

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	010586			Issued on Date	10/02/2022
Assessment Reference	B08-TY-06	Prop Type Ref	8.TY.06		
Property					
SAP Rating	85 B	DER	9.70	TER	22.42
Environmental	93 A	% DER<TER	56.73		
CO ₂ Emissions (t/year)	0.62	DFEE	40.65	TFEE	39.47
General Requirements Compliance	Fail	% DFEE<TFEE	-2.98		
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 80 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:Electricity (c)
Fuel factor:1.55 (electricity)
Target Carbon Dioxide Emission Rate (TER) 22.42 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 9.70 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)39.5 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)40.6 kWh/m²/yrFail
Excess energy =1.1 kWh/m²/yr (2.8%)

2 Fabric U-values

Element	Average	Highest	
External wall	0.14 (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: 10.70 m², No overhang
Windows facing South: 14.90 m², 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/m²K
Party wall U-value 0.00 W/m²K
Air permeability 3.0 m³/m²h
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	80.0000 (1b)	2.5000 (2b)	200.0000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	80.0000		200.0000 (4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	200.0000 (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)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) =	0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.0000
Infiltration rate					0.1500 (18)
Number of sides sheltered					2 (19)
Shelter factor				(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor				(21) = (18) x (20) =	0.1275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												0.5000 (23a)
If mechanical ventilation:												78.2000 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.2716	0.2684	0.2652	0.2493	0.2461	0.2301	0.2301	0.2269	0.2365	0.2461	0.2524	0.2588 (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)			25.6000	1.1450	29.3130		(27)
External Wall 1	66.0000	25.6000	40.4000	0.1200	4.8480		(29a)
Shelterrd Corrirodor	14.3000		14.3000	0.1842	2.6335		(29a)
Total net area of external elements Aum(A, m2)			80.3000				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	36.7945	(33)
Party Wall 1			26.4300	0.0000	0.0000		(32)
Party Floor 1			80.0000				(32d)
Party Ceilings 1			80.0000				(32b)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							12.1570 (36)
Total fabric heat loss						(33) + (36) =	48.9515 (37)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	17.9231	17.7128	17.5024	16.4505	16.2401	15.1883	15.1883	14.9779	15.6090	16.2401	16.6609	17.0816 (38)
Heat transfer coeff	66.8746	66.6642	66.4539	65.4020	65.1916	64.1397	64.1397	63.9294	64.5605	65.1916	65.6124	66.0331 (39)
Average = Sum(39)m / 12 =												65.3494 (39)
HLP	0.8359	0.8333	0.8307	0.8175	0.8149	0.8017	0.8017	0.7991	0.8070	0.8149	0.8202	0.8254 (40)
HLP (average)												0.8169 (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												2.4629 (42)
Average daily hot water use (litres/day)												92.6930 (43)
Daily hot water use	101.9622	98.2545	94.5468	90.8391	87.1314	83.4237	83.4237	87.1314	90.8391	94.5468	98.2545	101.9622 (44)
Energy conte	151.2071	132.2467	136.4667	118.9750	114.1593	98.5108	91.2848	104.7506	106.0017	123.5347	134.8478	146.4360 (45)
Energy content (annual)										Total = Sum(45)m =		1458.4211 (45)
Distribution loss (46)m = 0.15 x (45)m	22.6811	19.8370	20.4700	17.8462	17.1239	14.7766	13.6927	15.7126	15.9002	18.5302	20.2272	21.9654 (46)

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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	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	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	22.5120	23.2624	(59)
Total heat required for water heating calculated for each month															
	206.4839	182.1741	191.7435	172.4687	169.4361	152.0045	146.5616	160.0274	159.4953	178.8115	188.3415	201.7128	201.7128	188.3415	(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	0.0000	0.0000	(63)
Solar input (sum of months) = Sum(63)m =													0.0000	(64)	
Output from w/h	206.4839	182.1741	191.7435	172.4687	169.4361	152.0045	146.5616	160.0274	159.4953	178.8115	188.3415	201.7128	201.7128	188.3415	(64)
													Total per year (kWh/year) = Sum(64)m =	2109.2608	(64)
Heat gains from water heating, kWh/month	94.4978	83.9140	89.5966	82.3541	82.1794	75.5498	74.5736	79.0510	78.0405	85.2967	87.6318	92.9114	92.9114	85.2967	(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	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	19.5633	17.3759	14.1311	10.6981	7.9970	6.7514	7.2951	9.4825	12.7273	16.1603	18.8614	20.1070	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.4405	221.7177	215.9794	203.7634	188.3429	173.8497	164.1674	161.8903	167.6286	179.8446	195.2651	209.7582	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	(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)	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	(71)
Water heating gains (Table 5)	127.0132	124.8720	120.4256	114.3807	110.4562	104.9303	100.2334	106.2514	108.3896	114.6461	121.7109	124.8809	(72)
Total internal gains	425.9599	423.9085	410.4790	388.7852	366.7390	345.4743	331.6388	337.5671	348.6884	370.5939	395.7803	414.6891	(73)

