

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	010568			Issued on Date	10/02/2022
Assessment Reference	B08-TY-03	Prop Type Ref	8.TY.03		
Property					
SAP Rating	83 B	DER	17.48	TER	18.80
Environmental	89 B	% DER<TER	7.01		
CO ₂ Emissions (t/year)	0.74	DFEE	44.20	TFEE	43.89
General Requirements Compliance	Fail	% DFEE<TFEE	-0.71		
Assessor Details	Miss Emma Jolly, Emma Jolly, Tel: 01454806691, emmajolly@hoarelea.com			Assessor ID	T689-0001
Client					

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REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

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DWELLING AS DESIGNED

Mid-floor flat, total floor area 50 m²

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) 18.80 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 17.48 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 43.9 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE) 44.2 kWh/m²/yr Fail
Excess energy = 0.3 kWh/m²/yr (0.7%)

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	-
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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, TRVs	OK
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Hot water controls:

No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:	100%	
Minimum	75%	OK

8 Mechanical ventilation

Continuous supply and extract system		
Specific fan power:	0.52	
Maximum	1.5	OK
MVHR efficiency:	92%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley):	Slight	OK
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Based on:

Overshading:	Average
Windows facing North East:	3.76 m ² , No overhang
Windows facing South East:	11.75 m ² , No overhang
Windows facing South West:	3.76 m ² , 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 ² K
Party wall U-value	0.00 W/m ² K
Air permeability	3.0 m ³ /m ² h

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
 CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	50.0000 (1b)	2.5000 (2b)	125.0000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	125.0000 (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	44.0000	19.2700	24.7300	0.1200	2.9676		(29a)
Sheltered Corridor	5.9200		5.9200	0.1842	1.0902		(29a)
Sheltered Unheated	21.1000		21.1000	0.1695	3.5763		(29a)
Total net area of external elements Aum(A, m2)			71.0200				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	29.6990	(33)
Party Wall 1			14.7500	0.0000	0.0000		(32)
Party Floor 1			50.0000				(32d)
Party Ceilings 1			50.0000				(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 250.0000 (35)
 Thermal bridges (Sum(L x Psi) calculated using Appendix K) 6.5530 (36)
 Total fabric heat loss (33) + (36) = 36.2520 (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	10.6103	10.4904	10.3705	9.7711	9.6512	9.0518	9.0518	8.9319	9.2916	9.6512	9.8910	10.1307 (38)
Average = Sum(39)m / 12 =	46.8623	46.7424	46.6225	46.0231	45.9032	45.3038	45.3038	45.1839	45.5436	45.9032	46.1430	46.3827 (39)
												45.9931 (39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.9372	0.9348	0.9325	0.9205	0.9181	0.9061	0.9061	0.9037	0.9109	0.9181	0.9229	0.9277 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy 1.6901 (42)
 Average daily hot water use (litres/day) 74.3399 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	81.7739	78.8003	75.8267	72.8531	69.8795	66.9059	66.9059	69.8795	72.8531	75.8267	78.8003	81.7739 (44)
Energy conte	121.2683	106.0620	109.4465	95.4181	91.5560	79.0058	73.2105	84.0101	85.0135	99.0750	108.1481	117.4419 (45)
Energy content (annual)												Total = Sum(45)m = 1169.6560 (45)
Distribution loss (46)m = 0.15 x (45)m												

