)
Temperature adjustment												0.0000
adjusted MIT	19.7023	19.8690	20.1161	20.4098	20.5767	20.6259	20.6296	20.6305	20.6079	20.3898	19.9983	19.6790 (93)

#### 8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9966	0.9913	0.9745	0.9122	0.7599	0.5418	0.3815	0.4260	0.6948	0.9408	0.9912	0.9975 (94)
Useful gains	582.8251	662.6486	725.9793	749.1036	662.5309	464.3502	312.4530	326.6705	492.5957	595.9211	568.6727	553.5944 (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	1247.3589	1208.3680	1095.6128	911.1486	700.3909	467.6144	312.7033	327.1852	508.4095	772.4358	1024.4250	1237.4458 (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	494.4132	366.7234	275.0073	116.6724	28.1678	0.0000	0.0000	0.0000	0.0000	131.3269	328.1417	508.7854 (98)
Space heating												2249.2382 (98)

# FULL SAP CALCULATION PRINTOUT

## Calculation Type: New Build (As Designed)

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

Space heating per m2 (98) / (4) = 22.7196 (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 Heat pump	1.0000	(303a)
Fraction of total space heat from community Heat pump	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	2249.2382	(98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.05	2361.7001	(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	2209.1129	(64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.05	2319.5685	(310a)
Electricity used for heat distribution	46.8127	(313)
Annual totals kWh/year		
Electricity for pumps and fans:		
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.6875)		
mechanical ventilation fans (SFP = 0.6875)	207.5906	(330a)
Total electricity for the above, kWh/year	207.5906	(331)
Electricity for lighting (calculated in Appendix L)	401.0087	(332)
Energy saving/generation technologies (Appendices M ,N and Q)		
Total delivered energy for all uses	5289.8679	(338)

#### 12b. Carbon dioxide emissions - Community heating scheme

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Heat pump			300.0000 (367a)
Space heating from Heat pump	1560.4229	0.5190	809.8595 (367)
Electrical energy for heat distribution	46.8127	0.5190	24.2958 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			834.1553 (373)
Space and water heating			834.1553 (376)
Pumps and fans	207.5906	0.5190	107.7395 (378)
Energy for lighting	401.0087	0.5190	208.1235 (379)
Energy saving/generation technologies			
PV Unit	-350.0000	0.5190	-181.6500 (380)
Total CO2, kg/year			968.3683 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			9.7800 (384)

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

DER			9.7800	ZC1
Total Floor Area			99.0000	TFA
Assumed number of occupants			2.7301	N
CO2 emission factor in Table 12 for electricity displaced from grid			0.5190	EF
CO2 emissions from appliances, equation (L14)			15.2455	ZC2
CO2 emissions from cooking, equation (L16)			1.8639	ZC3
Total CO2 emissions			26.8894	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			26.8894	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	99.0000 (1b)	2.5000 (2b)	247.5000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	99.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	247.5000 (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				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) =	0.1212 (8)
Pressure test				Yes	
Measured/design AP50					5.0000
Infiltration rate					0.3712 (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) =		0.3155 (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	0.4023	0.3944	0.3865	0.3471	0.3392	0.2998	0.2998	0.2919	0.3155	0.3392	0.3550	0.3707 (22b)
Effective ac	0.5809	0.5778	0.5747	0.5602	0.5575	0.5449	0.5449	0.5426	0.5498	0.5575	0.5630	0.5687 (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)			24.7400	1.3258	32.7992		(27)					
External Wall 1	69.6800	24.7400	44.9400	0.1800	8.0892		(29a)					
External Wall 2	9.6500		9.6500	0.1800	1.7370		(29a)					
External Wall 3	15.1500		15.1500	0.1800	2.7270		(29a)					
Total net area of external elements Aum(A, m2)			94.4800				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 45.3524		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.0663 (36)					
Total fabric heat loss						(33) + (36) =	55.4187 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	47.4469	47.1902	46.9387	45.7571	45.5360	44.5068	44.5068	44.3163	44.9033	45.5360	45.9832	46.4508 (38)
Heat transfer coeff	102.8656	102.6090	102.3574	101.1758	100.9547	99.9256	99.9256	99.7350	100.3220	100.9547	101.4020	101.8695 (39)
Average = Sum(39)m / 12 =												101.1747 (39)
HLP	1.0390	1.0365	1.0339	1.0220	1.0197	1.0093	1.0093	1.0074	1.0134	1.0197	1.0243	1.0290 (40)
HLP (average)												1.0220 (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												2.7301 (42)
Average daily hot water use (litres/day)												99.0393 (43)
Daily hot water use	108.9432	104.9816	101.0200	97.0585	93.0969	89.1353	89.1353	93.0969	97.0585	101.0200	104.9816	108.9432 (44)
Energy conte	161.5596	141.3010	145.8100	127.1207	121.9753	105.2555	97.5346	111.9224	113.2591	131.9926	144.0803	156.4618 (45)
Energy content (annual)										Total = Sum(45)m =		1558.2731 (45)
Distribution loss (46)m = 0.15 x (45)m	24.2339	21.1952	21.8715	19.0681	18.2963	15.7883	14.6302	16.7884	16.9889	19.7989	21.6120	23.4693 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss												

