

BASIC COMPLIANCE REPORT

Calculation Type: New Build (As Built)



Property Reference	289 West End Road		Issued on Date	31/10/2022	
Assessment Reference	With PV		Prop Type Ref		
Property	289 West End Road, West End, SOUTHAMPTON, SO18 3BW				
SAP Rating	90 B	DER	11.13	TER	16.89
Environmental	91 B	% DER<TER	34.10		
CO₂ Emissions (t/year)	0.66	DFEE	42.37	TFEE	50.36
General Requirements Compliance	Pass	% DFEE<TFEE	15.88		
Assessor Details	Mr. Thomas McMahon, SAeasy Ltd, Tel: 0114 321 2037, info@sapeasy.co.uk			Assessor ID	r863-0001
Client					

SUMMARY FOR INPUT DATA FOR New Build (As Built)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Mains gas		
Fuel factor	1.00 (mains gas)		
Target Carbon Dioxide Emission Rate (TER)	16.89	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	11.13	kgCO ₂ /m ²	Pass
	-5.76 (-34.1%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	50.36	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	42.37	kWh/m ² /yr	
	-8.0 (-15.9%)	kWh/m ² /yr	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Floor	0.16 (max. 0.25)	0.16 (max. 0.70)	Pass
Roof	0.11 (max. 0.20)	0.13 (max. 0.35)	Pass
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	Pass

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	4.81 (measured in this dwelling)	
Maximum	10.0	Pass

Limiting System Efficiencies

4 Heating efficiency

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Main heating system

Boiler system with radiators or underfloor - Mains gas
Data from database
Worcester Greenstar 36CDi Compact ErP
Combi boiler
Efficiency: 89.8% SEDBUK2009
Minimum: 88.0%

Pass

Secondary heating system

None

5 Cylinder insulation

Hot water storage

No cylinder

6 Controls

Space heating controls

Programmer, room thermostat and TRVs

Pass

Hot water controls

No cylinder

Boiler interlock

Yes

Pass

7 Low energy lights

Percentage of fixed lights with low-energy fittings

100

%

Minimum

75

%

Pass

8 Mechanical ventilation

Not applicable

Criterion 3 – Limiting the effects of heat gains in summer

9 Summertime temperature

Overheating risk (Southern England)

Slight

Pass

Based on:

Overshading

Average

Windows facing North

8.75 m², No overhang

Windows facing South

9.71 m², No overhang

Air change rate

2.50 ach

Blinds/curtains

Dark-coloured curtain or roller blind, closed 100% of daylight hours

Criterion 4 – Building performance consistent with DER and DFEE rate

Party Walls

Type

U-value

Filled Cavity with Edge Sealing

0.00

W/m²K

Pass

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals

4.81 (measured in this dwelling)

Maximum

10.0

Pass

10 Key features

Party wall U-value

0.00

W/m²K

Roof U-value

0.11

W/m²K

Thermal bridging y-value

0.036

W/m²K

Photovoltaic array

1.17

kW

This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.

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SAP Rating	90 B	DER	11.13	TER	16.89
Environmental	91 B	% DER<TER	34.10		
CO ₂ Emissions (t/year)	0.66	DFEE	42.37	TFEE	50.36
General Requirements Compliance	Pass	% DFEE<TFEE	15.88		
Assessor Details	Mr. Thomas McMahon, SApeasy Ltd, Tel: 0114 321 2037, info@sapeasy.co.uk			Assessor ID	r863-0001
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REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

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DWELLING AS BUILT

Semi-Detached House, total floor area 101 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
Fuel factor:1.00 (mains gas)
Target Carbon Dioxide Emission Rate (TER) 16.89 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 11.13 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)50.4 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)42.4 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	OK
Party wall	0.00 (max. 0.20)	-	OK
Floor	0.16 (max. 0.25)	0.16 (max. 0.70)	OK
Roof	0.11 (max. 0.20)	0.13 (max. 0.35)	OK
Openings	1.40 (max. 2.00)	1.40 (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: 4.81 (measured in this dwelling)
Maximum 10.0 OK

