

# FULL SAP CALCULATION PRINTOUT

## Calculation Type: New Build (As Designed)

Property Reference	010572			Issued on Date	10/02/2022
Assessment Reference	B08-TY-10	Prop Type Ref	8.TY.10		
Property					
SAP Rating	85 B	DER	14.05	TER	15.30
Environmental	89 B	% DER<TER	8.17		
CO <sub>2</sub> Emissions (t/year)	1.15	DFEE	42.61	TFEE	45.13
General Requirements Compliance	Pass	% DFEE<TFEE	5.59		
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 102 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) 15.30 kgCO<sub>2</sub>/m<sup>2</sup>  
Dwelling Carbon Dioxide Emission Rate (DER) 14.05 kgCO<sub>2</sub>/m<sup>2</sup>OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)45.1 kWh/m<sup>2</sup>/yr  
Dwelling Fabric Energy Efficiency (DFEE)42.6 kWh/m<sup>2</sup>/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.13 (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: 5.76 m<sup>2</sup>, No overhang  
Windows facing South: 8.23 m<sup>2</sup>, No overhang  
Windows facing North West: 17.72 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

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## 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	102.0000 (1b)	x 2.5000 (2b)	= 255.0000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	102.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 255.0000 (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				1	(19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.9250 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.1388 (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	0.1769	0.1734	0.1700	0.1526	0.1492	0.1318	0.1318	0.1283	0.1388	0.1492	0.1561	0.1630 (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	0.2859	0.2824	0.2790	0.2616	0.2582	0.2408	0.2408	0.2373	0.2478	0.2582	0.2651	0.2720 (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)			31.7100	1.1450	36.3092		(27)
External Wall 1	86.8800	31.7100	55.1700	0.1200	6.6204		(29a)
Sheltered Corridor	5.7500		5.7500	0.1842	1.0589		(29a)
Sheltered Unheated	4.4300		4.4300	0.1842	0.8158		(29a)
Total net area of external elements Aum(A, m2)			97.0600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	44.8043		(33)
Party Wall 1			29.5500	0.0000	0.0000		(32)
Party Floor 1			102.0000				(32d)
Party Ceilings 1			102.0000				(32b)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							12.4493 (36)
Total fabric heat loss						(33) + (36) =	57.2536 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	24.0590	23.7671	23.4752	22.0157	21.7238	20.2644	20.2644	19.9725	20.8482	21.7238	22.3076	22.8914 (38)
Heat transfer coeff	81.3126	81.0207	80.7289	79.2694	78.9775	77.5180	77.5180	77.2261	78.1018	78.9775	79.5613	80.1451 (39)
Average = Sum(39)m / 12 =												79.1964 (39)
HLP	0.7972	0.7943	0.7915	0.7772	0.7743	0.7600	0.7600	0.7571	0.7657	0.7743	0.7800	0.7857 (40)
HLP (average)												0.7764 (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												2.7573 (42)
Average daily hot water use (litres/day)												99.6855 (43)
Daily hot water use	109.6541	105.6666	101.6792	97.6918	93.7044	89.7170	89.7170	93.7044	97.6918	101.6792	105.6666	109.6541 (44)
Energy conte	162.6138	142.2231	146.7615	127.9502	122.7713	105.9423	98.1711	112.6528	113.9982	132.8539	145.0204	157.4828 (45)
Energy content (annual)												Total = Sum(45)m = 1568.4413 (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:	24.3921	21.3335	22.0142	19.1925	18.4157	15.8913	14.7257	16.8979	17.0997	19.9281	21.7531	23.6224 (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	217.8906	192.1505	202.0383	181.4439	178.0481	159.4360	153.4479	167.9296	167.4919	188.1307	198.5141	212.7596 (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	217.8906	192.1505	202.0383	181.4439	178.0481	159.4360	153.4479	167.9296	167.4919	188.1307	198.5141	212.7596 (64)
Heat gains from water heating, kWh/month	98.2905	87.2311	93.0196	85.3384	85.0429	78.0208	76.8633	81.6785	80.6993	88.3954	91.0142	96.5845 (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	137.8642	137.8642	137.8642	137.8642	137.8642	137.8642	137.8642	137.8642	137.8642	137.8642	137.8642	137.8642 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	23.1365	20.5496	16.7121	12.6521	9.4576	7.9845	8.6275	11.2144	15.0520	19.1119	22.3064	23.7795 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	259.5211	262.2141	255.4278	240.9805	222.7434	205.6032	194.1524	191.4594	198.2457	212.6930	230.9300	248.0703 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.7864	36.7864	36.7864	36.7864	36.7864	36.7864	36.7864	36.7864	36.7864	36.7864	36.7864	36.7864 (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)	-110.2914	-110.2914	-110.2914	-110.2914	-110.2914	-110.2914	-110.2914	-110.2914	-110.2914	-110.2914	-110.2914	-110.2914 (71)
Water heating gains (Table 5)	132.1109	129.8082	125.0264	118.5255	114.3050	108.3622	103.3109	109.7829	112.0824	118.8110	126.4087	129.8178 (72)
Total internal gains	479.1278	476.9312	461.5255	436.5175	410.8653	386.3091	370.4502	376.8160	389.7394	414.9751	444.0044	466.0270 (73)

