

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)

Property Reference	22080			Issued on Date	05/04/2022
Assessment Reference	002	Prop Type Ref			
Property					
SAP Rating	90 B	DER	7.99	TER	18.36
Environmental	91 B	% DER<TER	56.48		
CO ₂ Emissions (t/year)	1.93	DFEE	43.02	TFEE	48.64
General Requirements Compliance	Pass	% DFEE<TFEE	11.56		
Assessor Details	Mr. Adrian Fell, Compass Energy Solutions Limited, Tel: 01440785794, mail@compass-energy.co.uk			Assessor ID	N222-0001
Client					

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

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DWELLING AS BUILT

Detached House, total floor area 277 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
Fuel factor:1.55 (electricity)
Target Carbon Dioxide Emission Rate (TER) 18.36 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 7.99 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)48.6 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)43.0 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.17 (max. 0.30)	0.19 (max. 0.70)	OK
Floor	0.11 (max. 0.25)	0.11 (max. 0.70)	OK
Roof	0.14 (max. 0.20)	0.16 (max. 0.35)	OK
Openings	1.39 (max. 2.00)	1.50 (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 (measured in this dwelling)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Heat pump with radiators or underfloor - Electric
Mitsubishi Electric Ecodan 11.2 kW PUZ-WM112VAA

Secondary heating system: None

5 Cylinder insulation

Hot water storage Measured cylinder loss: 2.09 kWh/day
Permitted by DBSCG 2.86 OK
Primary pipework insulated: Yes OK

6 Controls

Space heating controls: Time and temperature zone control OK

Hot water controls:

Cylinderstat OK
Independent timer for DHW OK

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: 0.89
Maximum 1.5 OK
MVHR efficiency: 93%
Minimum: 70% OK

9 Summertime temperature

Overheating risk (Thames Valley): Slight OK

Based on:

Overshading: Average
Windows facing North East: 4.62 m², No overhang
Windows facing South East: 15.22 m², No overhang
Windows facing South West: 16.14 m², No overhang
Windows facing North West: 8.83 m², No overhang
Air change rate: 4.00 ach
Blinds/curtains: None

10 Key features

Roof U-value 0.10 W/m²K
Floor U-value 0.11 W/m²K
Floor U-value 0.11 W/m²K
Door U-value 1.00 W/m²K
Air permeability 3.0 m³/m²h

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Built) (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	103.3500 (1b)	2.4300 (2b)	251.1405 (1b) - (3b)
First floor	136.6400 (1c)	2.4500 (2c)	334.7680 (1c) - (3c)
Second floor	37.4200 (1d)	2.4500 (2c)	91.6790 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	277.4100		(4)
Dwelling volume			(3a) + (3b) + (3c) + (3d) + (3e) ... (3n) = 677.5875 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour							
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)							
Number of open flues	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					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)							
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	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)
Adj infilt rate	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)
Balanced mechanical ventilation with heat recovery	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)
If mechanical ventilation:												0.5000 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												79.0500 (23c)
Effective ac	0.2673	0.2641	0.2609	0.2450	0.2418	0.2259	0.2259	0.2227	0.2323	0.2418	0.2482	0.2546 (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					
Window (Uw = 1.40)			28.5300	1.3258	37.8239		(27)					
Glazed Doors (Uw = 1.50)			16.2800	1.4151	23.0377		(27)					
Front Door			3.9000	1.0000	3.9000		(26)					
Roof Light (Uw = 1.30)			4.1600	1.2357	5.1407		(27a)					
Heat Loss Floor 1			64.1800	0.1100	7.0598		(28a)					
Heat Loss Floor 2			39.1700	0.1100	4.3087		(28a)					
Clad Wall	139.0000	24.3600	114.6400	0.1700	19.4888		(29a)					
Retaining Wall	18.9000		18.9000	0.1900	3.5910		(29a)					
Solid Outer Wall	78.9100	24.3500	54.5600	0.1700	9.2752		(29a)					
Sloping Roof	106.3400	4.1600	102.1800	0.1600	16.3488		(30)					
Cold Roof	55.1300		55.1300	0.1000	5.5130		(30)					
Total net area of external elements Aum(A, m2)			501.6300				(31)					
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =	135.4876			(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							33.4940 (36)					
Total fabric heat loss							(33) + (36) = 168.9816 (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	59.7721	59.0594	58.3466	54.7829	54.0702	50.5065	50.5065	49.7938	51.9320	54.0702	55.4957	56.9212 (38)
Heat transfer coeff	228.7537	228.0410	227.3282	223.7645	223.0518	219.4881	219.4881	218.7754	220.9136	223.0518	224.4773	225.9027 (39)
Average = Sum(39)m / 12 =												223.5863 (39)
HLP	0.8246	0.8220	0.8195	0.8066	0.8041	0.7912	0.7912	0.7886	0.7963	0.8041	0.8092	0.8143 (40)
HLP (average)												0.8060 (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	3.1026 (42)
Average daily hot water use (litres/day)	107.8859 (43)