4 Heating efficiency

Main heating system: Boiler system with radiators or underfloor - Mains gas
Data from database
Worcester Greenstar 36CDi Compact ErP
Combi boiler
Efficiency: 89.8% SEDBUK2009
Minimum: 88.0% OK

Secondary heating system:

None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Programmer, room thermostat and TRVs OK

Hot water controls:

No cylinder

Boiler interlock

Yes

OK

7 Low energy lights

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

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (Southern England): Slight OK
Based on:
Overshading: Average
Windows facing North: 8.75 m², No overhang
Windows facing South: 9.71 m², No overhang
Air change rate: 2.50 ach
Blinds/curtains: Dark-coloured curtain or roller blind, closed 100% of daylight hours

10 Key features

Party wall U-value 0.00 W/m²K
Roof U-value 0.11 W/m²K
Thermal bridging y-value 0.036 W/m²K
Photovoltaic array 1.17 kW

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



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 (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.4000 (1b)	x 2.4000 (2b)	= 120.9600 (1b) - (3b)
First floor	50.4000 (1c)	x 2.6000 (2c)	= 131.0400 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	100.8000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 252.0000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	1	=	1 * 20 = 20.0000 (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) =				60.0000 / (5) = 0.2381 (8)
Pressure test					Yes
Measured/design AP50					4.8100
Infiltration rate					0.4786 (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) =				0.4068 (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	0.5187	0.5085	0.4983	0.4475	0.4373	0.3865	0.3865	0.3763	0.4068	0.4373	0.4577	0.4780 (22b)
Effective ac	0.6345	0.6293	0.6242	0.6001	0.5956	0.5747	0.5747	0.5708	0.5827	0.5956	0.6047	0.6142 (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
W (Uw = 1.40)			18.4600	1.3258	24.4735		(27)
D			1.8900	1.4000	2.6460		(26a)
Ground floor			50.4000	0.1600	8.0640		(28a)
External wall	111.2100	20.3500	90.8600	0.1800	16.3548		(29a)
Joisted roof	49.7600		49.7600	0.1100	5.4736		(30)
Flat roof	0.6300		0.6300	0.1300	0.0819		(30)
Total net area of external elements Aum(A, m ²)			212.0000				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		57.0938		(33)
Party wall			41.8400	0.0000	0.0000		(32)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							7.6305 (36)
Total fabric heat loss						(33) + (36) =	64.7243 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	52.7661	52.3317	51.9060	49.9062	49.5320	47.7902	47.7902	47.4677	48.4611	49.5320	50.2889	51.0802 (38)
Heat transfer coeff	117.4904	117.0560	116.6303	114.6304	114.2563	112.5145	112.5145	112.1919	113.1854	114.2563	115.0132	115.8045 (39)
Average = Sum(39)m / 12 =												114.6286 (39)
HLP	1.1656	1.1613	1.1570	1.1372	1.1335	1.1162	1.1162	1.1130	1.1229	1.1335	1.1410	1.1489 (40)
HLP (average)												1.1372 (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												2.7468 (42)
Average daily hot water use (litres/day)												99.4367 (43)
Daily hot water use	109.3804	105.4029	101.4255	97.4480	93.4705	89.4930	89.4930	93.4705	97.4480	101.4255	105.4029	109.3804 (44)
Energy conte	162.2080	141.8681	146.3952	127.6309	122.4649	105.6779	97.9261	112.3716	113.7137	132.5223	144.6585	157.0897 (45)
Energy content (annual)										Total = Sum(45)m =		1564.5268 (45)
Distribution loss (46)m = 0.15 x (45)m	24.3312	21.2802	21.9593	19.1446	18.3697	15.8517	14.6889	16.8557	17.0571	19.8783	21.6988	23.5635 (46)
Water storage loss:												
Total storage loss												

