

# FULL SAP CALCULATION PRINTOUT

## Calculation Type: New Build (As Designed)

Property Reference	010581			Issued on Date	10/02/2022
Assessment Reference	B10-TY-03_3	Prop Type Ref	B10-TY-03		
Property	London				
SAP Rating	82 B	DER	11.84	TER	28.51
Environmental	92 A	% DER<TER	58.48		
CO <sub>2</sub> Emissions (t/year)	0.51	DFEE	48.80	TFEE	47.38
General Requirements Compliance	Fail	% DFEE<TFEE	-2.99		
Assessor Details	Miss Emma Jolly, Emma Jolly, Tel: 01454806691, emmajolly@hoarelea.com			Assessor ID	T689-0001
Client					

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### 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 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) 28.51 kgCO<sub>2</sub>/m<sup>2</sup>  
Dwelling Carbon Dioxide Emission Rate (DER) 11.84 kgCO<sub>2</sub>/m<sup>2</sup>OK

#### 1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)47.4 kWh/m<sup>2</sup>/yr  
Dwelling Fabric Energy Efficiency (DFEE)48.8 kWh/m<sup>2</sup>/yrFail  
Excess energy =1.4 kWh/m<sup>2</sup>/yr (3.0%)

#### 2 Fabric U-values

Element	Average	Highest	
External wall	0.17 (max. 0.30)	0.19 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor (no floor)			
Roof (no roof)			
Openings	1.47 (max. 2.00)	2.00 (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	-
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#### Secondary heating system:

None

#### 5 Cylinder insulation

Hot water storage	No cylinder
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#### 6 Controls

Space heating controls:	Charging system linked to use of community heating, TRVsOK
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#### 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:	0.52
Maximum	1.5 OK
MVHR efficiency:	92%
Minimum:	70% OK

#### 9 Summertime temperature

Overheating risk (Thames Valley):	Medium OK
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#### Based on:

Overshading:	Average
Windows facing North:	15.14 m <sup>2</sup> , Overhang width less than twice window, ratio 0.59
Air change rate:	2.10 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

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### 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	50.6300 (1b)	2.6000 (2b)	131.6380 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.6300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	131.6380 (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				3	(19)							
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.7750 (20)							
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.1163 (21)							
Wind speed	Jan 5.1000	Feb 5.0000	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 4.5000	Dec 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	0.1482	0.1453	0.1424	0.1279	0.1250	0.1104	0.1104	0.1075	0.1163	0.1250	0.1308	0.1366 (22b)
Balanced mechanical ventilation with heat recovery												0.5000 (23a)
If mechanical ventilation:												78.2000 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.2572	0.2543	0.2514	0.2369	0.2340	0.2194	0.2194	0.2165	0.2253	0.2340	0.2398	0.2456 (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					
Window (Uw = 1.40)			15.1400	1.3258	20.0720		(27)					
Door			2.1000	2.0000	4.2000		(26)					
External wall	26.3000	15.1400	11.1600	0.1200	1.3392		(29a)					
Sheltered to corr	28.1600	2.1000	26.0600	0.1852	4.8259		(29a)					
Total net area of external elements Aum(A, m2)			54.4600				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	30.4371	(33)					
Party wall			32.7700	0.0000	0.0000		(32)					
Party Floor 1			1.0000				(32d)					
Party Ceiling 1			1.0000				(32b)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							100.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.7802 (36)					
Total fabric heat loss						(33) + (36) =	36.2173 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 11.1737	Feb 11.0475	Mar 10.9212	Apr 10.2900	May 10.1637	Jun 9.5325	Jul 9.5325	Aug 9.4062	Sep 9.7850	Oct 10.1637	Nov 10.4162	Dec 10.6687 (38)
Heat transfer coeff	47.3910	47.2648	47.1385	46.5073	46.3810	45.7498	45.7498	45.6235	46.0023	46.3810	46.6335	46.8860 (39)
Average = Sum(39)m / 12 =												46.4757 (39)
HLP (average)	Jan 0.9360	Feb 0.9335	Mar 0.9310	Apr 0.9186	May 0.9161	Jun 0.9036	Jul 0.9036	Aug 0.9011	Sep 0.9086	Oct 0.9161	Nov 0.9211	Dec 0.9261 (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												1.7087 (42)
Average daily hot water use (litres/day)												74.7807 (43)
Daily hot water use	82.2588	79.2676	76.2763	73.2851	70.2939	67.3026	67.3026	70.2939	73.2851	76.2763	79.2676	82.2588 (44)
Energy conte	121.9874	106.6910	110.0955	95.9839	92.0989	79.4743	73.6446	84.5083	85.5176	99.6625	108.7894	118.1383 (45)
Energy content (annual)												Total = Sum(45)m = 1176.5917 (45)
Distribution loss (46)m = 0.15 x (45)m												

