

# FULL SAP CALCULATION PRINTOUT

## Calculation Type: New Build (As Designed)

Property Reference	010571			Issued on Date	10/02/2022
Assessment Reference	B08-TY-07	Prop Type Ref	8.TY.07		
Property					
SAP Rating	85 B	DER	13.53	TER	14.49
Environmental	90 B	% DER<TER	6.60		
CO <sub>2</sub> Emissions (t/year)	0.82	DFEE	33.83	TFEE	31.23
General Requirements Compliance	Fail	% DFEE<TFEE	-8.33		
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 71 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) 14.49 kgCO<sub>2</sub>/m<sup>2</sup>  
Dwelling Carbon Dioxide Emission Rate (DER) 13.53 kgCO<sub>2</sub>/m<sup>2</sup>OK

#### 1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)31.2 kWh/m<sup>2</sup>/yr  
Dwelling Fabric Energy Efficiency (DFEE)33.8 kWh/m<sup>2</sup>/yrFail  
Excess energy =2.6 kWh/m<sup>2</sup>/yr (8.3%)

#### 2 Fabric U-values

Element	Average	Highest	
External wall	0.16 (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 East: 2.35 m<sup>2</sup>, No overhang  
Windows facing South: 14.50 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 (m <sup>2</sup> )	Storey height (m)	Volume (m <sup>3</sup> )
Ground floor	71.0000 (1b)	2.5000 (2b)	177.5000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	177.5000 (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					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)

	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	0.1482	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												
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	0.2572	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 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 = 1.20)			16.8500	1.1450	19.2939		(27)
External Wall 1	33.8500	16.8500	17.0000	0.1200	2.0400		(29a)
Sheltered Corridor	26.6300		26.6300	0.1842	4.9042		(29a)
Total net area of external elements Aum(A, m <sup>2</sup> )			60.4800				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	26.2381	(33)
Party Wall 1			31.3000	0.0000	0.0000		(32)
Party Floor 1			71.0000				(32d)
Party Ceilings 1			71.0000				(32b)
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)							9.2290 (36)
Total fabric heat loss						(33) + (36) =	35.4671 (37)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	15.0666	14.8964	14.7261	13.8750	13.7047	12.8536	12.8536	12.6833	13.1940	13.7047	14.0452	14.3857 (38)
Heat transfer coeff	50.5337	50.3635	50.1932	49.3421	49.1718	48.3207	48.3207	48.1504	48.6611	49.1718	49.5123	49.8528 (39)
Average = Sum(39)m / 12 =												49.2995 (39)
HLP	0.7117	0.7093	0.7069	0.6950	0.6926	0.6806	0.6806	0.6782	0.6854	0.6926	0.6974	0.7022 (40)
HLP (average)												0.6944 (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												2.2702 (42)
Average daily hot water use (litres/day)												88.1162 (43)
Daily hot water use	96.9278	93.4032	89.8785	86.3539	82.8292	79.3046	79.3046	82.8292	86.3539	89.8785	93.4032	96.9278 (44)
Energy conte	143.7412	125.7169	129.7286	113.1005	108.5227	93.6468	86.7775	99.5785	100.7678	117.4351	128.1896	139.2056 (45)
Energy content (annual)										Total = Sum(45)m =		1386.4109 (45)
Distribution loss (46)m = 0.15 x (45)m	21.5612	18.8575	19.4593	16.9651	16.2784	14.0470	13.0166	14.9368	15.1152	17.6153	19.2284	20.8808 (46)

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

Water storage loss:													
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	22.5120	23.2624	22.5120	23.2624	22.5120	(59)
Total heat required for water heating calculated for each month	199.0180	175.6444	185.0054	166.5942	163.7995	147.1405	142.0543	154.8553	154.2615	172.7119	181.6833	194.4824	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Solar input (sum of months) = Sum(63)m =												0.0000 (64)	
Output from w/h	199.0180	175.6444	185.0054	166.5942	163.7995	147.1405	142.0543	154.8553	154.2615	172.7119	181.6833	194.4824	(64)
Heat gains from water heating, kWh/month	92.0154	81.7428	87.3562	80.4009	80.3052	73.9325	73.0750	77.3313	76.3002	83.2686	85.4180	90.5073	(65)
Total per year (kWh/year) = Sum(64)m =												2037.2507 (64)	