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
Combi loss	27.5638	24.8945	27.5500	26.6336	27.4975	26.5830	27.4519	27.4815	26.6106	27.5266	26.6606	0.0000 (57)
Total heat required for water heating calculated for each month	189.7718	166.7626	173.9452	154.2645	149.9624	132.2608	125.3780	139.8531	140.3243	160.0489	171.3191	184.6453 (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	189.7718	166.7626	173.9452	154.2645	149.9624	132.2608	125.3780	139.8531	140.3243	160.0489	171.3191	184.6453 (64)
Heat gains from water heating, kWh/month	60.8251	53.3948	55.5639	49.0957	47.5940	41.7836	39.4234	44.2339	44.4624	50.9453	54.7641	59.1212 (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	137.3405	137.3405	137.3405	137.3405	137.3405	137.3405	137.3405	137.3405	137.3405	137.3405	137.3405	137.3405	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	23.3939	20.7783	16.8980	12.7929	9.5628	8.0734	8.7235	11.3392	15.2194	19.3246	22.5546	24.0441	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	257.6146	260.2879	253.5514	239.2103	221.1072	204.0928	192.7262	190.0529	196.7894	211.1305	229.2336	246.2480	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.7340	36.7340	36.7340	36.7340	36.7340	36.7340	36.7340	36.7340	36.7340	36.7340	36.7340	36.7340	(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)	-109.8724	-109.8724	-109.8724	-109.8724	-109.8724	-109.8724	-109.8724	-109.8724	-109.8724	-109.8724	-109.8724	-109.8724	(71)
Water heating gains (Table 5)	81.7542	79.4565	74.6827	68.1884	63.9704	58.0328	52.9884	59.4542	61.7534	68.4749	76.0612	79.4640	(72)
Total internal gains	429.9649	427.7248	412.3342	387.3937	361.8425	337.4011	321.6403	328.0485	340.9644	366.1321	395.0516	416.9583	(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
North					8.7500	10.6334	0.7600		0.7000	0.7700		34.3024
South					9.7100	46.7521	0.7600		0.7000	0.7700		167.3651 (78)
Solar gains	201.6675	339.6546	460.5476	573.5457	652.2471	653.7699	627.5661	566.6297	498.6635	373.6766	240.7012	173.2150 (83)
Total gains	631.6324	767.3794	872.8819	960.9394	1014.0896	991.1710	949.2064	894.6782	839.6279	739.8088	635.7528	590.1733 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (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	59.5793	59.8004	60.0187	61.0658	61.2658	62.2142	62.2142	62.3931	61.8454	61.2658	60.8626	60.4467	
alpha	4.9720	4.9867	5.0012	5.0711	5.0844	5.1476	5.1476	5.1595	5.1230	5.0844	5.0575	5.0298	
util living area	0.9976	0.9933	0.9819	0.9465	0.8545	0.6819	0.5126	0.5621	0.8050	0.9641	0.9943	0.9983	(86)
MIT	19.7625	19.9564	20.2239	20.5540	20.8168	20.9585	20.9921	20.9876	20.9016	20.5561	20.0980	19.7360	(87)
Th 2	19.9476	19.9511	19.9545	19.9706	19.9736	19.9876	19.9876	19.9902	19.9822	19.9736	19.9675	19.9611	(88)
util rest of house	0.9968	0.9910	0.9757	0.9273	0.8050	0.5917	0.3994	0.4461	0.7270	0.9473	0.9920	0.9977	(89)
MIT 2	18.8245	19.0200	19.2868	19.6176	19.8530	19.9692	19.9857	19.9868	19.9303	19.6277	19.1749	18.8089	(90)
Living area fraction	18.9793	19.1745	19.4414	19.7721	20.0120	20.1324	20.1517	20.1519	20.0906	19.7808	19.3272	18.9619	(92)
Temperature adjustment	18.9793	19.1745	19.4414	19.7721	20.0120	20.1324	20.1517	20.1519	20.0906	19.7808	19.3272	18.9619	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	628.9128	758.7315	848.1642	886.7806	818.4376	600.0703	396.9104	416.3349	618.2360	697.8523	629.4170	588.3343	(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	1724.6725	1670.9195	1509.3613	1246.2740	949.7010	622.4729	399.6169	420.9352	678.0463	1048.9665	1406.2905	1709.4922	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000	(97a)
Space heating kWh	815.2452	612.9903	491.9306	258.8352	97.6599	0.0000	0.0000	0.0000	0.0000	261.2290	559.3489	834.1415	(98)
Space heating												3931.3806	(98)
Space heating per m2												39.0018	(99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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 %)													90.7000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													4334.4880 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	815.2452	612.9903	491.9306	258.8352	97.6599	0.0000	0.0000	0.0000	0.0000	261.2290	559.3489	834.1415	(98)
Space heating efficiency (main heating system 1)	90.7000	90.7000	90.7000	90.7000	90.7000	0.0000	0.0000	0.0000	0.0000	90.7000	90.7000	90.7000	(210)
Space heating fuel (main heating system)	898.8370	675.8438	542.3712	285.3751	107.6736	0.0000	0.0000	0.0000	0.0000	288.0143	616.7022	919.6709	(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	189.7718	166.7626	173.9452	154.2645	149.9624	132.2608	125.3780	139.8531	140.3243	160.0489	171.3191	184.6453	(64)
Efficiency of water heater (217)m	90.1577	90.0863	89.9515	89.6338	88.9834	87.9000	87.9000	87.9000	87.9000	89.6155	90.0276	90.1794	(217)
Fuel for water heating, kWh/month	210.4887	185.1143	193.3767	172.1053	168.5285	150.4674	142.6371	159.1048	159.6408	178.5952	190.2962	204.7534	(219)
Water heating fuel used												2115.1084	(219)
Annual totals kWh/year													
Space heating fuel - main system												4334.4880	(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)												413.1441	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 1.17 * 1080 * 1.00) =										-1010.4350		-1010.4350	(233)
Total delivered energy for all uses												5927.3054	(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	4334.4880	0.2160	936.2494	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2115.1084	0.2160	456.8634	(264)
Space and water heating			1393.1128	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	413.1441	0.5190	214.4218	(268)
Energy saving/generation technologies				
PV Unit	-1010.4350	0.5190	-524.4158	(269)
Total CO2, kg/year			1122.0438	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			11.1300	(273)