#### 6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	FF	Access factor Table 6d	Gains W					
North	5.7600	10.6334	0.2900	0.7000	0.7700	8.6164 (74)						
South	8.2300	46.7521	0.2900	0.7000	0.7700	54.1290 (78)						
Northwest	17.7200	11.2829	0.2900	0.7000	0.7700	28.1265 (81)						
Solar gains	90.8718	162.3679	244.0541	341.9741	421.2496	435.5672	412.6662	350.5004	277.2936	185.1844	110.1811	76.9249 (83)
Total gains	569.9996	639.2991	705.5797	778.4915	832.1148	821.8763	783.1163	727.3163	667.0330	600.1595	554.1855	542.9519 (84)

#### 7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation factor for gains for living area, nil,m (see Table 9a)	87.1123	87.4262	87.7423	89.3578	89.6880	91.3766	91.3766	91.7220	90.6936	89.6880	89.0299	88.3814
tau	6.8075	6.8284	6.8495	6.9572	6.9792	7.0918	7.0918	7.1148	7.0462	6.9792	6.9353	6.8921
util living area	0.9984	0.9961	0.9874	0.9456	0.8139	0.5969	0.4349	0.4869	0.7658	0.9672	0.9958	0.9989 (86)
MIT	20.2238	20.3427	20.5332	20.7797	20.9435	20.9945	20.9995	20.9989	20.9722	20.7619	20.4530	20.2070 (87)
Th 2	20.2558	20.2583	20.2607	20.2732	20.2757	20.2882	20.2882	20.2907	20.2832	20.2757	20.2707	20.2657 (88)
util rest of house	0.9979	0.9948	0.9832	0.9286	0.7693	0.5335	0.3649	0.4127	0.7018	0.9535	0.9943	0.9985 (89)
MIT 2	19.2057	19.3810	19.6589	20.0148	20.2219	20.2845	20.2879	20.2902	20.2617	19.9978	19.5522	19.1890 (90)
Living area fraction	19.5719	19.7268	19.9733	20.2898	20.4814	20.5398	20.5438	20.5450	20.5172	20.2726	19.8762	0.3596 (91)
MIT	19.5719	19.7268	19.9733	20.2898	20.4814	20.5398	20.5438	20.5450	20.5172	20.2726	19.8762	19.5551 (92)
Temperature adjustment												0.0000
adjusted MIT	19.5719	19.7268	19.9733	20.2898	20.4814	20.5398	20.5438	20.5450	20.5172	20.2726	19.8762	19.5551 (93)

#### 8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9973	0.9937	0.9812	0.9291	0.7827	0.5562	0.3901	0.4394	0.7237	0.9534	0.9932	0.9980 (94)
Ext temp.	568.4581	635.2410	692.3483	723.2715	651.2614	457.0877	305.4803	319.5826	482.7154	572.1944	550.4017	541.8718 (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	1241.7946	1201.2823	1087.6836	902.8641	693.5320	460.4444	305.7166	320.1050	501.1955	763.9172	1016.4875	1230.6332 (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	500.9623	380.3798	294.1294	129.3066	31.4493	0.0000	0.0000	0.0000	0.0000	142.6418	335.5818	512.4385 (98)
Space heating per m2												2326.8895 (98)
												(98) / (4) = 22.8126 (99)

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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 Boilers	1.0000 (303a)
Fraction of total space heat from community Boilers	1.0000 (304a)
Factor for control and charging method (Table 4c(3)) for community space heating	1.0000 (305)
Factor for control and charging method (Table 4c(3)) for community water heating	1.0000 (305a)
Distribution loss factor (Table 12c) for community heating system	1.0500 (306)
Space heating:	
Annual space heating requirement	2326.8895 (98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05	2443.2340 (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	2219.2811 (64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05	2330.2451 (310a)
Electricity used for heat distribution	47.7348 (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)	213.8813 (330a)
Total electricity for the above, kWh/year	213.8813 (331)
Electricity for lighting (calculated in Appendix L)	408.5977 (332)
Total delivered energy for all uses	5395.9581 (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 Boilers			95.0000 (367a)
Space heating from Boilers	5024.7149	0.2160	1085.3384 (367)
Electrical energy for heat distribution	47.7348	0.5190	24.7744 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			1110.1128 (373)
Space and water heating			1110.1128 (376)
Pumps and fans	213.8813	0.5190	111.0044 (378)
Energy for lighting	408.5977	0.5190	212.0622 (379)
Total CO2, kg/year			1433.1793 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			14.0500 (384)

