

# FULL SAP CALCULATION PRINTOUT

## Calculation Type: New Build (As Designed)

<b>Property Reference</b>	010585		<b>Issued on Date</b>	10/02/2022	
<b>Assessment Reference</b>	B08-TY-05	<b>Prop Type Ref</b>	8.TY.05		
<b>Property</b>					
<b>SAP Rating</b>	83 B	<b>DER</b>	10.57	<b>TER</b>	26.73
<b>Environmental</b>	93 A	<b>% DER&lt;TER</b>	60.46		
<b>CO<sub>2</sub> Emissions (t/year)</b>	0.50	<b>DFEE</b>	44.75	<b>TFEE</b>	46.86
<b>General Requirements Compliance</b>	Pass	<b>% DFEE&lt;TFEE</b>	4.51		
<b>Assessor Details</b>	Miss Emma Jolly, Emma Jolly, Tel: 01454806691, emmajolly@hoarelea.com			<b>Assessor ID</b>	T689-0001
<b>Client</b>					

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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 60 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) 26.73 kgCO<sub>2</sub>/m<sup>2</sup>  
Dwelling Carbon Dioxide Emission Rate (DER) 10.57 kgCO<sub>2</sub>/m<sup>2</sup>OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)46.9 kWh/m<sup>2</sup>/yr  
Dwelling Fabric Energy Efficiency (DFEE)44.7 kWh/m<sup>2</sup>/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.15 (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: 0.52  
Maximum 1.5 OK  
MVHR efficiency: 92%  
Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): Slight OK

Based on:

Overshading: Average  
Windows facing North East: 11.75 m<sup>2</sup>, No overhang  
Windows facing South East: 3.76 m<sup>2</sup>, No overhang  
Windows facing North West: 3.76 m<sup>2</sup>, No overhang  
Air change rate: 4.00 ach  
Blinds/curtains: Dark-coloured curtain or roller blind, closed 100% of daylight hours

10 Key features

External wall U-value 0.12 W/m<sup>2</sup>K  
Party wall U-value 0.00 W/m<sup>2</sup>K  
Air permeability 3.0 m<sup>3</sup>/m<sup>2</sup>h  
Photovoltaic array 350.00 kWh/Year

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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	60.0000 (1b)	x 2.5000 (2b)	= 150.0000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	60.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 150.0000 (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				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 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)			19.2700	1.1450	22.0649		(27)
External Wall 1	43.6300	19.2700	24.3600	0.1200	2.9232		(29a)
Sheltered Corridor	11.3000		11.3000	0.1842	2.0810		(29a)
Sheltered UNHEATED	17.0000		17.0000	0.1695	2.8814		(29a)
Total net area of external elements Aum(A, m2)			71.9300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	29.9505		(33)
Party Wall 1			36.5600	0.0000	0.0000		(32)
Party Floor 1			60.0000				(32d)
Party Ceilings 1			60.0000				(32b)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							8.4200 (36)
Total fabric heat loss						(33) + (36) =	38.3705 (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	12.7323	12.5885	12.4446	11.7253	11.5815	10.8622	10.8622	10.7183	11.1499	11.5815	11.8692	12.1569 (38)
Heat transfer coeff	51.1028	50.9589	50.8151	50.0958	49.9519	49.2326	49.2326	49.0888	49.5203	49.9519	50.2396	50.5274 (39)
Average = Sum(39)m / 12 =												50.0598 (39)
HLP	0.8517	0.8493	0.8469	0.8349	0.8325	0.8205	0.8205	0.8181	0.8253	0.8325	0.8373	0.8421 (40)
HLP (average)												0.8343 (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												1.9816 (42)
Average daily hot water use (litres/day)												81.2638 (43)
Daily hot water use	89.3902	86.1396	82.8891	79.6385	76.3880	73.1374	73.1374	76.3880	79.6385	82.8891	86.1396	89.3902 (44)
Energy content	132.5631	115.9405	119.6402	104.3053	100.0834	86.3643	80.0293	91.8347	92.9315	108.3028	118.2209	128.3803 (45)
Energy content (annual)												Total = Sum(45)m = 1278.5963 (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:	19.8845	17.3911	17.9460	15.6458	15.0125	12.9547	12.0044	13.7752	13.9397	16.2454	17.7331	19.2570 (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	187.8399	165.8680	174.9170	157.7989	155.3602	139.8580	135.3061	147.1115	146.4252	163.5796	171.7146	183.6571 (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	187.8399	165.8680	174.9170	157.7989	155.3602	139.8580	135.3061	147.1115	146.4252	163.5796	171.7146	183.6571 (64)
Heat gains from water heating, kWh/month	88.2987	78.4922	84.0018	77.4764	77.4992	71.5111	70.8312	74.7565	73.6947	80.2321	82.1034	86.9079 (65)
											Solar input (sum of months) = Sum(63)m =	0.0000 (63)
											Total per year (kWh/year) = Sum(64)m =	1929.4360 (64)