6. Solar gains

[Jan]													Gains W
	Area m2	Solar flux Table 6a W/m2		Specific data or Table 6b	g	Specific data or Table 6c	FF	Access factor Table 6d					
Northeast	10.7000	11.2829		0.2900	0.7000	0.7000	0.7700					16.9838	(75)
South	14.9000	46.7521		0.2900	0.7000	0.7000	0.7700					97.9978	(78)
Solar gains	114.9816	195.0662	266.7284	333.3558	378.2832	378.3106	363.5371	329.1940	289.4607	215.3576	137.5309	98.5490	(83)
Total gains	540.9415	618.9747	677.2074	722.1410	745.0222	723.7849	695.1759	666.7611	638.1491	585.9516	533.3112	513.2381	(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	83.0742	83.3364	83.6002	84.9447	85.2189	86.6164	86.6164	86.9015	86.0519	85.2189	84.6724	84.1329	(86)	
alpha	6.5383	6.5558	6.5733	6.6630	6.6813	6.7744	6.7744	6.7934	6.7368	6.6813	6.6448	6.6089	(86)	
util living area	0.9955	0.9883	0.9686	0.9057	0.7656	0.5618	0.4054	0.4401	0.6781	0.9240	0.9881	0.9967	(86)	
MIT	20.2799	20.4250	20.6165	20.8284	20.9552	20.9952	20.9995	20.9992	20.9841	20.8293	20.5191	20.2541	(87)	
Th 2	20.2223	20.2246	20.2268	20.2382	20.2404	20.2518	20.2518	20.2541	20.2473	20.2404	20.2359	20.2314	(88)	
util rest of house	0.9941	0.9849	0.9594	0.8807	0.7171	0.4985	0.3368	0.3693	0.6121	0.8982	0.9839	0.9957	(89)	
MIT 2	19.2611	19.4728	19.7476	20.0450	20.1992	20.2487	20.2516	20.2538	20.2358	20.0533	19.6191	19.2307	(90)	
Living area fraction	19.6979	19.8811	20.1202	20.3809	20.5233	20.5688	20.5723	20.5734	20.5566	20.3860	20.0050	19.6695	(91)	
Temperature adjustment												0.0000	(92)	
adjusted MIT	19.6979	19.8811	20.1202	20.3809	20.5233	20.5688	20.5723	20.5734	20.5566	20.3860	20.0050	19.6695	(93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation	0.9929	0.9830	0.9579	0.8858	0.7359	0.5256	0.3662	0.3997	0.6399	0.9037	0.9823	0.9947	(94)	
Useful gains	537.0954	608.4668	648.7084	639.6926	548.2264	380.4064	254.6023	266.4833	408.3200	529.5259	523.8881	510.5218	(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	1029.7288	998.7031	905.1122	750.8742	575.2083	382.8352	254.7822	266.8012	416.8406	637.9657	846.7256	1021.4973	(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	366.5193	262.2388	190.7644	80.0508	20.0745	0.0000	0.0000	0.0000	0.0000	80.6792	232.4430	380.1658	(98)	
Space heating												1612.9358	(98)	
Space heating per m2												(98) / (4) =	20.1617	(99)

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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 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	1612.9358 (98)
Space heat from Heat pump = (98) x 1.00 x 1.00 x 1.05	1693.5826 (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	2109.2608 (64)
Water heat from Heat pump = (64) x 1.00 x 1.00 x 1.05	2214.7239 (310a)
Electricity used for heat distribution	39.0831 (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)	158.6000 (330a)
Total electricity for the above, kWh/year	158.6000 (331)
Electricity for lighting (calculated in Appendix L)	345.4937 (332)
Energy saving/generation technologies (Appendices M ,N and Q)	
Total delivered energy for all uses	4412.4002 (338)

12b. Carbon dioxide emissions - Community heating scheme

	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	1302.7688	0.5190	676.1370 (367)
Electrical energy for heat distribution	39.0831	0.5190	20.2841 (372)
Total CO2 associated with community systems (negative value allowed since DFEE <= TFEE)			696.4211 (373)
Space and water heating			696.4211 (376)
Pumps and fans	158.6000	0.5190	82.3134 (378)
Energy for lighting	345.4937	0.5190	179.3112 (379)
Energy saving/generation technologies			
PV Unit	-350.0000	0.5190	-181.6500 (380)
Total CO2, kg/year			776.3958 (383)
Dwelling Carbon Dioxide Emission Rate (DER)			9.7000 (384)