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

DER			14.0500 ZC1
Total Floor Area		TFA	102.0000
Assumed number of occupants		N	2.7573
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190
CO2 emissions from appliances, equation (L14)			15.0771 ZC2
CO2 emissions from cooking, equation (L16)			1.8154 ZC3
Total CO2 emissions			30.9426 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			30.9426 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	102.0000 (1b)	x 2.5000 (2b)	= 255.0000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	102.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 255.0000 (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) =	0.1569 (8)
Pressure test				Yes	
Measured/design AP50					5.0000
Infiltration rate					0.4069 (18)
Number of sides sheltered					1 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.9250 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3763 (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	0.4798	0.4704	0.4610	0.4140	0.4046	0.3575	0.3575	0.3481	0.3763	0.4046	0.4234	0.4422 (22b)
Effective ac	0.6151	0.6107	0.6063	0.5857	0.5818	0.5639	0.5639	0.5606	0.5708	0.5818	0.5896	0.5978 (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)			25.5000	1.3258	33.8068		(27)					
External Wall 1	86.8800	25.5000	61.3800	0.1800	11.0484		(29a)					
Sheltered Corridor	5.7500		5.7500	0.1800	1.0350		(29a)					
Sheltered Unheated	4.4300		4.4300	0.1800	0.7974		(29a)					
Total net area of external elements Aum(A, m2)			97.0600				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	46.6876	(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.9973 (36)					
Total fabric heat loss						(33) + (36) =	55.6849 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	51.7628	51.3866	51.0178	49.2859	48.9618	47.4534	47.4534	47.1740	48.0344	48.9618	49.6174	50.3027 (38)
Heat transfer coeff	107.4477	107.0715	106.7028	104.9708	104.6468	103.1383	103.1383	102.8589	103.7193	104.6468	105.3023	105.9876 (39)
Average = Sum(39)m / 12 =												104.9693 (39)
HLP	1.0534	1.0497	1.0461	1.0291	1.0259	1.0112	1.0112	1.0084	1.0169	1.0259	1.0324	1.0391 (40)
HLP (average)												1.0291 (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												2.7573 (42)
Average daily hot water use (litres/day)												99.6855 (43)
Daily hot water use	109.6541	105.6666	101.6792	97.6918	93.7044	89.7170	89.7170	93.7044	97.6918	101.6792	105.6666	109.6541 (44)
Energy conte	162.6138	142.2231	146.7615	127.9502	122.7713	105.9423	98.1711	112.6528	113.9982	132.8539	145.0204	157.4828 (45)
Energy content (annual)												Total = Sum(45)m =
Distribution loss (46)m = 0.15 x (45)m	24.3921	21.3335	22.0142	19.1925	18.4157	15.8913	14.7257	16.8979	17.0997	19.9281	21.7531	23.6224 (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	209.2087	184.3088	193.3564	173.0421	169.3662	151.0341	144.7660	159.2477	159.0900	179.4488	190.1123	204.0777	(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)												
	209.2087	184.3088	193.3564	173.0421	169.3662	151.0341	144.7660	159.2477	159.0900	179.4488	190.1123	204.0777	(64)
	Total per year (kWh/year) = Sum(64)m = 2117.0587 (64)												
	91.3450	80.9577	86.0741	78.6169	78.0974	71.2993	69.9178	74.7330	73.9779	81.4498	84.2928	89.6390	(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	137.8642	137.8642	137.8642	137.8642	137.8642	137.8642	137.8642	137.8642	137.8642	137.8642	137.8642	137.8642	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	23.1365	20.5496	16.7121	12.6521	9.4576	7.9845	8.6275	11.2144	15.0520	19.1119	22.3064	23.7795	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	259.5211	262.2141	255.4278	240.9805	222.7434	205.6032	194.1524	191.4594	198.2457	212.6930	230.9300	248.0703	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.7864	36.7864	36.7864	36.7864	36.7864	36.7864	36.7864	36.7864	36.7864	36.7864	36.7864	36.7864	(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)	-110.2914	-110.2914	-110.2914	-110.2914	-110.2914	-110.2914	-110.2914	-110.2914	-110.2914	-110.2914	-110.2914	-110.2914	(71)
Water heating gains (Table 5)	122.7756	120.4728	115.6910	109.1902	104.9696	99.0268	93.9756	100.4475	102.7470	109.4756	117.0733	120.4825	(72)
Total internal gains	472.7924	470.5958	455.1901	430.1821	404.5299	379.9737	364.1148	370.4806	383.4040	408.6398	437.6690	459.6916	(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	4.6300	10.6334	0.6300	0.7000	0.7700	15.0461 (74)							
South	6.6200	46.7521	0.6300	0.7000	0.7700	94.5868 (78)							
Northwest	14.2500	11.2829	0.6300	0.7000	0.7700	49.1370 (81)							
Solar gains	158.7700	283.6826	426.3903	597.4499	735.9347	760.9421	720.9361	612.3403	484.4576	323.5437	192.5061	134.4027	(83)
Total gains	631.5624	754.2785	881.5804	1027.6320	1140.4646	1140.9158	1085.0508	982.8209	867.8615	732.1835	630.1751	594.0943	(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	65.9236	66.1552	66.3838	67.4791	67.6880	68.6780	68.6780	68.8645	68.2933	67.6880	67.2667	66.8317	
alpha	5.3949	5.4103	5.4256	5.4986	5.5125	5.5785	5.5785	5.5910	5.5529	5.5125	5.4844	5.4554	
util living area	0.9977	0.9935	0.9791	0.9203	0.7723	0.5667	0.4164	0.4772	0.7555	0.9602	0.9944	0.9983	(86)
MIT	19.9088	20.0861	20.3580	20.6946	20.9129	20.9872	20.9981	20.9961	20.9434	20.6370	20.2124	19.8841	(87)
Th 2	20.0391	20.0421	20.0451	20.0591	20.0618	20.0740	20.0740	20.0763	20.0693	20.0618	20.0564	20.0509	(88)
util rest of house	0.9969	0.9914	0.9722	0.8957	0.7168	0.4899	0.3298	0.3836	0.6782	0.9426	0.9922	0.9978	(89)
MIT 2	18.5819	18.8422	19.2365	19.7132	19.9824	20.0662	20.0734	20.0748	20.0271	19.6479	19.0379	18.5545	(90)
Living area fraction	fLA = Living area / (4) = 0.3596 (91)												
MIT	19.0591	19.2895	19.6398	20.0661	20.3170	20.3974	20.4059	20.4061	20.3566	20.0036	19.4603	19.0326	(92)
Temperature adjustment	0.0000												
adjusted MIT	19.0591	19.2895	19.6398	20.0661	20.3170	20.3974	20.4059	20.4061	20.3566	20.0036	19.4603	19.0326	(93)