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

Metabolic gains (Table 5), Watts												
(66)m	99.0817	99.0817	99.0817	99.0817	99.0817	99.0817	99.0817	99.0817	99.0817	99.0817	99.0817	99.0817 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	15.4183	13.6944	11.1371	8.4315	6.3026	5.3209	5.7495	7.4734	10.0307	12.7363	14.8652	15.8469 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	172.9469	174.7416	170.2191	160.5914	148.4380	137.0156	129.3847	127.5901	132.1125	141.7403	153.8936	165.3161 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082 (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)	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654 (71)
Water heating gains (Table 5)	118.6810	116.8038	112.9057	107.6062	104.1655	99.3210	95.2032	100.4792	102.3537	107.8389	114.0325	116.8117 (72)
Total internal gains	359.7708	357.9644	346.9864	329.3535	311.6307	294.3820	283.0619	288.2671	297.2215	315.0400	335.5158	350.6991 (73)

#### 6. Solar gains

[Jan]	Area		Solar flux		g		FF		Access		Gains	
	m2		Table 6a		W/m2		Specific data		factor		W	
							or Table 6b		or Table 6c			
Northeast	11.7500		11.2829		0.2900		0.7000		0.7700		18.6505 (75)	
Southeast	3.7600		36.7938		0.2900		0.7000		0.7700		19.4622 (77)	
Northwest	3.7600		11.2829		0.2900		0.7000		0.7700		5.9681 (81)	
Solar gains	44.0808	83.2632	135.6448	204.4771	262.2618	274.9821	259.0292	213.6846	159.1288	97.8800	54.2878	36.7604 (83)
Total gains	403.8516	441.2276	482.6312	533.8307	573.8925	569.3642	542.0911	501.9518	456.3503	412.9200	389.8037	387.4595 (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)												
tau	81.5350	81.7652	81.9967	83.1740	83.4135	84.6322	84.6322	84.8802	84.1405	83.4135	82.9358	82.4636
alpha	6.4357	6.4510	6.4664	6.5449	6.5609	6.6421	6.6421	6.6587	6.6094	6.5609	6.5291	6.4976
util living area	0.9957	0.9915	0.9766	0.9158	0.7612	0.5485	0.3991	0.4486	0.7175	0.9448	0.9901	0.9967 (86)
MIT	20.2530	20.3658	20.5602	20.8052	20.9539	20.9953	20.9995	20.9990	20.9763	20.7851	20.4815	20.2327 (87)
Th 2	20.2087	20.2108	20.2129	20.2232	20.2252	20.2356	20.2356	20.2376	20.2314	20.2252	20.2211	20.2170 (88)
util rest of house	0.9944	0.9889	0.9694	0.8923	0.7118	0.4852	0.3300	0.3750	0.6496	0.9239	0.9865	0.9956 (89)
MIT 2	19.2114	19.3767	19.6573	20.0020	20.1831	20.2326	20.2354	20.2372	20.2139	19.9836	19.5534	19.1883 (90)
Living area fraction												fLA = Living area / (4) =
MIT	19.8242	19.9586	20.1885	20.4746	20.6366	20.6814	20.6849	20.6854	20.6624	20.4551	20.0994	19.8028 (92)
Temperature adjustment												0.0000
adjusted MIT	19.8242	19.9586	20.1885	20.4746	20.6366	20.6814	20.6849	20.6854	20.6624	20.4551	20.0994	19.8028 (93)