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Water storage loss:	18.1902	15.9093	16.4170	14.3127	13.7334	11.8509	10.9816	12.6015	12.7520	14.8613	16.2222	17.6163 (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	176.5451	155.9895	164.7233	148.9118	146.8328	132.4995	128.4873	139.2869	138.5072	154.3518	161.6418	172.7187 (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	176.5451	155.9895	164.7233	148.9118	146.8328	132.4995	128.4873	139.2869	138.5072	154.3518	161.6418	172.7187 (64)
Heat gains from water heating, kWh/month	84.5432	75.2076	80.6124	74.5215	74.6638	69.0644	68.5639	72.1548	71.0619	77.1639	78.7542	83.2709 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.1260	11.6584	9.4813	7.1779	5.3656	4.5298	4.8947	6.3623	8.5394	10.8428	12.6551	13.4908 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	147.2339	148.7618	144.9117	136.7153	126.3689	116.6447	110.1484	108.6205	112.4706	120.6670	131.0134	140.7376 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505 (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)	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040 (71)
Water heating gains (Table 5)	113.6333	111.9160	108.3500	103.5020	100.3546	95.9228	92.1558	96.9823	98.6971	103.7149	109.3808	111.9232 (72)
Total internal gains	322.3447	320.6877	311.0945	295.7468	280.4406	265.4488	255.5504	260.3166	268.0587	283.5762	301.4009	314.5031 (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							
Northeast	3.7600	11.2829	0.2900	0.7000	0.7700	5.9681 (75)						
Southeast	11.7500	36.7938	0.2900	0.7000	0.7700	60.8194 (77)						
Southwest	3.7600	36.7938	0.2900	0.7000	0.7700	19.4622 (79)						
Solar gains	86.2498	148.8976	208.9938	267.7793	309.3072	296.7305	266.1891	229.2668	165.9833	103.6683	73.5782 (83)	
Total gains	408.5945	469.5854	520.0883	563.5261	588.4315	574.7561	552.2809	526.5057	497.3255	449.5595	405.0692	388.0814 (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	74.0942	74.2842	74.4752	75.4452	75.6423	76.6431	76.6431	76.8464	76.2396	75.6423	75.2492	74.8602
alpha	5.9396	5.9523	5.9650	6.0297	6.0428	6.1095	6.1095	6.1231	6.0826	6.0428	6.0166	5.9907
util living area	0.9898	0.9764	0.9425	0.8526	0.6935	0.5006	0.3605	0.3940	0.6171	0.8824	0.9758	0.9922 (86)
MIT	20.2611	20.4252	20.6365	20.8502	20.9631	20.9956	20.9995	20.9992	20.9855	20.8418	20.5178	20.2284 (87)
Th 2	20.1360	20.1380	20.1400	20.1501	20.1522	20.1623	20.1623	20.1644	20.1583	20.1522	20.1481	20.1441 (88)
util rest of house	0.9868	0.9698	0.9272	0.8190	0.6402	0.4368	0.2921	0.3228	0.5478	0.8471	0.9679	0.9899 (89)
MIT 2	19.1660	19.4025	19.6996	19.9887	20.1198	20.1597	20.1622	20.1640	20.1483	19.9865	19.5454	19.1252 (90)
Living area fraction												fLA = Living area / (4) = 0.6820 (91)
MIT	19.9128	20.1000	20.3386	20.5762	20.6949	20.7298	20.7332	20.7336	20.7193	20.5698	20.2086	19.8776 (92)
Temperature adjustment												0.0000
adjusted MIT	19.9128	20.1000	20.3386	20.5762	20.6949	20.7298	20.7332	20.7336	20.7193	20.5698	20.2086	19.8776 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9859	0.9695	0.9310	0.8366	0.6749	0.4802	0.3387	0.3714	0.5945	0.8655	0.9685	0.9890 (94)
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	731.6527	710.4825	645.1890	537.3767	412.8962	277.7038	187.2509	195.8088	301.4657	457.6460	604.8679	727.1681 (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	244.6480	171.5218	119.7639	47.4775	11.7424	0.0000	0.0000	0.0000	0.0000	50.9882	153.0381	255.4491 (98)
Space heating												1054.6290 (98)
Space heating per m2												(98) / (4) = 21.0926 (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	1054.6290	(98)
Space heat from Boilers = (98) x 1.00 x 1.00 x 1.05	1107.3605	(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	1820.4958	(64)
Water heat from Boilers = (64) x 1.00 x 1.00 x 1.05	1911.5206	(310a)
Electricity used for heat distribution	30.1888	(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)	99.1250	(330a)
Total electricity for the above, kWh/year	99.1250	(331)
Electricity for lighting (calculated in Appendix L)	231.8095	(332)
Total delivered energy for all uses	3349.8156	(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	3177.7696	0.2160	686.3982 (367)
Electrical energy for heat distribution	30.1888	0.5190	15.6680 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			702.0662 (373)
Space and water heating			702.0662 (376)
Pumps and fans	99.1250	0.5190	51.4459 (378)
Energy for lighting	231.8095	0.5190	120.3091 (379)
Total CO2, kg/year			873.8212 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			17.4800 (384)