#### 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	113.5078	113.5078	113.5078	113.5078	113.5078	113.5078	113.5078	113.5078	113.5078	113.5078	113.5078	113.5078 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.7962	15.8065	12.8547	9.7318	7.2746	6.1416	6.6362	8.6260	11.5777	14.7006	17.1578	18.2908 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	199.6196	201.6911	196.4711	185.3585	171.3309	158.1468	149.3391	147.2676	152.4876	163.6002	177.6279	190.8119 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.3508	34.3508	34.3508	34.3508	34.3508	34.3508	34.3508	34.3508	34.3508	34.3508	34.3508	34.3508 (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)	-90.8062	-90.8062	-90.8062	-90.8062	-90.8062	-90.8062	-90.8062	-90.8062	-90.8062	-90.8062	-90.8062	-90.8062 (71)
Water heating gains (Table 5)	123.6766	121.6411	117.4143	111.6679	107.9371	102.6840	98.2190	103.9399	105.9725	111.9202	118.6361	121.6496 (72)
Total internal gains	398.1448	396.1910	383.7924	363.8106	343.5950	324.0248	311.2466	316.8858	327.0902	347.2733	370.4741	387.8047 (73)

#### 6. Solar gains

[Jan]	Area m <sup>2</sup>	Solar flux Table 6a W/m <sup>2</sup>	Specific data or Table 6b	Specific data FF or Table 6c	Access factor Table 6d	Gains W						
East	2.3500	19.6403	0.2900	0.7000	0.7700	6.4930 (76)						
South	14.5000	46.7521	0.2900	0.7000	0.7700	95.3670 (78)						
Solar gains	101.8600	168.8882	219.8718	255.3686	271.7072	263.7736	256.7653	245.2681	232.1592	183.5334	121.1384	87.7454 (83)
Total gains	500.0048	565.0792	603.6642	619.1791	615.3022	587.7984	568.0119	562.1539	559.2494	530.8067	491.6125	475.5501 (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)	97.5696	97.8994	98.2314	99.9260	100.2719	102.0382	102.0382	102.3990	101.3243	100.2719	99.5824	98.9023
tau	7.5046	7.5266	7.5488	7.6617	7.6848	7.8025	7.8025	7.8266	7.7550	7.6848	7.6388	7.5935
util living area	0.9919	0.9790	0.9479	0.8678	0.7221	0.5245	0.3742	0.3938	0.5957	0.8677	0.9769	0.9941 (86)
MIT	20.4998	20.6295	20.7761	20.9139	20.9813	20.9986	20.9999	20.9999	20.9962	20.9267	20.7002	20.4746 (87)
Th 2	20.3305	20.3326	20.3347	20.3453	20.3474	20.3580	20.3580	20.3602	20.3538	20.3474	20.3432	20.3389 (88)
util rest of house	0.9896	0.9735	0.9349	0.8400	0.6781	0.4726	0.3197	0.3392	0.5419	0.8349	0.9698	0.9924 (89)
MIT 2	19.6667	19.8541	20.0607	20.2510	20.3305	20.3571	20.3580	20.3601	20.3511	20.2711	19.9653	19.6372 (90)
Living area fraction	20.0680	20.2276	20.4053	20.5703	20.6440	20.6661	20.6672	20.6683	20.6619	20.5869	20.3193	20.0406 (92)
Temperature adjustment	fLA = Living area / (4) = 0.4817 (91)											
adjusted MIT	20.0680	20.2276	20.4053	20.5703	20.6440	20.6661	20.6672	20.6683	20.6619	20.5869	20.3193	20.0406 (93)

#### 8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9885	0.9725	0.9365	0.8500	0.6984	0.4976	0.3459	0.3655	0.5678	0.8476	0.9695	0.9914 (94)
Ext temp.	494.2555	549.5194	565.3055	526.2998	429.7482	292.4722	196.4971	205.4694	317.5206	449.9179	476.6010	471.4773 (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	796.8145	771.9513	697.9529	575.8362	439.7912	293.1183	196.5297	205.5190	319.3088	491.0738	654.5177	789.6974 (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 per m <sup>2</sup>	225.1039	149.4743	98.6897	35.6662	7.4720	0.0000	0.0000	0.0000	0.0000	30.6200	128.1000	236.7557 (98)
(98) / (4) =												12.8434 (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 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	911.8818 (98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05	957.4759 (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	2037.2507 (64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05	2139.1132 (310a)
Electricity used for heat distribution	30.9659 (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)	148.8781 (330a)
Total electricity for the above, kWh/year	148.8781 (331)
Electricity for lighting (calculated in Appendix L)	314.2871 (332)
Total delivered energy for all uses	3559.7543 (338)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Efficiency of heat source Boilers			95.0000 (367a)
Space heating from Boilers	3259.5675	0.2160	704.0666 (367)
Electrical energy for heat distribution	30.9659	0.5190	16.0713 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			720.1379 (373)
Space and water heating			720.1379 (376)
Pumps and fans	148.8781	0.5190	77.2677 (378)
Energy for lighting	314.2871	0.5190	163.1150 (379)
Total CO2, kg/year			960.5206 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			13.5300 (384)