#### 8. Space heating requirement

Utilisation	0.9936	0.9878	0.9692	0.9005	0.7388	0.5223	0.3707	0.4183	0.6886	0.9308	0.9858	0.9949 (94)	
Useful gains	401.2635	435.8610	467.7572	480.6976	423.9643	297.4000	200.9379	209.9906	314.2432	384.3520	384.2830	385.5000 (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	793.3312	767.3708	695.5833	579.8371	446.4001	299.4013	201.1125	210.3644	324.9735	492.2828	653.0864	788.3677 (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	291.6984	222.7746	169.5027	71.3805	16.6922	0.0000	0.0000	0.0000	0.0000	80.3005	193.5384	299.7336 (98)	
Space heating												1345.6209 (98)	
Space heating per m2												(98) / (4) =	22.4270 (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 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	1345.6209 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.05	1412.9019 (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	1929.4360 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.05	2025.9078 (310a)
Electricity used for heat distribution	34.3881 (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)	118.9500 (330a)
Total electricity for the above, kWh/year	118.9500 (331)
Electricity for lighting (calculated in Appendix L)	272.2928 (332)
Energy saving/generation technologies (Appendices M ,N and Q)	
Total delivered energy for all uses	3830.0525 (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	1146.2699	0.5190	594.9141 (367)
Electrical energy for heat distribution	34.3881	0.5190	17.8474 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			612.7615 (373)
Space and water heating			612.7615 (376)
Pumps and fans	118.9500	0.5190	61.7351 (378)
Energy for lighting	272.2928	0.5190	141.3200 (379)
Energy saving/generation technologies			
PV Unit	-350.0000	0.5190	-181.6500 (380)
Total CO2, kg/year			634.1665 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			10.5700 (384)

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

DER	10.5700 ZC1
Total Floor Area	TFA 60.0000
Assumed number of occupants	N 1.9816
CO2 emission factor in Table 12 for electricity displaced from grid	EF 0.5190
CO2 emissions from appliances, equation (L14)	17.0808 ZC2
CO2 emissions from cooking, equation (L16)	2.7760 ZC3
Total CO2 emissions	30.4268 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	30.4268 ZC8

