

# FULL SAP CALCULATION PRINTOUT

## Calculation Type: New Build (As Designed)

Property Reference	010576			Issued on Date	10/02/2022
Assessment Reference	B06-TY-03_3	Prop Type Ref	B06-TY-03		
Property	London				
SAP Rating	84 B	DER	10.64	TER	21.48
Environmental	91 B	% DER<TER	50.47		
CO <sub>2</sub> Emissions (t/year)	0.90	DFEE	44.91	TFEE	41.89
General Requirements Compliance	Fail	% DFEE<TFEE	-7.22		
Assessor Details	Miss Emma Jolly, Emma Jolly, Tel: 01454806691, emmajolly@hoarelea.com			Assessor ID	T689-0001
Client					

# FULL SAP CALCULATION PRINTOUT

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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 101 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) 21.48 kgCO<sub>2</sub>/m<sup>2</sup>  
Dwelling Carbon Dioxide Emission Rate (DER) 10.64 kgCO<sub>2</sub>/m<sup>2</sup>OK

#### 1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)41.9 kWh/m<sup>2</sup>/yr  
Dwelling Fabric Energy Efficiency (DFEE)44.9 kWh/m<sup>2</sup>/yrFail  
Excess energy =3.0 kWh/m<sup>2</sup>/yr (7.2%)

#### 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	1.44 (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:	0.63
Maximum	1.5 OK
MVHR efficiency:	90%
Minimum:	70% OK

#### 9 Summertime temperature

Overheating risk (Thames Valley):	High	Fail
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#### Based on:

Overshading:	Average
Windows facing South East:	16.50 m <sup>2</sup> , No overhang
Windows facing North West:	16.50 m <sup>2</sup> , No overhang
Air change rate:	2.00 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

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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 (m <sup>2</sup> )	Storey height (m)	Volume (m <sup>3</sup> )
Ground floor	100.5000 (1b)	x 2.6000 (2b)	= 261.3000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	100.5000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 261.3000 (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 = 1.40)			33.0000	1.3258	43.7500		(27)
Opening Type 5			2.3000	2.0000	4.6000		(26)
External wall	59.6000	33.0000	26.6000	0.1200	3.1920		(29a)
Sheltered to corr	36.4000	2.3000	34.1000	0.2000	6.8200		(29a)
Total net area of external elements Aum(A, m <sup>2</sup> )			96.0000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	58.3620		(33)
Party wall			21.5000	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/m <sup>2</sup> K							100.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.3234 (36)
Total fabric heat loss						(33) + (36) =	67.6854 (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	24.1495	23.8747	23.5998	22.2255	21.9507	20.5764	20.5764	20.3015	21.1261	21.9507	22.5004	23.0501 (38)
Average = Sum(39)m / 12 =	91.8349	91.5601	91.2852	89.9109	89.6361	88.2618	88.2618	87.9869	88.8115	89.6361	90.1858	90.7355 (39)
HLP	0.9138	0.9110	0.9083	0.8946	0.8919	0.8782	0.8782	0.8755	0.8837	0.8919	0.8974	0.9028 (40)
HLP (average)												0.8940 (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												2.7441 (42)
Average daily hot water use (litres/day)												99.3725 (43)
Daily hot water use	109.3098	105.3349	101.3600	97.3851	93.4102	89.4353	89.4353	93.4102	97.3851	101.3600	105.3349	109.3098 (44)
Energy conte	162.1032	141.7765	146.3007	127.5485	122.3858	105.6096	97.8629	112.2991	113.6403	132.4368	144.5651	156.9883 (45)
Energy content (annual)												Total = Sum(45)m = 1563.5168 (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:	24.3155	21.2665	21.9451	19.1323	18.3579	15.8414	14.6794	16.8449	17.0460	19.8655	21.6848	23.5483 (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	217.3801	191.7040	201.5775	181.0422	177.6626	159.1033	153.1397	167.5759	167.1340	187.7136	198.0588	212.2651 (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	217.3801	191.7040	201.5775	181.0422	177.6626	159.1033	153.1397	167.5759	167.1340	187.7136	198.0588	212.2651 (64)
Heat gains from water heating, kWh/month	98.1208	87.0826	92.8664	85.2048	84.9147	77.9102	76.7608	81.5609	80.5803	88.2567	90.8628	96.4201 (65)
											Solar input (sum of months) = Sum(63)m =	0.0000 (63)
											Total per year (kWh/year) = Sum(64)m =	2214.3566 (64)