#### 8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9958	0.9892	0.9685	0.8959	0.7328	0.5172	0.3610	0.4174	0.7036	0.9413	0.9903	0.9969	(94)
Useful gains	628.9081	746.1178	853.7682	920.6993	835.7261	590.0796	391.6698	410.2005	610.6510	689.1882	624.0332	592.2621	(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	1585.8274	1540.7099	1402.0521	1172.1145	901.7430	597.9335	392.5329	412.0613	648.9313	984.0547	1301.5628	1572.0721	(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	711.9479	533.9659	407.9232	181.0189	49.1166	0.0000	0.0000	0.0000	0.0000	219.3806	487.8213	728.9786	(98)
Space heating	3320.1531 (98)												
Space heating per m2	(98) / (4) = 32.5505 (99)												

#### 8c. Space cooling requirement

Not applicable

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#### 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													3550.9659 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	711.9479	533.9659	407.9232	181.0189	49.1166	0.0000	0.0000	0.0000	0.0000	219.3806	487.8213	728.9786	(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)	761.4417	571.0865	436.2815	193.6031	52.5311	0.0000	0.0000	0.0000	0.0000	234.6317	521.7340	779.6562	(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	209.2087	184.3088	193.3564	173.0421	169.3662	151.0341	144.7660	159.2477	159.0900	179.4488	190.1123	204.0777	(64)
Efficiency of water heater (217)m	87.8255	87.4898	86.7591	84.9341	81.9790	79.8000	79.8000	79.8000	79.8000	85.3508	87.2204	87.9215	(217)
Fuel for water heating, kWh/month	238.2096	210.6632	222.8659	203.7369	206.5971	189.2658	181.4110	199.5585	199.3609	210.2486	217.9677	232.1135	(219)
Water heating fuel used													2511.9987 (219)
Annual totals kWh/year													
Space heating fuel - main system													3550.9659 (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)													408.5977 (232)
Total delivered energy for all uses													6546.5622 (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	3550.9659	0.2160	767.0086 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2511.9987	0.2160	542.5917 (264)
Space and water heating			1309.6003 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	408.5977	0.5190	212.0622 (268)
Total CO2, kg/m2/year			1560.5875 (272)
Emissions per m2 for space and water heating			12.8392 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.0790 (272b)
Emissions per m2 for pumps and fans			0.3816 (272c)
Target Carbon Dioxide Emission Rate (TER) = (12.8392 * 1.00) + 2.0790 + 0.3816, rounded to 2 d.p.			15.3000 (273)