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## 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 (m <sup>2</sup> )	Storey height (m)	Volume (m <sup>3</sup> )
Ground floor	60.0000 (1b)	2.5000 (2b)	150.0000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	60.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	150.0000 (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)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				20.0000 / (5) =	0.1333 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3833 (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) =		0.2971 (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	0.3788	0.3714	0.3639	0.3268	0.3194	0.2822	0.2822	0.2748	0.2971	0.3194	0.3342	0.3491 (22b)
Effective ac	0.5717	0.5690	0.5662	0.5534	0.5510	0.5398	0.5398	0.5378	0.5441	0.5510	0.5559	0.5609 (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 Opening Type (Uw = 1.40)			15.0100	1.3258	19.8996		(27)					
External Wall 1	43.6300	15.0100	28.6200	0.1800	5.1516		(29a)					
Shelterrd Corrirodir	11.3000		11.3000	0.1800	2.0340		(29b)					
Shelterredd uNHEATED	17.0000		17.0000	0.1800	3.0600		(29a)					
Total net area of external elements Aum(A, m <sup>2</sup> )			71.9300				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	30.1452	(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)							6.3700 (36)					
Total fabric heat loss						(33) + (36) =	36.5152 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	28.3010	28.1631	28.0280	27.3931	27.2743	26.7214	26.7214	26.6190	26.9344	27.2743	27.5146	27.7658 (38)
Heat transfer coeff	64.8162	64.6783	64.5432	63.9083	63.7896	63.2366	63.2366	63.1342	63.4496	63.7896	64.0298	64.2811 (39)
Average = Sum(39)m / 12 =												63.9078 (39)
HLP	1.0803	1.0780	1.0757	1.0651	1.0632	1.0539	1.0539	1.0522	1.0575	1.0632	1.0672	1.0714 (40)
HLP (average)												1.0651 (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												1.9816 (42)
Average daily hot water use (litres/day)												81.2638 (43)
Daily hot water use	89.3902	86.1396	82.8891	79.6385	76.3880	73.1374	73.1374	76.3880	79.6385	82.8891	86.1396	89.3902 (44)
Energy conte	132.5631	115.9405	119.6402	104.3053	100.0834	86.3643	80.0293	91.8347	92.9315	108.3028	118.2209	128.3803 (45)
Energy content (annual)												Total = Sum(45)m = 1278.5963 (45)
Distribution loss (46)m = 0.15 x (45)m	19.8845	17.3911	17.9460	15.6458	15.0125	12.9547	12.0044	13.7752	13.9397	16.2454	17.7331	19.2570 (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												

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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	(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	179.1580	158.0262	166.2351	149.3971	146.6783	131.4562	126.6242	138.4296	138.0234	154.8977	163.3128	174.9752	(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)												
	179.1580	158.0262	166.2351	149.3971	146.6783	131.4562	126.6242	138.4296	138.0234	154.8977	163.3128	174.9752	(64)
	Total per year (kWh/year) = Sum(64)m = 1827.2137 (64)												
	81.3531	72.2188	77.0563	70.7550	70.5536	64.7896	63.8856	67.8110	66.9732	73.2866	75.3819	79.9624	(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	99.0817	99.0817	99.0817	99.0817	99.0817	99.0817	99.0817	99.0817	99.0817	99.0817	99.0817	99.0817	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	15.4183	13.6944	11.1371	8.4315	6.3026	5.3209	5.7495	7.4734	10.0307	12.7363	14.8652	15.8469	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	172.9469	174.7416	170.2191	160.5914	148.4380	137.0156	129.3847	127.5901	132.1125	141.7403	153.8936	165.3161	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	32.9082	(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)	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	-79.2654	(71)
Water heating gains (Table 5)	109.3456	107.4684	103.5703	98.2708	94.8302	89.9856	85.8678	91.1438	93.0183	98.5035	104.6971	107.4763	(72)
Total internal gains	353.4354	351.6290	340.6510	323.0181	305.2953	288.0466	276.7265	281.9318	290.8861	308.7046	329.1805	344.3637	(73)