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	118.6745	114.3590	110.0436	105.7282	101.4127	97.0973	97.0973	101.4127	105.7282	110.0436	114.3590	118.6745 (44)
Energy conte	175.9908	153.9227	158.8344	138.4757	132.8707	114.6573	106.2469	121.9198	123.3759	143.7828	156.9501	170.4377 (45)
Energy content (annual)	Total = Sum(45)m = 1697.4648 (45)											
Distribution loss (46)m = 0.15 x (45)m	26.3986	23.0884	23.8252	20.7714	19.9306	17.1986	15.9370	18.2880	18.5064	21.5674	23.5425	25.5657 (46)
Water storage loss:												
Store volume												300.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												2.0900 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												1.1286 (55)
Total storage loss	34.9866	31.6008	34.9866	33.8580	34.9866	33.8580	34.9866	34.9866	33.8580	34.9866	33.8580	34.9866 (56)
If cylinder contains dedicated solar storage	34.9866	31.6008	34.9866	33.8580	34.9866	33.8580	34.9866	34.9866	33.8580	34.9866	33.8580	34.9866 (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	234.2398	206.5347	217.0834	194.8457	191.1197	171.0273	164.4959	180.1688	179.7459	202.0318	213.3201	228.6867 (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	234.2398	206.5347	217.0834	194.8457	191.1197	171.0273	164.4959	180.1688	179.7459	202.0318	213.3201	228.6867 (64)
Heat gains from water heating, kWh/month	105.1161	93.2689	99.4116	91.1392	90.7787	83.2196	81.9263	87.1375	86.1185	94.4070	97.2819	103.2697 (65)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Metabolic gains (Table 5), Watts												
(66)m	155.1281	155.1281	155.1281	155.1281	155.1281	155.1281	155.1281	155.1281	155.1281	155.1281	155.1281	155.1281 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	40.0514	35.5733	28.9302	21.9020	16.3720	13.8219	14.9351	19.4132	26.0564	33.0845	38.6145	41.1646 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	439.7039	444.2667	432.7687	408.2908	377.3919	348.3513	328.9504	324.3877	335.8857	360.3635	391.2624	420.3030 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	38.5128	38.5128	38.5128	38.5128	38.5128	38.5128	38.5128	38.5128	38.5128	38.5128	38.5128	38.5128 (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)	-124.1025	-124.1025	-124.1025	-124.1025	-124.1025	-124.1025	-124.1025	-124.1025	-124.1025	-124.1025	-124.1025	-124.1025 (71)
Water heating gains (Table 5)	141.2851	138.7930	133.6178	126.5822	122.0144	115.5827	110.1160	117.1204	119.6090	126.8911	135.1138	138.8034 (72)
Total internal gains	690.5789	688.1714	664.8551	626.3135	585.3168	547.2945	523.5400	530.4597	551.0895	589.8776	634.5292	669.8095 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W						
Northeast	4.6200	11.2829	0.6300	0.7000	0.7700	15.9307 (75)						
Southeast	15.2200	36.7938	0.6300	0.7000	0.7700	171.1439 (77)						
Southwest	4.7000	36.7938	0.6300	0.7000	0.7700	52.8500 (79)						
Northwest	3.9900	11.2829	0.6300	0.7000	0.7700	13.7584 (81)						
Southwest	11.4400	36.7938	0.6300	0.7000	0.7700	128.6391 (79)						
Northwest	4.8400	11.2829	0.6300	0.7000	0.7700	16.6894 (81)						
Southeast	0.8000	38.2331	0.6300	0.7000	1.0000	12.1398 (82)						
Southwest	3.3600	38.2331	0.6300	0.7000	1.0000	50.9870 (82)						
Solar gains	462.1382	813.5350	1177.7403	1558.8694	1830.6472	1852.9268	1771.7626	1564.6904	1309.6373	917.0707	558.4618	392.2358 (83)
Total gains	1152.7171	1501.7064	1842.5954	2185.1829	2415.9640	2400.2213	2295.3026	2095.1501	1860.7268	1506.9482	1192.9910	1062.0453 (84)