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

DER			13.5300 ZC1
Total Floor Area		TFA	71.0000
Assumed number of occupants		N	2.2702
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190
CO2 emissions from appliances, equation (L14)			16.6606 ZC2
CO2 emissions from cooking, equation (L16)			2.4434 ZC3
Total CO2 emissions			32.6341 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			32.6341 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	71.0000 (1b)	2.5000 (2b)	177.5000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	71.0000		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 177.5000 (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)
Air changes per hour					
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				30.0000 / (5) =	0.1690 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4190 (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) =	0.3247 (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	0.4140	0.4059	0.3978	0.3572	0.3491	0.3085	0.3085	0.3004	0.3247	0.3491	0.3653	0.3816 (22b)
Effective ac	0.5857	0.5824	0.5791	0.5638	0.5609	0.5476	0.5476	0.5451	0.5527	0.5609	0.5667	0.5728 (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)			16.8500	1.3258	22.3390		(27)					
External Wall 1	33.8500	16.8500	17.0000	0.1800	3.0600		(29a)					
Sheltered Corridor	26.6300		26.6300	0.1800	4.7934		(29a)					
Total net area of external elements Aum(A, m2)			60.4800				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 30.1924		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.0845 (36)					
Total fabric heat loss							(33) + (36) = 35.2769 (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	34.3082	34.1132	33.9221	33.0245	32.8566	32.0748	32.0748	31.9301	32.3760	32.8566	33.1963	33.5515 (38)
Average = Sum(39)m / 12 =	69.5851	69.3901	69.1990	68.3015	68.1335	67.3518	67.3518	67.2070	67.6529	68.1335	68.4733	68.8284 (39)
HLP	0.9801	0.9773	0.9746	0.9620	0.9596	0.9486	0.9486	0.9466	0.9529	0.9596	0.9644	0.9694 (40)
HLP (average)												0.9620 (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												2.2702 (42)
Average daily hot water use (litres/day)												88.1162 (43)
Daily hot water use	96.9278	93.4032	89.8785	86.3539	82.8292	79.3046	79.3046	82.8292	86.3539	89.8785	93.4032	96.9278 (44)
Energy conte	143.7412	125.7169	129.7286	113.1005	108.5227	93.6468	86.7775	99.5785	100.7678	117.4351	128.1896	139.2056 (45)
Energy content (annual)												Total = Sum(45)m = 1386.4109 (45)
Distribution loss (46)m = 0.15 x (45)m	21.5612	18.8575	19.4593	16.9651	16.2784	14.0470	13.0166	14.9368	15.1152	17.6153	19.2284	20.8808 (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	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)

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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 (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	190.3361	167.8026	176.3235	158.1924	155.1176	138.7387	133.3724	146.1734	145.8596	164.0300	173.2815	185.8005 (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	190.3361	167.8026	176.3235	158.1924	155.1176	138.7387	133.3724	146.1734	145.8596	164.0300	173.2815	185.8005 (64)
Heat gains from water heating, kWh/month	85.0699	75.4695	80.4107	73.6794	73.3597	67.2110	66.1295	70.3858	69.5788	76.3231	78.6965	83.5618 (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	113.5078	113.5078	113.5078	113.5078	113.5078	113.5078	113.5078	113.5078	113.5078	113.5078	113.5078	113.5078 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	17.7962	15.8065	12.8547	9.7318	7.2746	6.1416	6.6362	8.6260	11.5777	14.7006	17.1578	18.2908 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	199.6196	201.6911	196.4711	185.3585	171.3309	158.1468	149.3391	147.2676	152.4876	163.6002	177.6279	190.8119 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.3508	34.3508	34.3508	34.3508	34.3508	34.3508	34.3508	34.3508	34.3508	34.3508	34.3508	34.3508 (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)	-90.8062	-90.8062	-90.8062	-90.8062	-90.8062	-90.8062	-90.8062	-90.8062	-90.8062	-90.8062	-90.8062	-90.8062 (71)
Water heating gains (Table 5)	114.3412	112.3057	108.0789	102.3325	98.6018	93.3487	88.8837	94.6045	96.6372	102.5848	109.3007	112.3142 (72)
Total internal gains	391.8094	389.8556	377.4570	357.4752	337.2596	317.6894	304.9113	310.5505	320.7548	340.9379	364.1387	381.4693 (73)