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

Metabolic gains (Table 5), Watts												
(66)m	137.2053	137.2053	137.2053	137.2053	137.2053	137.2053	137.2053	137.2053	137.2053	137.2053	137.2053	137.2053 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	22.9236	20.3606	16.5583	12.5357	9.3706	7.9111	8.5482	11.1112	14.9135	18.9361	22.1012	23.5608 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	257.1336	259.8018	253.0779	238.7636	220.6943	203.7117	192.3663	189.6980	196.4219	210.7363	228.8056	245.7881 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.7205	36.7205	36.7205	36.7205	36.7205	36.7205	36.7205	36.7205	36.7205	36.7205	36.7205	36.7205 (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)	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643 (71)
Water heating gains (Table 5)	131.8828	129.5873	124.8205	118.3400	114.1327	108.2085	103.1732	109.6248	111.9171	118.6246	126.1984	129.5969 (72)
Total internal gains	476.1016	473.9113	458.6183	433.8009	408.3592	383.9929	368.2492	374.5957	387.4141	412.4585	441.2668	463.1074 (73)

#### 6. Solar gains

[Jan]			Area	Solar flux		g	FF		Access		Gains	
			m2	Table 6a		W/m2	Specific data		factor		W	
				Table 6a			Specific data		Table 6d			
				or Table 6b			or Table 6c					
Southeast			16.5000	36.7938		0.2900	0.8000		0.7700		97.6068 (77)	
Northwest			16.5000	11.2829		0.2900	0.8000		0.7700		29.9314 (81)	
Solar gains	127.5383	227.1868	337.2547	462.1384	558.0351	571.7710	543.8527	469.5925	380.0743	258.2101	154.5720	107.9746 (83)
Total gains	603.6398	701.0981	795.8730	895.9393	966.3943	955.7639	912.1019	844.1882	767.4884	670.6686	595.8387	571.0820 (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	30.3988	30.4900	30.5818	31.0492	31.1445	31.6294	31.6294	31.7282	31.4336	31.1445	30.9546	30.7671
alpha	3.0266	3.0327	3.0388	3.0699	3.0763	3.1086	3.1086	3.1152	3.0956	3.0763	3.0636	3.0511
util living area	0.9631	0.9420	0.9025	0.8220	0.6964	0.5378	0.4080	0.4529	0.6653	0.8621	0.9435	0.9681 (86)
MIT	19.1562	19.4230	19.8255	20.3146	20.6864	20.9001	20.9683	20.9560	20.7999	20.3088	19.6530	19.1113 (87)
Th 2	20.1558	20.1581	20.1604	20.1721	20.1744	20.1860	20.1860	20.1884	20.1814	20.1744	20.1697	20.1651 (88)
util rest of house	0.9580	0.9344	0.8896	0.7986	0.6578	0.4817	0.3385	0.3813	0.6116	0.8386	0.9348	0.9638 (89)
MIT 2	17.6665	18.0519	18.6288	19.3210	19.8200	20.0922	20.1636	20.1556	19.9786	19.3286	18.3956	17.6074 (90)
Living area fraction												fLA = Living area / (4) =
MIT	18.1824	18.5267	19.0432	19.6650	20.1200	20.3720	20.4422	20.4327	20.2630	19.6680	18.8310	18.1282 (92)
Temperature adjustment												0.0000
adjusted MIT	18.1824	18.5267	19.0432	19.6650	20.1200	20.3720	20.4422	20.4327	20.2630	19.6680	18.8310	18.1282 (93)