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

DER	9.7000 ZC1
Total Floor Area	80.0000 TFA
Assumed number of occupants	2.4629 N
CO2 emission factor in Table 12 for electricity displaced from grid	0.5190 EF
CO2 emissions from appliances, equation (L14)	16.2545 ZC2
CO2 emissions from cooking, equation (L16)	2.2264 ZC3
Total CO2 emissions	28.1808 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	28.1808 ZC8

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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 CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	80.0000 (1b)	2.5000 (2b)	200.0000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	80.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	200.0000 (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				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) =	0.1500 (8)
Pressure test				Yes	
Measured/design AP50					5.0000
Infiltration rate					0.4000 (18)
Number of sides sheltered					2 (19)
Shelter factor			(20) = 1 - [0.075 x (19)] =		0.8500 (20)
Infiltration rate adjusted to include shelter factor			(21) = (18) x (20) =		0.3400 (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	0.4335	0.4250	0.4165	0.3740	0.3655	0.3230	0.3230	0.3145	0.3400	0.3655	0.3825	0.3995 (22b)
Effective ac	0.5940	0.5903	0.5867	0.5699	0.5668	0.5522	0.5522	0.5495	0.5578	0.5668	0.5732	0.5798 (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)			20.0000	1.3258	26.5152		(27)					
External Wall 1	66.0000	20.0000	46.0000	0.1800	8.2800		(29a)					
Shelterrd Corrirodir	14.3000		14.3000	0.1800	2.5740		(29a)					
Total net area of external elements Aum(A, m2)			80.3000				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	37.3692	(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.9993 (36)					
Total fabric heat loss						(33) + (36) =	45.3685 (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	39.2014	38.9606	38.7246	37.6159	37.4085	36.4429	36.4429	36.2640	36.8148	37.4085	37.8281	38.2668 (38)
Average = Sum(39)m / 12 =	84.5699	84.3291	84.0930	82.9844	82.7769	81.8113	81.8113	81.6325	82.1833	82.7769	83.1966	83.6353 (39)
HLP	1.0571	1.0541	1.0512	1.0373	1.0347	1.0226	1.0226	1.0204	1.0273	1.0347	1.0400	1.0454 (40)
HLP (average)												1.0373 (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												2.4629 (42)
Average daily hot water use (litres/day)												92.6930 (43)
Daily hot water use	101.9622	98.2545	94.5468	90.8391	87.1314	83.4237	83.4237	87.1314	90.8391	94.5468	98.2545	101.9622 (44)
Energy conte	151.2071	132.2467	136.4667	118.9750	114.1593	98.5108	91.2848	104.7506	106.0017	123.5347	134.8478	146.4360 (45)
Energy content (annual)												Total = Sum(45)m = 1458.4211 (45)
Distribution loss (46)m = 0.15 x (45)m	22.6811	19.8370	20.4700	17.8462	17.1239	14.7766	13.6927	15.7126	15.9002	18.5302	20.2272	21.9654 (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	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	197.8020	174.3324	183.0616	164.0668	160.7542	143.6027	137.8797	151.3455	151.0935	170.1296	179.9396	193.0309 (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	197.8020	174.3324	183.0616	164.0668	160.7542	143.6027	137.8797	151.3455	151.0935	170.1296	179.9396	193.0309 (64)
Heat gains from water heating, kWh/month	87.5523	77.6406	82.6511	75.6327	75.2339	68.8283	67.6281	72.1055	71.3190	78.3512	80.9104	85.9659 (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	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431	123.1431 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	19.5633	17.3759	14.1311	10.6981	7.9970	6.7514	7.2951	9.4825	12.7273	16.1603	18.8614	20.1070 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	219.4405	221.7177	215.9794	203.7634	188.3429	173.8497	164.1674	161.8903	167.6286	179.8446	195.2651	209.7582 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143	35.3143 (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)	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144	-98.5144 (71)
Water heating gains (Table 5)	117.6778	115.5366	111.0902	105.0454	101.1208	95.5949	90.8980	96.9160	99.0542	105.3108	112.3755	115.5455 (72)