7. Mean internal temperature (heating season)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
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	84.2154	84.4786	84.7435	86.0931	86.3682	87.7705	87.7705	88.0565	87.2042	86.3682	85.8198	85.2782
alpha	6.6144	6.6319	6.6496	6.7395	6.7579	6.8514	6.8514	6.8704	6.8136	6.7579	6.7213	6.6852
util living area	0.9997	0.9984	0.9907	0.9438	0.7961	0.5790	0.4201	0.4787	0.7710	0.9803	0.9990	0.9999 (86)
Tweekday	19.1866	19.3838	19.6609	19.9841	20.1524	20.2001	20.2026	20.2047	20.1791	19.9174	19.4884	19.1665
Tweekend	20.5079	20.5943	20.7166	20.8609	20.9475	20.9717	20.9740	20.9738	20.9584	20.8264	20.6363	20.4958
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	0	0	0	0	0	0	0	0	0	0	0	0
16 / 9	0	0	0	0	0	0	0	0	0	0	0	0
MIT	20.2405	20.3724	20.5627	20.7828	20.9190	20.9565	20.9599	20.9595	20.9351	20.7320	20.4321	20.2219 (87)
Th 2	20.2321	20.2343	20.2365	20.2476	20.2498	20.2610	20.2610	20.2632	20.2565	20.2498	20.2454	20.2409 (88)
util rest of house	0.9997	0.9979	0.9875	0.9262	0.7493	0.5149	0.3499	0.4029	0.7055	0.9712	0.9986	0.9998 (89)
Tweekday	19.1866	19.3838	19.6609	19.9841	20.1524	20.2001	20.2026	20.2047	20.1791	19.9174	19.4884	19.1665
Tweekend	19.1866	19.3838	19.6609	19.9841	20.1524	20.2001	20.2026	20.2047	20.1791	19.9174	19.4884	19.1665
MIT 2	19.1866	19.3838	19.6609	19.9841	20.1524	20.2001	20.2026	20.2047	20.1791	19.9174	19.4884	19.1665 (90)
Living area fraction	fLA = Living area / (4) =											0.0844 (91)
MIT	19.2755	19.4673	19.7370	20.0515	20.2172	20.2640	20.2665	20.2685	20.2430	19.9862	19.5681	19.2556 (92)
Temperature adjustment												0.0000
adjusted MIT	19.2755	19.4673	19.7370	20.0515	20.2172	20.2640	20.2665	20.2685	20.2430	19.9862	19.5681	19.2556 (93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9995	0.9972	0.9848	0.9208	0.7472	0.5152	0.3504	0.4035	0.7042	0.9671	0.9981	0.9997	(94)
Useful gains	1152.1484	1497.4444	1814.5563	2012.2233	1805.1261	1236.5263	804.3603	845.3276	1310.3384	1457.3047	1190.7686	1061.7402	(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													
	3425.7118	3321.9310	3009.1418	2495.3074	1899.7674	1243.1721	804.7582	846.3240	1357.0650	2093.6067	2798.8016	3401.1040	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh													
	1691.5312	1226.0550	888.7716	347.8205	70.4131	0.0000	0.0000	0.0000	0.0000	473.4087	1157.7837	1740.4867	(98)
Space heating													7596.2704
Space heating per m2													(98) / (4) = 27.3828