#### 6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains							
	m <sup>2</sup>	Table 6a	Specific data	Specific data	factor	W							
		W/m <sup>2</sup>	or Table 6b	or Table 6c	Table 6d								
Northeast	9.1500	11.2829	0.6300	0.7000	0.7700	31.5512 (75)							
Southeast	2.9300	36.7938	0.6300	0.7000	0.7700	32.9469 (77)							
Northwest	2.9300	11.2829	0.6300	0.7000	0.7700	10.1033 (81)							
Solar gains	74.6013	140.9095	229.5493	346.0224	443.7993	465.3216	438.3275	361.6005	269.2873	165.6440	91.8748	62.2128	(83)
Total gains	428.0367	492.5385	570.2003	669.0405	749.0946	753.3683	715.0540	643.5323	560.1735	474.3486	421.0553	406.5765	(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	64.2843	64.4214	64.5563	65.1975	65.3189	65.8901	65.8901	65.9969	65.6689	65.3189	65.0738	64.8195	
alpha	5.2856	5.2948	5.3038	5.3465	5.3546	5.3927	5.3927	5.3998	5.3779	5.3546	5.3383	5.3213	
util living area	0.9955	0.9899	0.9705	0.8966	0.7308	0.5283	0.3877	0.4479	0.7243	0.9463	0.9902	0.9965	(86)
MIT	19.9595	20.1217	20.3931	20.7243	20.9272	20.9893	20.9983	20.9965	20.9490	20.6588	20.2482	19.9285	(87)
Th 2	20.0170	20.0189	20.0207	20.0294	20.0310	20.0386	20.0386	20.0400	20.0357	20.0310	20.0277	20.0243	(88)
util rest of house	0.9940	0.9867	0.9611	0.8670	0.6725	0.4529	0.3038	0.3562	0.6440	0.9240	0.9865	0.9954	(89)
MIT 2	18.6395	18.8762	19.2662	19.7239	19.9665	20.0322	20.0380	20.0387	19.9987	19.6506	19.0678	18.5997	(90)
Living area fraction	fLA = Living area / (4) = 0.5883 (91)												
MIT	19.4161	19.6090	19.9292	20.3125	20.5317	20.5953	20.6030	20.6022	20.5578	20.2438	19.7623	19.3815	(92)
Temperature adjustment	0.0000												
adjusted MIT	19.4161	19.6090	19.9292	20.3125	20.5317	20.5953	20.6030	20.6022	20.5578	20.2438	19.7623	19.3815	(93)

#### 8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9929	0.9850	0.9600	0.8764	0.7036	0.4970	0.3532	0.4102	0.6892	0.9296	0.9852	0.9945	(94)
Useful gains	424.9920	485.1441	547.4075	586.3547	527.0543	374.4241	252.5315	263.9964	386.0476	440.9550	414.8317	404.3204	(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	979.7668	951.3516	866.7608	729.3517	563.3701	379.1243	253.1371	265.3039	409.7436	615.1719	810.7626	975.8817	(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	412.7524	313.2914	237.5988	102.9578	27.0190	0.0000	0.0000	0.0000	0.0000	129.6174	285.0702	425.2416	(98)
Space heating	1933.5486 (98)												
Space heating per m <sup>2</sup>	(98) / (4) = 32.2258 (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													2067.9664 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	412.7524	313.2914	237.5988	102.9578	27.0190	0.0000	0.0000	0.0000	0.0000	129.6174	285.0702	425.2416	(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)	441.4464	335.0710	254.1164	110.1153	28.8973	0.0000	0.0000	0.0000	0.0000	138.6282	304.8879	454.8038	(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	179.1580	158.0262	166.2351	149.3971	146.6783	131.4562	126.6242	138.4296	138.0234	154.8977	163.3128	174.9752	(64)
Efficiency of water heater (217)m	86.9703	86.6064	85.7661	83.8444	81.2951	79.8000	79.8000	79.8000	79.8000	84.3430	86.2860	87.0956	(216)
Fuel for water heating, kWh/month	205.9989	182.4648	193.8238	178.1837	180.4269	164.7321	158.6769	173.4707	172.9616	183.6521	189.2691	200.9002	(219)
Water heating fuel used													2184.5607 (219)
Annual totals kWh/year													
Space heating fuel - main system													2067.9664 (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)													272.2928 (232)
Total delivered energy for all uses													4599.8199 (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	2067.9664	0.2160	446.6807 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2184.5607	0.2160	471.8651 (264)
Space and water heating			918.5459 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	272.2928	0.5190	141.3200 (268)
Total CO2, kg/m2/year			1098.7908 (272)
Emissions per m2 for space and water heating			15.3091 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.3553 (272b)
Emissions per m2 for pumps and fans			0.6487 (272c)
Target Carbon Dioxide Emission Rate (TER) = (15.3091 * 1.55) + 2.3553 + 0.6487, rounded to 2 d.p.			26.7300 (273)