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

DER			11.1300	ZC1
Total Floor Area		TFA	100.8000	
Assumed number of occupants		N	2.7468	
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190	
CO2 emissions from appliances, equation (L14)			15.1445	ZC2
CO2 emissions from cooking, equation (L16)			1.8346	ZC3
Total CO2 emissions			28.1091	ZC4
Residual CO2 emissions offset from biofuel CHP			0.0000	ZC5
Additional allowable electricity generation, kWh/m²/year			0.0000	ZC6
Resulting CO2 emissions offset from additional allowable electricity generation			0.0000	ZC7
Net CO2 emissions			28.1091	ZC8

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Built) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	50.4000 (1b)	x 2.4000 (2b)	= 120.9600 (1b) - (3b)
First floor	50.4000 (1c)	x 2.6000 (2c)	= 131.0400 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	100.8000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 252.0000 (5)

2. Ventilation rate

										main	secondary	other	total	m3 per hour			
										heating	heating						
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)
										Air changes per hour							
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =										40.0000 / (5) =							0.1587 (8)
Pressure test										Yes							
Measured/design AP50																	5.0000
Infiltration rate																	0.4087 (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) =							0.3474 (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	0.4430	0.4343	0.4256	0.3822	0.3735	0.3300	0.3300	0.3214	0.3474	0.3735	0.3908	0.4082	(22b)				
Effective ac	0.5981	0.5943	0.5906	0.5730	0.5697	0.5545	0.5545	0.5516	0.5604	0.5697	0.5764	0.5833	(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 Semi-glazed door			1.8900	1.2000	2.2680			(26a)					
TER Opening Type (Uw = 1.40)			18.4600	1.3258	24.4735			(27)					
Ground floor			50.4000	0.1300	6.5520			(28a)					
External wall	111.2100	20.3500	90.8600	0.1800	16.3548			(29a)					
Joisted roof	49.7600		49.7600	0.1300	6.4688			(30)					
Flat roof	0.6300		0.6300	0.1300	0.0819			(30)					
Total net area of external elements Aum(A, m2)			212.0000					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	56.1990			(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000	(35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.9260	(36)					
Total fabric heat loss						(33) + (36) =	66.1250	(37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 49.7386	Feb 49.4218	Mar 49.1113	Apr 47.6527	May 47.3798	Jun 46.1094	Jul 46.1094	Aug 45.8742	Sep 46.5988	Oct 47.3798	Nov 47.9319	Dec 48.5090	(38)
Heat transfer coeff	115.8636	115.5468	115.2362	113.7777	113.5048	112.2344	112.2344	111.9992	112.7237	113.5048	114.0568	114.6340	(39)
Average = Sum(39)m / 12 =												113.7764	(39)
HLP	Jan 1.1494	Feb 1.1463	Mar 1.1432	Apr 1.1287	May 1.1260	Jun 1.1134	Jul 1.1134	Aug 1.1111	Sep 1.1183	Oct 1.1260	Nov 1.1315	Dec 1.1372	(40)
HLP (average)												1.1287	(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												2.7468 (42)
Average daily hot water use (litres/day)												99.4367 (43)
Daily hot water use	Jan 109.3804	Feb 105.4029	Mar 101.4255	Apr 97.4480	May 93.4705	Jun 89.4930	Jul 89.4930	Aug 93.4705	Sep 97.4480	Oct 101.4255	Nov 105.4029	Dec 109.3804 (44)
Energy conte	162.2080	141.8681	146.3952	127.6309	122.4649	105.6779	97.9261	112.3716	113.7137	132.5223	144.6585	157.0897 (45)
Energy content (annual)										Total = Sum(45)m =		1564.5268 (45)
Distribution loss (46)m = 0.15 x (45)m	24.3312	21.2802	21.9593	19.1446	18.3697	15.8517	14.6889	16.8557	17.0571	19.8783	21.6988	23.5635 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)