# FULL SAP CALCULATION PRINTOUT

## Calculation Type: New Build (As Designed)

### CALCULATION OF TARGET EMISSIONS 09 Jan 2014

If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
Primary loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(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	208.1545	183.3868	192.4049	172.2126	168.5703	150.3473	144.1296	158.5173	158.3510	178.5875	189.1721	203.0567	(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	Solar input (sum of months) = Sum(63)m = 0.0000 (63)												
	Total per year (kWh/year) = Sum(64)m = 2106.8905 (64)												
	208.1545	183.3868	192.4049	172.2126	168.5703	150.3473	144.1296	158.5173	158.3510	178.5875	189.1721	203.0567	(64)
	90.9945	80.6512	85.7578	78.3411	77.8327	71.0709	69.7062	74.4901	73.7321	81.1635	83.9802	89.2995	(65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)
(66)m	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	136.5037	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	22.7068	20.1680	16.4017	12.4171	9.2819	7.8362	8.4673	11.0061	14.7724	18.7569	21.8921	23.3379	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	254.7009	257.3439	250.6836	236.5047	218.6064	201.7844	190.5464	187.9034	194.5636	208.7426	226.6409	243.4628	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	36.6504	(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)	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	-109.2030	(71)
Water heating gains (Table 5)	122.3044	120.0166	115.2658	108.8071	104.6139	98.7096	93.6911	100.1211	102.4057	109.0907	116.6391	120.0262	(72)
Total internal gains	466.6632	464.4796	449.3022	424.6800	399.4533	375.2814	359.6559	365.9817	378.6929	403.5413	432.1233	453.7780	(73)