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

Water storage loss:	18.2981	16.0036	16.5143	14.3976	13.8148	11.9211	11.0467	12.6762	12.8276	14.9494	16.3184	17.7207 (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	177.2642	156.6184	165.3723	149.4776	147.3757	132.9680	128.9214	139.7851	139.0113	154.9393	162.2831	173.4151 (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	177.2642	156.6184	165.3723	149.4776	147.3757	132.9680	128.9214	139.7851	139.0113	154.9393	162.2831	173.4151 (64)
Heat gains from water heating, kWh/month	84.7823	75.4167	80.8282	74.7096	74.8443	69.2202	68.7083	72.3205	71.2295	77.3592	78.9674	83.5024 (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	85.4331	85.4331	85.4331	85.4331	85.4331	85.4331	85.4331	85.4331	85.4331	85.4331	85.4331	85.4331 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.2719	11.7880	9.5866	7.2577	5.4252	4.5802	4.9491	6.4330	8.6343	10.9632	12.7957	13.6407 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	148.8701	150.4149	146.5220	138.2346	127.7732	117.9409	111.3724	109.8276	113.7205	122.0079	132.4693	142.3015 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5433	31.5433	31.5433	31.5433	31.5433	31.5433	31.5433	31.5433	31.5433	31.5433	31.5433	31.5433 (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)	-68.3465	-68.3465	-68.3465	-68.3465	-68.3465	-68.3465	-68.3465	-68.3465	-68.3465	-68.3465	-68.3465	-68.3465 (71)
Water heating gains (Table 5)	113.9546	112.2272	108.6401	103.7633	100.5972	96.1391	92.3498	97.2049	98.9299	103.9775	109.6770	112.2344 (72)
Total internal gains	324.7265	323.0600	313.3786	297.8855	282.4255	267.2901	257.3012	262.0954	269.9146	285.5785	303.5719	316.8066 (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							
North	15.1400	10.6334	0.2900	0.8000	0.7700	25.8833 (74)						
Solar gains	25.8833	49.4642	84.0518	135.0088	181.8692	194.6963	181.7739	144.2144	101.0575	58.8807	31.9303	21.5776 (83)
Total gains	350.6098	372.5242	397.4304	432.8943	464.2947	461.9865	439.0751	406.3098	370.9721	344.4592	335.5022	338.3842 (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	29.6763	29.7555	29.8352	30.2402	30.3225	30.7409	30.7409	30.8260	30.5722	30.3225	30.1583	29.9959
alpha	2.9784	2.9837	2.9890	3.0160	3.0215	3.0494	3.0494	3.0551	3.0381	3.0215	3.0106	2.9997
util living area	0.9487	0.9357	0.9065	0.8394	0.7230	0.5652	0.4344	0.4809	0.6910	0.8607	0.9285	0.9532 (86)
MIT	19.2514	19.4268	19.7657	20.2352	20.6327	20.8777	20.9593	20.9441	20.7648	20.2862	19.7095	19.2206 (87)
Th 2	20.1370	20.1391	20.1412	20.1517	20.1539	20.1644	20.1644	20.1666	20.1602	20.1539	20.1496	20.1454 (88)
util rest of house	0.9420	0.9272	0.8938	0.8171	0.6847	0.5069	0.3598	0.4048	0.6370	0.8367	0.9177	0.9470 (89)
MIT 2	17.7910	18.0446	18.5316	19.1990	19.7366	20.0492	20.1357	20.1248	19.9206	19.2825	18.4619	17.7520 (90)
Living area fraction	18.6823	18.8882	19.2848	19.8314	20.2835	20.5549	20.6383	20.6248	20.4358	19.8951	19.2233	0.6103 (91)
Temperature adjustment	18.6823	18.8882	19.2848	19.8314	20.2835	20.5549	20.6383	20.6248	20.4358	19.8951	19.2233	18.6483 (92)
adjusted MIT	18.6823	18.8882	19.2848	19.8314	20.2835	20.5549	20.6383	20.6248	20.4358	19.8951	19.2233	18.6483 (93)