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If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Combi loss	50.9589	46.0274	50.9589	48.0565	47.6316	44.1336	45.6047	47.6316	48.0565	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month	213.1669	187.8955	197.3541	175.6874	170.0964	149.8114	143.5308	160.0032	161.7702	183.4812	193.9736	208.0487 (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	213.1669	187.8955	197.3541	175.6874	170.0964	149.8114	143.5308	160.0032	161.7702	183.4812	193.9736	208.0487 (64)
Heat gains from water heating, kWh/month	66.6739	58.6780	61.4161	54.4514	52.6275	46.1713	43.9616	49.2714	49.8239	56.8034	60.4277	64.9721 (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	137.3405	137.3405	137.3405	137.3405	137.3405	137.3405	137.3405	137.3405	137.3405	137.3405	137.3405	137.3405 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	23.3939	20.7783	16.8980	12.7929	9.5628	8.0734	8.7235	11.3392	15.2194	19.3246	22.5546	24.0441 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	257.6146	260.2879	253.5514	239.2103	221.1072	204.0928	192.7262	190.0529	196.7894	211.1305	229.2336	246.2480 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.7340	36.7340	36.7340	36.7340	36.7340	36.7340	36.7340	36.7340	36.7340	36.7340	36.7340	36.7340 (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)	-109.8724	-109.8724	-109.8724	-109.8724	-109.8724	-109.8724	-109.8724	-109.8724	-109.8724	-109.8724	-109.8724	-109.8724 (71)
Water heating gains (Table 5)	89.6154	87.3184	82.5486	75.6269	70.7358	64.1268	59.0882	66.2251	69.1999	76.3487	83.9274	87.3280 (72)
Total internal gains	437.8261	435.5867	420.2001	394.8322	368.6080	343.4951	327.7400	334.8193	348.4109	374.0059	402.9178	424.8223 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g		FF		Access factor		Gains
						or Table 6b		or Table 6c		Table 6d		W
North				8.7500	10.6334	0.6300		0.7000		0.7700		28.4349
South				9.7100	46.7521	0.6300		0.7000		0.7700		138.7369 (78)
Solar gains	167.1718	281.5558	381.7698	475.4392	540.6785	541.9408	520.2193	469.7062	413.3658	309.7583	199.5286	143.5862 (83)
Total gains	604.9979	717.1425	801.9699	870.2714	909.2865	885.4359	847.9593	804.5255	761.7767	683.7642	602.4464	568.4084 (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	60.4159	60.5815	60.7448	61.5235	61.6714	62.3695	62.3695	62.5005	62.0987	61.6714	61.3729	61.0639
alpha	5.0277	5.0388	5.0497	5.1016	5.1114	5.1580	5.1580	5.1667	5.1399	5.1114	5.0915	5.0709
util living area	0.9980	0.9949	0.9871	0.9623	0.8919	0.7394	0.5669	0.6158	0.8457	0.9732	0.9955	0.9986 (86)
MIT	19.7597	19.9308	20.1797	20.4956	20.7711	20.9403	20.9877	20.9814	20.8748	20.5181	20.0786	19.7315 (87)
Th 2	19.9607	19.9632	19.9657	19.9774	19.9796	19.9899	19.9899	19.9918	19.9859	19.9796	19.9752	19.9705 (88)
util rest of house	0.9973	0.9932	0.9824	0.9478	0.8498	0.6497	0.4447	0.4930	0.7744	0.9601	0.9937	0.9981 (89)
MIT 2	18.3078	18.5591	18.9220	19.3807	19.7507	19.9491	19.9852	19.9840	19.8849	19.4202	18.7841	18.2737 (90)