#### 6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains							
	m <sup>2</sup>	Table 6a	Specific data	Specific data	factor	W							
		W/m <sup>2</sup>	or Table 6b	or Table 6c	Table 6d								
Northeast	9.1500	11.2829	0.6300	0.7000	0.7700	31.5512 (75)							
Southeast	12.2500	36.7938	0.6300	0.7000	0.7700	137.7473 (77)							
Southwest	1.6900	36.7938	0.6300	0.7000	0.7700	19.0035 (79)							
Northwest	1.6500	11.2829	0.6300	0.7000	0.7700	5.6896 (81)							
Solar gains	193.9915	342.8091	501.9029	676.9546	808.5133	824.7777	785.9720	684.4430	561.9917	387.7360	234.6097	164.5586	(83)
Total gains	660.6547	807.2887	951.2051	1101.6347	1207.9666	1200.0590	1145.6279	1050.4247	940.6846	791.2773	666.7330	618.3366	(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	(85)
tau	66.8348	67.0019	67.1666	67.9510	68.0998	68.8012	68.8012	68.9327	68.5293	68.0998	67.7995	67.4883	(86)
alpha	5.4557	5.4668	5.4778	5.5301	5.5400	5.5867	5.5867	5.5955	5.5686	5.5400	5.5200	5.4992	(87)
util living area	0.9966	0.9897	0.9667	0.8878	0.7242	0.5254	0.3827	0.4344	0.6952	0.9390	0.9915	0.9976	(86)
MIT	19.9743	20.1737	20.4528	20.7609	20.9377	20.9912	20.9987	20.9975	20.9628	20.7018	20.2734	19.9383	(87)
Th 2	20.0509	20.0531	20.0552	20.0651	20.0669	20.0755	20.0755	20.0772	20.0722	20.0669	20.0632	20.0592	(88)
util rest of house	0.9956	0.9864	0.9565	0.8573	0.6672	0.4528	0.3029	0.3485	0.6171	0.9148	0.9882	0.9969	(89)
MIT 2	18.6860	18.9769	19.3771	19.8016	20.0118	20.0702	20.0751	20.0762	20.0457	19.7369	19.1309	18.6397	(90)
Living area fraction	19.3236	19.5693	19.9095	20.2764	20.4701	20.5261	20.5323	20.5322	20.4996	20.2144	19.6964	19.2824	(92)
Temperature adjustment	19.3236	19.5693	19.9095	20.2764	20.4701	20.5261	20.5323	20.5322	20.4996	20.2144	19.6964	19.2824	(93)
adjusted MIT	19.3236	19.5693	19.9095	20.2764	20.4701	20.5261	20.5323	20.5322	20.4996	20.2144	19.6964	19.2824	(93)

#### 8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(94)
Useful gains	656.9730	794.6439	908.0144	952.6923	836.7090	586.3132	392.2791	410.7909	615.5787	727.3166	657.7958	615.8535	(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	1545.4139	1505.1984	1372.5659	1151.0134	885.3793	592.1671	392.9337	412.1273	642.0231	970.6233	1277.2955	1536.4378	(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	661.0000	477.4926	345.6263	142.7912	36.2107	0.0000	0.0000	0.0000	0.0000	181.0202	446.0398	684.9147	(98)
Space heating	2975.0953 (98)												
Space heating per m <sup>2</sup>	30.0515 (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													3181.9201 (211)
Space heating requirement	661.0000	477.4926	345.6263	142.7912	36.2107	0.0000	0.0000	0.0000	0.0000	181.0202	446.0398	684.9147	(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)	706.9519	510.6873	369.6538	152.7178	38.7280	0.0000	0.0000	0.0000	0.0000	193.6045	477.0479	732.5291	(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	208.1545	183.3868	192.4049	172.2126	168.5703	150.3473	144.1296	158.5173	158.3510	178.5875	189.1721	203.0567	(64)
Efficiency of water heater (217)m	87.6843	87.2535	86.3591	84.3190	81.5040	79.8000	79.8000	79.8000	79.8000	84.8499	87.0249	87.8076	(216)
Fuel for water heating, kWh/month	237.3909	210.1769	222.7964	204.2392	206.8246	188.4051	180.6135	198.6433	198.4348	210.4746	217.3769	231.2518	(219)
Water heating fuel used													2506.6279 (219)
Annual totals kWh/year													
Space heating fuel - main system													3181.9201 (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)													401.0087 (232)
Total delivered energy for all uses													6164.5568 (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	3181.9201	0.2160	687.2948 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2506.6279	0.2160	541.4316 (264)
Space and water heating			1228.7264 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	401.0087	0.5190	208.1235 (268)
Total CO2, kg/m2/year			1475.7749 (272)
Emissions per m2 for space and water heating			12.4114 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.1023 (272b)
Emissions per m2 for pumps and fans			0.3932 (272c)
Target Carbon Dioxide Emission Rate (TER) = (12.4114 * 1.55) + 2.1023 + 0.3932, rounded to 2 d.p.			21.7300 (273)