#### 8. Space heating requirement

Utilisation	0.9424	0.9154	0.8689	0.7826	0.6551	0.4949	0.3608	0.4035	0.6173	0.8218	0.9167	0.9494 (94)	
Useful gains	568.8526	641.8176	691.4962	701.1738	633.0388	473.0528	329.1182	340.6024	473.7870	551.1482	546.1992	542.1913 (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	1274.8861	1247.6616	1145.0052	967.8953	754.7349	509.4431	339.1237	354.8260	547.3458	812.8189	1057.9713	1263.7780 (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	525.2890	407.1272	337.4107	192.0395	90.5419	0.0000	0.0000	0.0000	0.0000	194.6830	368.4759	536.8605 (98)	
Space heating												2652.4276 (98)	
Space heating per m2												(98) / (4) =	26.3923 (99)

# FULL SAP CALCULATION PRINTOUT

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

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 8c. Space cooling requirement  
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Not applicable

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 9b. Energy requirements  
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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	2652.4276 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.05	2785.0490 (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	2214.3566 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.05	2325.0744 (310a)
Electricity used for heat distribution	51.1012 (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)	251.0440 (330a)
Total electricity for the above, kWh/year	251.0440 (331)
Electricity for lighting (calculated in Appendix L)	404.8387 (332)
Energy saving/generation technologies (Appendices M ,N and Q)	
Total delivered energy for all uses	5766.0061 (338)

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 12b. Carbon dioxide emissions - Community heating scheme  
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	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	1703.3745	0.5190	884.0514 (367)
Electrical energy for heat distribution	51.1012	0.5190	26.5215 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			910.5729 (373)
Space and water heating			910.5729 (376)
Pumps and fans	251.0440	0.5190	130.2918 (378)
Energy for lighting	404.8387	0.5190	210.1113 (379)
Energy saving/generation technologies			
PV Unit	-350.0000	0.5190	-181.6500 (380)
Total CO2, kg/year			1069.3260 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			10.6400 (384)

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 16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES  
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DER			10.6400 ZC1
Total Floor Area		TFA	100.5000
Assumed number of occupants		N	2.7441
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190
CO2 emissions from appliances, equation (L14)			15.1614 ZC2
CO2 emissions from cooking, equation (L16)			1.8394 ZC3
Total CO2 emissions			27.6408 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			27.6408 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 (m2)	Storey height (m)	Volume (m3)
Ground floor	100.5000 (1b)	x 2.6000 (2b)	= 261.3000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	100.5000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 261.3000 (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)
Air changes per hour					
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				40.0000 / (5) =	0.1531 (8)
Pressure test				Yes	
Measured/design AP50					5.0000
Infiltration rate					0.4031 (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) =		0.3426 (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	0.4368	0.4283	0.4197	0.3769	0.3683	0.3255	0.3255	0.3169	0.3426	0.3683	0.3854	0.4026 (22b)
Effective ac	0.5954	0.5917	0.5881	0.5710	0.5678	0.5530	0.5530	0.5502	0.5587	0.5678	0.5743	0.5810 (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			2.3000	1.0000	2.3000		(26)					
TER Opening Type (Uw = 1.40)			22.8200	1.3258	30.2538		(27)					
External wall	59.6000	22.8200	36.7800	0.1800	6.6204		(29a)					
Sheltered to corr	36.4000	2.3000	34.1000	0.1800	6.1380		(29a)					
Total net area of external elements Aum(A, m2)			96.0000				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 45.3122		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.3744 (36)					
Total fabric heat loss						(33) + (36) =	50.6866 (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	51.3420	51.0225	50.7093	49.2384	48.9632	47.6821	47.6821	47.4449	48.1756	48.9632	49.5200	50.1020 (38)
Average = Sum(39)m / 12 =	102.0285	101.7091	101.3959	99.9250	99.6498	98.3687	98.3687	98.1315	98.8622	99.6498	100.2065	100.7886 (39)
HLP	1.0152	1.0120	1.0089	0.9943	0.9915	0.9788	0.9788	0.9764	0.9837	0.9915	0.9971	1.0029 (40)
HLP (average)												0.9943 (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												2.7441 (42)
Average daily hot water use (litres/day)												99.3725 (43)
Daily hot water use	109.3098	105.3349	101.3600	97.3851	93.4102	89.4353	89.4353	93.4102	97.3851	101.3600	105.3349	109.3098 (44)
Energy conte	162.1032	141.7765	146.3007	127.5485	122.3858	105.6096	97.8629	112.2991	113.6403	132.4368	144.5651	156.9883 (45)
Energy content (annual)												Total = Sum(45)m = 1563.5168 (45)
Distribution loss (46)m = 0.15 x (45)m	24.3155	21.2665	21.9451	19.1323	18.3579	15.8414	14.6794	16.8449	17.0460	19.8655	21.6848	23.5483 (46)
Water storage loss:												150.0000 (47)
Store volume												1.3938 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.5400 (49)
Temperature factor from Table 2b												0.7527 (55)
Enter (49) or (54) in (55)												
Total storage loss												