#### 6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains						
	m2	Table 6a	Specific data	Specific data	factor	W						
		W/m2	or Table 6b	or Table 6c	Table 6d							
East	2.3500	19.6403	0.6300	0.7000	0.7700	14.1055 (76)						
South	14.5000	46.7521	0.6300	0.7000	0.7700	207.1766 (78)						
Solar gains	221.2820	366.8951	477.6525	554.7662	590.2605	573.0255	557.8004	532.8237	504.3458	398.7106	263.1627	190.6193 (83)
Total gains	613.0914	756.7507	855.1095	912.2414	927.5201	890.7148	862.7117	843.3742	825.1006	739.6485	627.3014	572.0886 (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	70.8565	71.0556	71.2518	72.1881	72.3661	73.2060	73.2060	73.3637	72.8802	72.3661	72.0070	71.6355	
alpha	5.7238	5.7370	5.7501	5.8125	5.8244	5.8804	5.8804	5.8909	5.8587	5.8244	5.8005	5.7757	
util living area	0.9877	0.9628	0.9108	0.8080	0.6577	0.4804	0.3431	0.3659	0.5568	0.8345	0.9677	0.9912 (86)	
MIT	20.2403	20.4693	20.6931	20.8776	20.9677	20.9957	20.9995	20.9993	20.9899	20.8749	20.5281	20.1941 (87)	
Th 2	20.1000	20.1023	20.1045	20.1151	20.1171	20.1264	20.1264	20.1281	20.1228	20.1171	20.1131	20.1089 (88)	
util rest of house	0.9841	0.9529	0.8895	0.7696	0.6034	0.4164	0.2752	0.2969	0.4898	0.7919	0.9574	0.9886 (89)	
MIT 2	19.1081	19.4347	19.7428	19.9869	20.0894	20.1238	20.1262	20.1278	20.1161	19.9913	19.5307	19.0484 (90)	
Living area fraction	fLA = Living area / (4) =											0.4817 (91)	
MIT	19.6535	19.9330	20.2005	20.4159	20.5124	20.5438	20.5469	20.5476	20.5370	20.4169	20.0111	19.6002 (92)	
Temperature adjustment													0.0000
adjusted MIT	19.6535	19.9330	20.2005	20.4159	20.5124	20.5438	20.5469	20.5476	20.5370	20.4169	20.0111	19.6002 (93)	

#### 8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9818	0.9508	0.8920	0.7833	0.6282	0.4472	0.3079	0.3302	0.5218	0.8073	0.9560	0.9867 (94)
Useful gains	601.9478	719.5148	762.7866	714.5424	582.6934	398.3167	265.6466	278.4721	430.5556	597.1267	599.7269	564.4980 (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	1068.3732	1043.1447	948.0641	786.5549	600.4232	400.3238	265.8279	278.7467	435.4824	668.8608	884.0668	1059.9743 (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	347.0205	217.4792	137.8465	51.8490	13.1910	0.0000	0.0000	0.0000	0.0000	53.3701	204.7248	368.6344 (98)
Space heating												1394.1155 (98)
Space heating per m2												(98) / (4) = 19.6354 (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													1491.0326 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	347.0205	217.4792	137.8465	51.8490	13.1910	0.0000	0.0000	0.0000	0.0000	53.3701	204.7248	368.6344	(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)	371.1449	232.5981	147.4294	55.4535	14.1080	0.0000	0.0000	0.0000	0.0000	57.0804	218.9570	394.2614	(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	190.3361	167.8026	176.3235	158.1924	155.1176	138.7387	133.3724	146.1734	145.8596	164.0300	173.2815	185.8005	(64)
Efficiency of water heater (217)m	86.3967	85.5066	84.1662	82.1990	80.5464	79.8000	79.8000	79.8000	79.8000	82.1854	85.2595	79.8000	(216)
Fuel for water heating, kWh/month	220.3049	196.2454	209.4944	192.4504	192.5817	173.8580	167.1334	183.1747	182.7815	199.5853	203.2402	214.5297	(219)
Water heating fuel used													2335.3794 (219)
Annual totals kWh/year													
Space heating fuel - main system													1491.0326 (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)													314.2871 (232)
Total delivered energy for all uses													4215.6991 (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	1491.0326	0.2160	322.0630 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2335.3794	0.2160	504.4419 (264)
Space and water heating			826.5050 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	314.2871	0.5190	163.1150 (268)
Total CO2, kg/m2/year			1028.5450 (272)
Emissions per m2 for space and water heating			11.6409 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.2974 (272b)
Emissions per m2 for pumps and fans			0.5482 (272c)
Target Carbon Dioxide Emission Rate (TER) = (11.6409 * 1.00) + 2.2974 + 0.5482, rounded to 2 d.p.			14.4900 (273)