#### 8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9278	0.9122	0.8789	0.8077	0.6909	0.5349	0.4028	0.4475	0.6557	0.8283	0.9036	0.9335 (94)
Ext temp.	325.3033	339.8343	349.2912	349.6682	320.8010	247.1194	176.8769	181.8400	243.2361	285.3313	303.1634	315.8700 (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	681.5911	661.1470	602.6555	508.3880	398.1133	272.4337	184.7521	192.7515	291.4620	431.1148	565.3543	677.4223 (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	265.0781	215.9222	188.5031	114.2783	57.5204	0.0000	0.0000	0.0000	0.0000	108.4629	188.7775	268.9949 (98)
Space heating per m <sup>2</sup>												27.8005 (99)

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### 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)	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	1407.5373 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.05	1477.9141 (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	1827.4315 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.05	1918.8031 (310a)
Electricity used for heat distribution	33.9672 (313)
Annual totals kWh/year	
Electricity for pumps and fans:	
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.6500)	
mechanical ventilation fans (SFP = 0.6500)	104.3889 (330a)
Total electricity for the above, kWh/year	104.3889 (331)
Electricity for lighting (calculated in Appendix L)	234.3855 (332)
Energy saving/generation technologies (Appendices M ,N and Q)	
Total delivered energy for all uses	3735.4916 (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	1132.2391	0.5190	587.6321 (367)
Electrical energy for heat distribution	33.9672	0.5190	17.6290 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			605.2610 (373)
Space and water heating			605.2610 (376)
Pumps and fans	104.3889	0.5190	54.1779 (378)
Energy for lighting	234.3855	0.5190	121.6461 (379)
Energy saving/generation technologies			
PV Unit	-350.0000	0.5190	-181.6500 (380)
Total CO2, kg/year			599.4350 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			11.8400 (384)

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

DER		11.8400 ZC1
Total Floor Area		50.6300
Assumed number of occupants		TFA 1.7087
CO2 emission factor in Table 12 for electricity displaced from grid		N 0.5190
CO2 emissions from appliances, equation (L14)		EF 17.4239 ZC2
CO2 emissions from cooking, equation (L16)		3.1603 ZC3
Total CO2 emissions		32.4243 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		32.4243 ZC8

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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