Living area fraction	18.5473	18.7854	19.1295	19.5647	19.9191	20.1126	20.1506	20.1485	20.0482	19.6014	18.9977	18.5142 (92)
Temperature adjustment	18.5473	18.7854	19.1295	19.5647	19.9191	20.1126	20.1506	20.1485	20.0482	19.6014	18.9977	18.5142 (93)
adjusted MIT	18.5473	18.7854	19.1295	19.5647	19.9191	20.1126	20.1506	20.1485	20.0482	19.6014	18.9977	18.5142 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	602.5272	710.2305	783.7144	818.2747	770.0774	585.7395	394.1614	412.7336	593.7627	652.0017	597.0447	566.6869 (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	1650.7443	1604.4159	1455.3795	1213.4020	932.9018	618.7039	398.5003	419.8324	670.5062	1021.6971	1357.0108	1640.8989 (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	779.8735	600.8925	499.7188	284.4916	121.1413	0.0000	0.0000	0.0000	0.0000	275.0534	547.1756	799.2137 (98)
Space heating												3907.5605 (98)
Space heating per m2										(98) / (4) =		38.7655 (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 %)													93.4000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													4183.6836 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	779.8735	600.8925	499.7188	284.4916	121.1413	0.0000	0.0000	0.0000	0.0000	275.0534	547.1756	799.2137	(98)
Space heating efficiency (main heating system 1)	93.4000	93.4000	93.4000	93.4000	93.4000	0.0000	0.0000	0.0000	0.0000	93.4000	93.4000	93.4000	(210)
Space heating fuel (main heating system)	834.9823	643.3539	535.0309	304.5949	129.7016	0.0000	0.0000	0.0000	0.0000	294.4897	585.8411	855.6892	(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	213.1669	187.8955	197.3541	175.6874	170.0964	149.8114	143.5308	160.0032	161.7702	183.4812	193.9736	208.0487	(64)
Efficiency of water heater (217)m	88.0234	87.7703	87.2915	86.2579	84.2136	80.3000	80.3000	80.3000	80.3000	86.0682	87.5190	88.1109	(216)
Fuel for water heating, kWh/month	242.1707	214.0765	226.0862	203.6769	201.9820	186.5647	178.7432	199.2567	201.4573	213.1812	221.6360	236.1213	(219)
Water heating fuel used												2524.9525	(219)
Annual totals kWh/year													
Space heating fuel - main system												4183.6836	(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)												413.1441	(232)
Total delivered energy for all uses												7196.7801	(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	4183.6836	0.2160	903.6757 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2524.9525	0.2160	545.3897 (264)
Space and water heating			1449.0654 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	413.1441	0.5190	214.4218 (268)
Total CO2, kg/m2/year			1702.4122 (272)
Emissions per m2 for space and water heating			14.3756 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.1272 (272b)
Emissions per m2 for pumps and fans			0.3862 (272c)
Target Carbon Dioxide Emission Rate (TER) = (14.3756 * 1.00) + 2.1272 + 0.3862, rounded to 2 d.p.			16.8900 (273)