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

DER			17.4800	ZC1
Total Floor Area			50.0000	
Assumed number of occupants			1.6901	
CO2 emission factor in Table 12 for electricity displaced from grid			0.5190	
CO2 emissions from appliances, equation (L14)			17.4495	ZC2
CO2 emissions from cooking, equation (L16)			3.1912	ZC3
Total CO2 emissions			38.1208	ZC4
Residual CO2 emissions offset from biofuel CHP			0.0000	ZC5
Additional allowable electricity generation, kWh/m ² /year			0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation			0.0000	ZC7
Net CO2 emissions			38.1208	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	50.0000 (1b)	x 2.5000 (2b)	= 125.0000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	50.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 125.0000 (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				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) =	0.1600 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.4100 (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) =	0.3178 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.4051	0.3972	0.3892	0.3495	0.3416	0.3019	0.3019	0.2939	0.3178	0.3416	0.3575	0.3734 (22b)
	0.5821	0.5789	0.5758	0.5611	0.5583	0.5456	0.5456	0.5432	0.5505	0.5583	0.5639	0.5697 (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)			12.5000	1.3258	16.5720		(27)					
External Wall 1	44.0000	12.5000	31.5000	0.1800	5.6700		(29a)					
Sheltered Corridor	5.9200		5.9200	0.1800	1.0656		(29a)					
Sheltered Unheated	21.1000		21.1000	0.1800	3.7980		(29a)					
Total net area of external elements Aum(A, m2)			71.0200				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	27.1056	(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							5.8150 (36)					
Total fabric heat loss						(33) + (36) =	32.9206 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	24.0102	23.8788	23.7499	23.1447	23.0315	22.5044	22.5044	22.4068	22.7074	23.0315	23.2605	23.5000 (38)
Heat transfer coeff	56.9308	56.7993	56.6705	56.0653	55.9520	55.4249	55.4249	55.3273	55.6280	55.9520	56.1811	56.4206 (39)
Average = Sum(39)m / 12 =												56.0647 (39)
HLP	1.1386	1.1360	1.1334	1.1213	1.1190	1.1085	1.1085	1.1065	1.1126	1.1190	1.1236	1.1284 (40)
HLP (average)												1.1213 (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												1.6901 (42)
Average daily hot water use (litres/day)												74.3399 (43)
Daily hot water use	81.7739	78.8003	75.8267	72.8531	69.8795	66.9059	66.9059	69.8795	72.8531	75.8267	78.8003	81.7739 (44)
Energy conte	121.2683	106.0620	109.4465	95.4181	91.5560	79.0058	73.2105	84.0101	85.0135	99.0750	108.1481	117.4419 (45)
Energy content (annual)												Total = Sum(45)m = 1169.6560 (45)
Distribution loss (46)m = 0.15 x (45)m												
	18.1902	15.9093	16.4170	14.3127	13.7334	11.8509	10.9816	12.6015	12.7520	14.8613	16.2222	17.6163 (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	167.8632	148.1478	156.0414	140.5100	138.1509	124.0977	119.8054	130.6050	130.1053	145.6699	153.2400	164.0368	(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)												
	167.8632	148.1478	156.0414	140.5100	138.1509	124.0977	119.8054	130.6050	130.1053	145.6699	153.2400	164.0368	(64)
	Total per year (kWh/year) = Sum(64)m = 1718.2734 (64)												
	77.5976	68.9342	73.6669	67.8000	67.7183	62.3429	61.6184	65.2093	64.3405	70.2184	72.0327	76.3253	(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	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	84.5050	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	13.1260	11.6584	9.4813	7.1779	5.3656	4.5298	4.8947	6.3623	8.5394	10.8428	12.6551	13.4908	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	147.2339	148.7618	144.9117	136.7153	126.3689	116.6447	110.1484	108.6205	112.4706	120.6670	131.0134	140.7376	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	31.4505	(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)	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	-67.6040	(71)
Water heating gains (Table 5)	104.2979	102.5807	99.0146	94.1667	91.0192	86.5874	82.8205	87.6469	89.3617	94.3795	100.0455	102.5878	(72)
Total internal gains	316.0094	314.3524	304.7591	289.4114	274.1052	259.1135	249.2150	253.9812	261.7233	277.2408	295.0655	308.1678	(73)