8c. Space cooling requirement

Not applicable

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 %)														452.3264	(206)
Efficiency of secondary/supplementary heating system, %														100.0000	(208)
Space heating requirement														1679.3780	(211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
Space heating requirement	1691.5312	1226.0550	888.7716	347.8205	70.4131	0.0000	0.0000	0.0000	0.0000	473.4087	1157.7837	1740.4867	(98)		
Space heating efficiency (main heating system 1)	452.3264	452.3264	452.3264	452.3264	452.3264	0.0000	0.0000	0.0000	0.0000	452.3264	452.3264	452.3264	(210)		
Space heating fuel (main heating system)	373.9625	271.0554	196.4890	76.8959	15.5669	0.0000	0.0000	0.0000	0.0000	104.6609	255.9620	384.7855	(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															
Water heating requirement	234.2398	206.5347	217.0834	194.8457	191.1197	171.0273	164.4959	180.1688	179.7459	202.0318	213.3201	228.6867	(64)		
Efficiency of water heater	278.8250	278.8250	278.8250	278.8250	278.8250	278.8250	278.8250	278.8250	278.8250	278.8250	278.8250	278.8250	(216)		
(217)m	278.8250	278.8250	278.8250	278.8250	278.8250	278.8250	278.8250	278.8250	278.8250	278.8250	278.8250	278.8250	(217)		
Fuel for water heating, kWh/month	84.0096	74.0732	77.8565	69.8810	68.5447	61.3386	58.9961	64.6172	64.4655	72.4583	76.5068	82.0180	(219)		
Water heating fuel used													854.7655	(219)	
Annual totals kWh/year															
Space heating fuel - main system														1679.3780	(211)
Space heating fuel - secondary														0.0000	(215)
Electricity for pumps and fans:															
(BalancedWithHeatRecovery, Database: in-use factor = 1.4000, SFP = 1.2460)															
mechanical ventilation fans (SFP = 1.2460)														1030.0143	(230a)
Total electricity for the above, kWh/year														1030.0143	(231)
Electricity for lighting (calculated in Appendix L)														707.3210	(232)
Total delivered energy for all uses														4271.4788	(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	1679.3780	0.5190	871.5972	(261)
Space heating - secondary	0.0000	0.5190	0.0000	(263)
Water heating (other fuel)	854.7655	0.5190	443.6233	(264)
Space and water heating			1315.2205	(265)
Pumps and fans	1030.0143	0.5190	534.5774	(267)
Energy for lighting	707.3210	0.5190	367.0996	(268)
Total CO2, kg/year			2216.8975	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			7.9900	(273)

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

DER			7.9900	ZC1
Total Floor Area		TFA	277.4100	
Assumed number of occupants		N	3.1026	
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190	
CO2 emissions from appliances, equation (L14)			9.3926	ZC2
CO2 emissions from cooking, equation (L16)			0.6974	ZC3
Total CO2 emissions			18.0800	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			18.0800	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 (m ²)	Storey height (m)	Volume (m ³)
Ground floor	103.3500 (1b)	2.4300 (2b)	251.1405 (1b) - (3b)
First floor	136.6400 (1c)	2.4500 (2c)	334.7680 (1c) - (3c)
Second floor	37.4200 (1d)	2.4500 (2c)	91.6790 (1d) - (3d)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	277.4100		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 677.5875 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	0	0	0 * 40 =	0.0000 (6a)
Number of open flues	0	0	0	0 * 20 =	0.0000 (6b)
Number of intermittent fans				4 * 10 =	40.0000 (7a)
Number of passive vents				0 * 10 =	0.0000 (7b)
Number of flueless gas fires				0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				40.0000 / (5) =	0.0590 (8)
Pressure test				Yes	
Measured/design AP50				5.0000	
Infiltration rate				0.3090	(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) =	0.2627 (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	0.3349	0.3283	0.3218	0.2889	0.2824	0.2495	0.2495	0.2430	0.2627	0.2824	0.2955	0.3086 (22b)
Effective ac	0.5561	0.5539	0.5518	0.5417	0.5399	0.5311	0.5311	0.5295	0.5345	0.5399	0.5437	0.5476 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			3.9000	1.0000	3.9000		(26)
TER Opening Type (Uw = 1.40)			44.8100	1.3258	59.4072		(27)
TER Room Window (Uw = 1.70)			4.1600	1.5918	6.6217		(27a)
Heat Loss Floor 1			64.1800	0.1300	8.3434		(28a)
Heat Loss Floor 2			39.1700	0.1300	5.0921		(28a)
Clad Wall	139.0000	24.3600	114.6400	0.1800	20.6352		(29a)
Retaining Wall	18.9000		18.9000	0.1800	3.4020		(29a)
Solid Outer Wall	78.9100	24.3500	54.5600	0.1800	9.8208		(29a)
Sloping Roof	106.3400	4.1600	102.1800	0.1300	13.2834		(30)
Cold Roof	55.1300		55.1300	0.1300	7.1669		(30)
Total net area of external elements Aum(A, m ²)			501.6300				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 137.6727		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							21.8122 (36)
Total fabric heat loss							(33) + (36) = 159.4849 (37)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	124.3425	123.8555	123.3782	121.1362	120.7168	118.7641	118.7641	118.4025	119.5162	120.7168	121.5654	122.4525 (38)
Heat transfer coeff	283.8274	283.3405	282.8631	280.6212	280.2017	278.2490	278.2490	277.8874	279.0012	280.2017	281.0503	281.9374 (39)
Average = Sum(39)m / 12 =												280.6192 (39)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0231	1.0214	1.0197	1.0116	1.0101	1.0030	1.0030	1.0017	1.0057	1.0101	1.0131	1.0163 (40)
HLP (average)												1.0116 (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												3.1026 (42)
Average daily hot water use (litres/day)												107.8859 (43)
Daily hot water use	118.6745	114.3590	110.0436	105.7282	101.4127	97.0973	97.0973	101.4127	105.7282	110.0436	114.3590	118.6745 (44)
Energy conte	175.9908	153.9227	158.8344	138.4757	132.8707	114.6573	106.2469	121.9198	123.3759	143.7828	156.9501	170.4377 (45)
Energy content (annual)										Total = Sum(45)m =		1697.4648 (45)