	Area (m <sup>2</sup> )	Storey height (m)	Volume (m <sup>3</sup> )
Ground floor	50.6300 (1b)	2.6000 (2b)	131.6380 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.6300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	131.6380 (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				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) =	0.1519 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4019 (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) =		0.3115 (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	0.3972	0.3894	0.3816	0.3426	0.3349	0.2959	0.2959	0.2881	0.3115	0.3349	0.3504	0.3660 (22b)
	0.5789	0.5758	0.5728	0.5587	0.5561	0.5438	0.5438	0.5415	0.5485	0.5561	0.5614	0.5670 (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
TER Opaque door			2.1000	1.0000	2.1000		(26)
TER Opening Type (Uw = 1.40)			10.5500	1.3258	13.9867		(27)
External wall	26.3000	10.5500	15.7500	0.1800	2.8350		(29a)
Sheltered to corr	28.1600	2.1000	26.0600	0.1800	4.6908		(29a)
Total net area of external elements Aum(A, m <sup>2</sup> )			54.4600				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 23.6125		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m <sup>2</sup> K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							3.7552 (36)
Total fabric heat loss						(33) + (36) =	27.3677 (37)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	25.1463	25.0133	24.8829	24.2704	24.1558	23.6223	23.6223	23.5235	23.8278	24.1558	24.3876	24.6300 (38)
Heat transfer coeff	52.5141	52.3810	52.2506	51.6381	51.5235	50.9901	50.9901	50.8913	51.1955	51.5235	51.7554	51.9977 (39)
Average = Sum(39)m / 12 =												51.6376 (39)
HLP	1.0372	1.0346	1.0320	1.0199	1.0176	1.0071	1.0071	1.0052	1.0112	1.0176	1.0222	1.0270 (40)
HLP (average)												1.0199 (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												1.7087 (42)
Average daily hot water use (litres/day)												74.7807 (43)
Daily hot water use	82.2588	79.2676	76.2763	73.2851	70.2939	67.3026	67.3026	70.2939	73.2851	76.2763	79.2676	82.2588 (44)
Energy conte	121.9874	106.6910	110.0955	95.9839	92.0989	79.4743	73.6446	84.5083	85.5176	99.6625	108.7894	118.1383 (45)
Energy content (annual)												Total = Sum(45)m = 1176.5917 (45)
Distribution loss (46)m = 0.15 x (45)m	18.2981	16.0036	16.5143	14.3976	13.8148	11.9211	11.0467	12.6762	12.8276	14.9494	16.3184	17.7207 (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	23.2624	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	168.5823	148.7767	156.6904	141.0758	138.6938	124.5662	120.2395	131.1032	130.6094	146.2574	153.8813	164.7332 (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	168.5823	148.7767	156.6904	141.0758	138.6938	124.5662	120.2395	131.1032	130.6094	146.2574	153.8813	164.7332 (64)
Heat gains from water heating, kWh/month	77.8367	69.1433	73.8827	67.9881	67.8988	62.4987	61.7628	65.3749	64.5081	70.4137	72.2460	76.5569 (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	13.3158	11.8270	9.6184	7.2817	5.4432	4.5954	4.9654	6.4543	8.6629	10.9996	12.8381	13.6859	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	148.8701	150.4149	146.5220	138.2346	127.7732	117.9409	111.3724	109.8276	113.7205	122.0079	132.4693	142.3015	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.5433	31.5433	31.5433	31.5433	31.5433	31.5433	31.5433	31.5433	31.5433	31.5433	31.5433	31.5433	(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)	-68.3465	-68.3465	-68.3465	-68.3465	-68.3465	-68.3465	-68.3465	-68.3465	-68.3465	-68.3465	-68.3465	-68.3465	(71)
Water heating gains (Table 5)	104.6193	102.8918	99.3047	94.4280	91.2618	86.8037	83.0145	87.8695	89.5945	94.6421	100.3416	102.8991	(72)
Total internal gains	318.4351	316.7637	307.0750	291.5742	276.1081	260.9699	250.9822	255.7813	263.6078	279.2794	297.2789	310.5164	(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						
North	10.5500	10.6334	0.6300		0.7000	0.7700	34.2844	(74)					
Solar gains	34.2844	65.5192	111.3331	178.8295	240.8997	257.8903	240.7735	191.0231	133.8585	77.9920	42.2942	28.5811	(83)
Total gains	352.7195	382.2828	418.4081	470.4037	517.0078	518.8602	491.7558	446.8044	397.4663	357.2715	339.5731	339.0976	(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)	0.9959	0.9928	0.9824	0.9392	0.8134	0.6107	0.4531	0.5172	0.7939	0.9622	0.9916	0.9967	(86)
MIT	20.0044	20.1212	20.3430	20.6523	20.8885	20.9819	20.9971	20.9943	20.9282	20.6349	20.2733	19.9837	(87)
Th 2	20.0524	20.0546	20.0567	20.0668	20.0687	20.0774	20.0774	20.0790	20.0740	20.0687	20.0649	20.0609	(88)
util rest of house	0.9945	0.9904	0.9764	0.9190	0.7613	0.5304	0.3598	0.4172	0.7194	0.9454	0.9884	0.9956	(89)
MIT 2	18.7309	18.9024	19.2243	19.6651	19.9640	20.0660	20.0764	20.0767	20.0186	19.6508	19.1320	18.7071	(90)
Living area fraction	19.5081	19.6462	19.9071	20.2676	20.5282	20.6250	20.6383	20.6367	fLA = Living area / (4) =	20.5737	20.2514	19.8285	0.6103 (91)
MIT	19.5081	19.6462	19.9071	20.2676	20.5282	20.6250	20.6383	20.6367	20.5737	20.2514	19.8285	19.4862	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.5081	19.6462	19.9071	20.2676	20.5282	20.6250	20.6383	20.6367	20.5737	20.2514	19.8285	19.4862	(93)