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### 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	208.6982	183.8623	192.8956	172.6403	168.9807	150.7015	144.4578	158.8940	158.7321	179.0317	189.6569	203.5832 (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)											
	208.6982	183.8623	192.8956	172.6403	168.9807	150.7015	144.4578	158.8940	158.7321	179.0317	189.6569	203.5832 (64)
	Total per year (kWh/year) = Sum(64)m = 2112.1342 (64)											
	91.1753	80.8093	85.9209	78.4833	77.9692	71.1887	69.8153	74.6154	73.8589	81.3112	84.1414	89.4745 (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	137.2053	137.2053	137.2053	137.2053	137.2053	137.2053	137.2053	137.2053	137.2053	137.2053	137.2053	137.2053	137.2053 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	22.9190	20.3564	16.5550	12.5332	9.3687	7.9095	8.5464	11.1090	14.9105	18.9323	22.0967	23.5560	23.5560 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	257.1336	259.8018	253.0779	238.7636	220.6943	203.7117	192.3663	189.6980	196.4219	210.7363	228.8056	245.7881	245.7881 (68)
Pumps, fans	36.7205	36.7205	36.7205	36.7205	36.7205	36.7205	36.7205	36.7205	36.7205	36.7205	36.7205	36.7205	36.7205 (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	3.0000 (70)
Water heating gains (Table 5)	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643	-109.7643 (71)
Total internal gains	122.5474	120.2519	115.4851	109.0046	104.7973	98.8732	93.8378	100.2895	102.5818	109.2892	116.8630	120.2615	120.2615 (72)
	469.7615	467.5717	452.2796	427.4630	402.0219	377.6559	361.9121	368.2581	381.0757	406.1193	434.9269	456.7672	456.7672 (73)