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Distribution loss (46)m = 0.15 x (45)m	26.3986	23.0884	23.8252	20.7714	19.9306	17.1986	15.9370	18.2880	18.5064	21.5674	23.5425	25.5657 (46)
Water storage loss:												
Store volume												300.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												2.1127 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												1.1409 (55)
Total storage loss	35.3664	31.9439	35.3664	34.2256	35.3664	34.2256	35.3664	35.3664	34.2256	35.3664	34.2256	35.3664 (56)
If cylinder contains dedicated solar storage	35.3664	31.9439	35.3664	34.2256	35.3664	34.2256	35.3664	35.3664	34.2256	35.3664	34.2256	35.3664 (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	234.6196	206.8777	217.4632	195.2132	191.4995	171.3949	164.8757	180.5486	180.1135	202.4116	213.6877	229.0665 (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	234.6196	206.8777	217.4632	195.2132	191.4995	171.3949	164.8757	180.5486	180.1135	202.4116	213.6877	229.0665 (64)
Heat gains from water heating, kWh/month	105.4200	93.5433	99.7155	91.4332	91.0826	83.5136	82.2301	87.4414	86.4126	94.7108	97.5760	103.5736 (65)
												Solar input (sum of months) = Sum(63)m = 0.0000 (63)
												Total per year (kWh/year) = Sum(64)m = 2387.7718 (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	155.1281	155.1281	155.1281	155.1281	155.1281	155.1281	155.1281	155.1281	155.1281	155.1281	155.1281	155.1281 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	40.0514	35.5733	28.9302	21.9020	16.3720	13.8219	14.9351	19.4132	26.0564	33.0845	38.6145	41.1646 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	439.7039	444.2667	432.7687	408.2908	377.3919	348.3513	328.9504	324.3877	335.8857	360.3635	391.2624	420.3030 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	38.5128	38.5128	38.5128	38.5128	38.5128	38.5128	38.5128	38.5128	38.5128	38.5128	38.5128	38.5128 (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)	-124.1025	-124.1025	-124.1025	-124.1025	-124.1025	-124.1025	-124.1025	-124.1025	-124.1025	-124.1025	-124.1025	-124.1025 (71)
Water heating gains (Table 5)	141.6935	139.2014	134.0262	126.9906	122.4228	115.9911	110.5244	117.5288	120.0174	127.2995	135.5222	139.2118 (72)
Total internal gains	693.9873	691.5798	668.2635	629.7219	588.7252	550.7029	526.9484	533.8681	554.4979	593.2860	637.9376	673.2179 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	Access factor Table 6d	Gains W						
Northeast	4.6200	11.2829	0.6300	0.7000	0.7700	15.9307 (75)						
Southeast	15.2200	36.7938	0.6300	0.7000	0.7700	171.1439 (77)						
Southwest	16.1400	36.7938	0.6300	0.7000	0.7700	181.4890 (79)						
Northwest	8.8300	11.2829	0.6300	0.7000	0.7700	30.4477 (81)						
Southeast	0.8000	38.2331	0.6300	0.7000	1.0000	12.1398 (82)						
Southwest	3.3600	38.2331	0.6300	0.7000	1.0000	50.9870 (82)						
Solar gains	462.1382	813.5350	1177.7403	1558.8694	1830.6472	1852.9268	1771.7626	1564.6904	1309.6373	917.0707	558.4618	392.2358 (83)
Total gains	1156.1255	1505.1148	1846.0038	2188.5913	2419.3724	2403.6297	2298.7110	2098.5585	1864.1352	1510.3566	1196.3994	1065.4537 (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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
alpha	67.8743	67.9909	68.1057	68.6498	68.7526	69.2350	69.2350	69.3251	69.0484	68.7526	68.5450	68.3293	
util living area	5.5250	5.5327	5.5404	5.5767	5.5835	5.6157	5.6157	5.6217	5.6032	5.5835	5.5697	5.5553	
util living area	0.9997	0.9985	0.9934	0.9675	0.8777	0.6996	0.5252	0.5939	0.8619	0.9876	0.9990	0.9998 (86)	
MIT	19.7579	19.9396	20.2136	20.5561	20.8324	20.9655	20.9941	20.9889	20.8893	20.5058	20.0586	19.7261 (87)	
Th 2	20.0641	20.0656	20.0670	20.0737	20.0750	20.0808	20.0808	20.0819	20.0786	20.0750	20.0724	20.0698 (88)	
util rest of house	0.9996	0.9980	0.9909	0.9551	0.8349	0.6155	0.4194	0.4831	0.7977	0.9811	0.9986	0.9997 (89)	
MIT 2	18.3796	18.6465	19.0469	19.5420	19.9087	20.0576	20.0786	20.0771	19.9864	19.4780	18.8259	18.3372 (90)	
Living area fraction	18.4960	18.7557	19.1454	19.6276	19.9867	20.1342	20.1559	20.1541	20.0626	19.5648	18.9300	18.4544 (92)	
MIT	18.4960	18.7557	19.1454	19.6276	19.9867	20.1342	20.1559	20.1541	20.0626	19.5648	18.9300	18.4544 (92)	
Temperature adjustment													0.0000
adjusted MIT	18.4960	18.7557	19.1454	19.6276	19.9867	20.1342	20.1559	20.1541	20.0626	19.5648	18.9300	18.4544 (93)	