#### 8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9935	0.9891	0.9753	0.9238	0.7883	0.5788	0.4169	0.4783	0.7618	0.9492	0.9874	0.9947	(94)
Useful gains	350.4421	378.1339	408.0728	434.5791	407.5466	300.3288	204.9940	213.7180	302.7722	339.1342	335.2995	337.3079	(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	798.6391	772.4222	700.5268	587.0005	454.8620	307.2154	205.9133	215.6109	331.4271	497.2743	658.7695	794.8496	(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	333.4586	264.9617	217.5858	109.7434	35.2027	0.0000	0.0000	0.0000	0.0000	117.6562	232.8984	340.4110	(98)
Space heating												1651.9178	(98)
Space heating per m2										(98) / (4) =		32.6273	(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													1766.7571 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	333.4586	264.9617	217.5858	109.7434	35.2027	0.0000	0.0000	0.0000	0.0000	117.6562	232.8984	340.4110	(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)	356.6402	283.3815	232.7121	117.3727	37.6499	0.0000	0.0000	0.0000	0.0000	125.8355	249.0892	364.0760	(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	168.5823	148.7767	156.6904	141.0758	138.6938	124.5662	120.2395	131.1032	130.6094	146.2574	153.8813	164.7332	(64)
Efficiency of water heater (217)m	86.6008	86.3372	85.6898	84.1534	81.7568	79.8000	79.8000	79.8000	79.8000	84.2403	85.9167	79.8000	(216)
Fuel for water heating, kWh/month	194.6660	172.3205	182.8576	167.6413	169.6419	156.0979	150.6761	164.2897	163.6710	173.6194	179.1052	189.9850	(219)
Water heating fuel used													2064.5717 (219)
Annual totals kWh/year													
Space heating fuel - main system													1766.7571 (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)													235.1619 (232)
Total delivered energy for all uses													4141.4906 (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	1766.7571	0.2160	381.6195 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2064.5717	0.2160	445.9475 (264)
Space and water heating			827.5670 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	235.1619	0.5190	122.0490 (268)
Total CO2, kg/m2/year			988.5410 (272)
Emissions per m2 for space and water heating			16.3454 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.4106 (272b)
Emissions per m2 for pumps and fans			0.7688 (272c)
Target Carbon Dioxide Emission Rate (TER) = (16.3454 * 1.55) + 2.4106 + 0.7688, rounded to 2 d.p.			28.5100 (273)