Total internal gains	419.6245	417.5731	404.1436	382.4498	360.4036	339.1389	325.3035	331.2317	342.3530	364.2585	389.4450	408.3537 (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	8.3600	11.2829	0.6300	0.7000	0.7700	28.8271 (75)						
South	11.6400	46.7521	0.6300	0.7000	0.7700	166.3128 (78)						
Solar gains	195.1398	331.0558	452.6803	565.7629	642.0171	642.0656	616.9913	558.7014	491.2624	365.4942	233.4093	167.2512 (83)
Total gains	614.7644	748.6289	856.8238	948.2126	1002.4207	981.2045	942.2948	889.9331	833.6154	729.7528	622.8542	575.6049 (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	65.6919	65.8795	66.0644	66.9470	67.1148	67.9069	67.9069	68.0557	67.5996	67.1148	66.7763	66.4260	
alpha	5.3795	5.3920	5.4043	5.4631	5.4743	5.5271	5.5271	5.5370	5.5066	5.4743	5.4518	5.4284	
util living area	0.9935	0.9815	0.9507	0.8684	0.7167	0.5258	0.3809	0.4199	0.6519	0.9062	0.9839	0.9953 (86)	
MIT	20.0429	20.2557	20.5161	20.7835	20.9384	20.9907	20.9987	20.9978	20.9716	20.7607	20.3488	20.0041 (87)	
Th 2	20.0360	20.0385	20.0409	20.0524	20.0545	20.0645	20.0645	20.0664	20.0607	20.0545	20.0502	20.0456 (88)	
util rest of house	0.9915	0.9759	0.9365	0.8348	0.6591	0.4524	0.3005	0.3358	0.5742	0.8735	0.9781	0.9939 (89)	
MIT 2	18.7745	19.0830	19.4521	19.8174	20.0002	20.0589	20.0641	20.0655	20.0410	19.7995	19.2287	18.7255 (90)	
Living area fraction	fLA = Living area / (4) =											0.4288 (91)	
MIT	19.3183	19.5858	19.9083	20.2316	20.4025	20.4584	20.4648	20.4652	20.4400	20.2116	19.7089	19.2737 (92)	
Temperature adjustment													0.0000
adjusted MIT	19.3183	19.5858	19.9083	20.2316	20.4025	20.4584	20.4648	20.4652	20.4400	20.2116	19.7089	19.2737 (93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9895	0.9727	0.9342	0.8417	0.6811	0.4837	0.3350	0.3719	0.6065	0.8796	0.9755	0.9922 (94)
Useful gains	608.3022	728.1905	800.4603	798.1415	682.7196	474.5687	315.6795	330.9705	505.6288	641.9029	607.5707	571.1401 (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	1270.0973	1238.4396	1127.5441	940.3436	720.3630	479.2859	316.1825	331.8553	521.0421	795.6205	1049.0183	1260.6915 (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	492.3755	342.8874	243.3504	102.3855	28.0066	0.0000	0.0000	0.0000	0.0000	114.3659	317.8423	513.0262 (98)
Space heating												2154.2399 (98)
Space heating per m2												(98) / (4) = 26.9280 (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													2303.9998 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	492.3755	342.8874	243.3504	102.3855	28.0066	0.0000	0.0000	0.0000	0.0000	114.3659	317.8423	513.0262	(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)	526.6049	366.7245	260.2678	109.5032	29.9536	0.0000	0.0000	0.0000	0.0000	122.3164	339.9383	548.6911	(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	197.8020	174.3324	183.0616	164.0668	160.7542	143.6027	137.8797	151.3455	151.0935	170.1296	179.9396	193.0309	(64)
Efficiency of water heater (217)m	87.1509	86.5868	85.5740	83.5980	81.2249	79.8000	79.8000	79.8000	79.8000	83.7821	86.3163	79.8000	(216)
Fuel for water heating, kWh/month	226.9648	201.3384	213.9219	196.2570	197.9126	179.9532	172.7815	189.6560	189.3402	203.0621	208.4654	221.1127	(219)
Water heating fuel used													2400.7659 (219)
Annual totals kWh/year													
Space heating fuel - main system													2303.9998 (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)													345.4937 (232)
Total delivered energy for all uses													5125.2594 (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	2303.9998	0.2160	497.6640 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2400.7659	0.2160	518.5654 (264)
Space and water heating			1016.2294 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	345.4937	0.5190	179.3112 (268)
Total CO2, kg/m2/year			1234.4656 (272)
Emissions per m2 for space and water heating			12.7029 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.2414 (272b)
Emissions per m2 for pumps and fans			0.4866 (272c)
Target Carbon Dioxide Emission Rate (TER) = (12.7029 * 1.55) + 2.2414 + 0.4866, rounded to 2 d.p.			22.4200 (273)