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9993	0.9969	0.9874	0.9474	0.8301	0.6207	0.4283	0.4922	0.7964	0.9759	0.9978	0.9995 (94)
Ext temp.	1155.2927	1500.4934	1822.8216	2073.4851	2008.4199	1491.9784	984.4447	1032.8071	1484.5764	1473.9055	1193.8150	1064.9630 (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	4029.2100	3925.8671	3576.9235	3010.4022	2321.9356	1539.8989	989.4181	1043.2227	1663.5733	2511.9522	3324.8287	4018.8550 (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 kWh	2138.1944	1629.8511	1305.0518	674.5804	233.2557	0.0000	0.0000	0.0000	0.0000	772.3067	1534.3299	2197.6957 (98)

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Space heating 10485.2657 (98)
 Space heating per m2 (98) / (4) = 37.7970 (99)

8c. Space cooling requirement

Not applicable

9a. Energy requirements - Individual heating systems, including micro-CHP

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
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													11214.1879 (211)
Space heating requirement	2138.1944	1629.8511	1305.0518	674.5804	233.2557	0.0000	0.0000	0.0000	0.0000	772.3067	1534.3299	2197.6957	(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)	2286.8390	1743.1563	1395.7773	721.4763	249.4713	0.0000	0.0000	0.0000	0.0000	825.9965	1640.9945	2350.4766	(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	234.6196	206.8777	217.4632	195.2132	191.4995	171.3949	164.8757	180.5486	180.1135	202.4116	213.6877	229.0665	(64)
Efficiency of water heater (217)m	89.3158	89.1536	88.7994	87.8561	85.3410	79.8000	79.8000	79.8000	79.8000	88.0484	89.0405	89.3689	(217)
Fuel for water heating, kWh/month	262.6853	232.0465	244.8928	222.1966	224.3934	214.7806	206.6111	226.2514	225.7061	229.8869	239.9893	256.3157	(219)
Water heating fuel used													2785.7558 (219)
Annual totals kWh/year													
Space heating fuel - main system													11214.1879 (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)													707.3210 (232)
Total delivered energy for all uses													14782.2646 (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	11214.1879	0.2160	2422.2646 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2785.7558	0.2160	601.7233 (264)
Space and water heating			3023.9878 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	707.3210	0.5190	367.0996 (268)
Total CO2, kg/m2/year			3430.0124 (272)
Emissions per m2 for space and water heating			10.9008 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			1.3233 (272b)
Emissions per m2 for pumps and fans			0.1403 (272c)
Target Carbon Dioxide Emission Rate (TER) = (10.9008 * 1.55) + 1.3233 + 0.1403, rounded to 2 d.p.			18.3600 (273)