6. Solar gains

[Jan]	Area m ²	Solar flux Table 6a W/m ²	Specific data or Table 6b	g Specific data or Table 6c	FF Specific data or Table 6c	Access factor Table 6d	Gains W	(75)					
Northeast	2.4400	11.2829	0.6300	0.7000	0.7700	8.4136	(75)						
Southeast	7.6200	36.7938	0.6300	0.7000	0.7700	85.6844	(77)						
Southwest	2.4400	36.7938	0.6300	0.7000	0.7700	27.4370	(79)						
Solar gains	121.5351	209.8138	294.4996	377.3416	434.0108	435.8678	418.1441	375.1026	323.0688	233.8905	146.0799	103.6794	(83)
Total gains	437.5444	524.1662	599.2587	666.7530	708.1160	694.9812	667.3591	629.0839	584.7921	511.1312	441.1454	411.8471	(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	(86)
tau	60.9902	61.1314	61.2704	61.9318	62.0571	62.6473	62.6473	62.7578	62.4186	62.0571	61.8041	61.5418	(87)
alpha	5.0660	5.0754	5.0847	5.1288	5.1371	5.1765	5.1765	5.1839	5.1612	5.1371	5.1203	5.1028	(88)
util living area	0.9893	0.9738	0.9363	0.8440	0.6877	0.5026	0.3642	0.4023	0.6286	0.8862	0.9759	0.9919	(86)
MIT	20.0252	20.2391	20.5090	20.7816	20.9369	20.9897	20.9984	20.9974	20.9693	20.7564	20.3387	19.9829	(87)
Th 2	19.9694	19.9716	19.9736	19.9835	19.9853	19.9939	19.9939	19.9955	19.9906	19.9853	19.9816	19.9777	(88)
util rest of house	0.9860	0.9661	0.9186	0.8060	0.6270	0.4270	0.2816	0.3157	0.5476	0.8482	0.9675	0.9894	(89)
MIT 2	18.6995	19.0072	19.3857	19.7512	19.9310	19.9879	19.9934	19.9945	19.9699	19.7319	19.1608	18.6445	(90)
Living area fraction	fLA = Living area / (4) = 0.6820 (91)												
MIT	19.6037	19.8474	20.1517	20.4539	20.6171	20.6711	20.6788	20.6785	20.6515	20.4306	19.9641	19.5573	(92)
Temperature adjustment	0.0000												
adjusted MIT	19.6037	19.8474	20.1517	20.4539	20.6171	20.6711	20.6788	20.6785	20.6515	20.4306	19.9641	19.5573	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(94)
Useful gains	430.7924	505.8403	552.5209	549.7494	471.3138	332.3824	225.5156	235.7828	351.7990	442.7153	426.7183	406.9379	(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	871.2494	849.0010	773.6511	647.7747	498.9279	336.4924	226.0672	236.7156	364.4472	550.0421	722.7197	866.4679	(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	327.7000	230.6040	164.5209	70.5782	20.5449	0.0000	0.0000	0.0000	0.0000	79.8512	213.1210	341.8904	(98)
Space heating	1448.8106 (98)												
Space heating per m ²	(98) / (4) = 28.9762 (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													1549.5300 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	327.7000	230.6040	164.5209	70.5782	20.5449	0.0000	0.0000	0.0000	0.0000	79.8512	213.1210	341.8904	(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)	350.4813	246.6353	175.9582	75.4847	21.9732	0.0000	0.0000	0.0000	0.0000	85.4023	227.9369	365.6581	(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	167.8632	148.1478	156.0414	140.5100	138.1509	124.0977	119.8054	130.6050	130.1053	145.6699	153.2400	164.0368	(64)
Efficiency of water heater (217)m	86.5682	85.9901	84.9551	83.0844	81.0404	79.8000	79.8000	79.8000	79.8000	83.2866	85.6939	86.7295	(217)
Fuel for water heating, kWh/month	193.9087	172.2847	183.6753	169.1171	170.4715	155.5109	150.1321	163.6655	163.0393	174.9020	178.8225	189.1361	(219)
Water heating fuel used													2064.6657 (219)
Annual totals kWh/year													
Space heating fuel - main system													1549.5300 (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)													231.8095 (232)
Total delivered energy for all uses													3921.0052 (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	1549.5300	0.2160	334.6985 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2064.6657	0.2160	445.9678 (264)
Space and water heating			780.6663 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	231.8095	0.5190	120.3091 (268)
Total CO2, kg/m2/year			939.9004 (272)
Emissions per m2 for space and water heating			15.6133 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.4062 (272b)
Emissions per m2 for pumps and fans			0.7785 (272c)
Target Carbon Dioxide Emission Rate (TER) = (15.6133 * 1.00) + 2.4062 + 0.7785, rounded to 2 d.p.			18.8000 (273)