#### 6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b g	FF Specific data or Table 6c	Access factor Table 6d	Gains W							
Southeast	11.4100	36.7938	0.6300	0.7000	0.7700	128.3017 (77)							
Northwest	11.4100	11.2829	0.6300	0.7000	0.7700	39.3441 (81)							
Solar gains	167.6458	298.6314	443.3129	607.4693	733.5232	751.5787	714.8807	617.2676	499.5981	339.4107	203.1810	141.9299	141.9299 (83)
Total gains	637.4074	766.2031	895.5924	1034.9323	1135.5451	1129.2346	1076.7928	985.5256	880.6738	745.5300	638.1079	598.6971	598.6971 (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)	68.4041	68.6189	68.8309	69.8440	70.0369	70.9490	70.9490	71.1206	70.5949	70.0369	69.6478	69.2456	21.0000 (85)
util living area	5.5603	5.5746	5.5887	5.6563	5.6691	5.7299	5.7299	5.7414	5.7063	5.6691	5.6432	5.6164	
MIT	0.9974	0.9922	0.9745	0.9073	0.7522	0.5487	0.4007	0.4552	0.7250	0.9512	0.9933	0.9981	0.9981 (86)
MIT 2	19.9767	20.1591	20.4270	20.7403	20.9302	20.9904	20.9987	20.9973	20.9579	20.6851	20.2704	19.9479	19.9479 (87)
util rest of house	20.0707	20.0733	20.0759	20.0881	20.0904	20.1010	20.1010	20.1030	20.0969	20.0904	20.0858	20.0809	20.0809 (88)
MIT 2	0.9965	0.9897	0.9664	0.8805	0.6970	0.4755	0.3195	0.3680	0.6485	0.9309	0.9908	0.9975	0.9975 (89)
Living area fraction	18.7042	18.9713	19.3580	19.7969	20.0274	20.0951	20.1006	20.1020	20.0662	19.7356	19.1438	18.6698	18.6698 (90)
Temperature adjustment	19.1448	19.3826	19.7282	20.1236	20.3400	20.4051	20.4115	20.4120	20.3750	20.0644	19.5339	19.1123	19.1123 (92)
adjusted MIT	19.1448	19.3826	19.7282	20.1236	20.3400	20.4051	20.4115	20.4120	20.3750	20.0644	19.5339	19.1123	19.1123 (93)

#### 8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9953	0.9873	0.9626	0.8817	0.7129	0.5006	0.3477	0.3982	0.6732	0.9302	0.9887	0.9966	0.9966 (94)
Ext temp.	634.3964	756.4539	862.1141	912.4847	809.5064	565.3089	374.3569	392.4824	592.9082	693.4871	630.8911	596.6441	596.6441 (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	4.2000 (96)
Month fracti	1514.5939	1473.0111	1341.2804	1121.5164	860.9760	571.0418	374.9365	393.7032	620.3563	943.1279	1245.9605	1502.9931	1502.9931 (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	1.0000 (97a)
Space heating per m2	654.8670	481.5265	356.4997	150.5029	38.2934	0.0000	0.0000	0.0000	0.0000	185.7327	442.8500	674.3237	674.3237 (98)
	(98) / (4) = 29.6975 (99)												

#### 8c. Space cooling requirement

Not applicable

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#### 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													3192.0811 (211)
Space heating requirement	654.8670	481.5265	356.4997	150.5029	38.2934	0.0000	0.0000	0.0000	0.0000	185.7327	442.8500	674.3237	(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)	700.3925	515.0016	381.2831	160.9657	40.9555	0.0000	0.0000	0.0000	0.0000	198.6446	473.6363	721.2018	(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	208.6982	183.8623	192.8956	172.6403	168.9807	150.7015	144.4578	158.8940	158.7321	179.0317	189.6569	203.5832	(64)
Efficiency of water heater (217)m	87.6594	87.2667	86.4310	84.4504	81.5820	79.8000	79.8000	79.8000	79.8000	84.9119	87.0020	87.7709	(216)
Fuel for water heating, kWh/month	238.0783	210.6901	223.1787	204.4282	207.1299	188.8490	181.0248	199.1152	198.9124	210.8441	217.9914	231.9485	(219)
Water heating fuel used												2512.1906	(219)
Annual totals kWh/year													
Space heating fuel - main system													3192.0811 (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)													404.7566 (232)
Total delivered energy for all uses													6184.0284 (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	3192.0811	0.2160	689.4895 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2512.1906	0.2160	542.6332 (264)
Space and water heating			1232.1227 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	404.7566	0.5190	210.0687 (268)
Total CO2, kg/m2/year			1481.1164 (272)
Emissions per m2 for space and water heating			12.2599 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.0902 (272b)
Emissions per m2 for pumps and fans			0.3873 (272c)
Target Carbon Dioxide Emission Rate (TER) = (12.2599 * 1.55) + 2.0902 + 0.3873, rounded to 2 d.p.			21.4800 (273)