

BASIC COMPLIANCE REPORT

Calculation Type: New Build (As Built)



Property Reference	291 West End Road		Issued on Date	31/10/2022	
Assessment Reference	With PV		Prop Type Ref		
Property	291 West End Road, West End, SOUTHAMPTON, SO18 3BW				
SAP Rating	90 B	DER	10.91	TER	17.47
Environmental	92 A	% DER<TER	37.56		
CO₂ Emissions (t/year)	0.57	DFEE	40.50	TFEE	49.76
General Requirements Compliance	Pass	% DFEE<TFEE	18.60		
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)	17.47	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	10.91	kgCO ₂ /m ²	Pass
	-6.56 (-37.6%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	49.76	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	40.50	kWh/m ² /yr	
	-9.3 (-18.7%)	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)	0.11 (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	4.85 (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

6.63 m², No overhang

Windows facing East

0.83 m², No overhang

Windows facing South

6.46 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

4.85 (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

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.

FULL SAP CALCULATION PRINTOUT

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Environmental	92 A	% DER<TER	37.56		
CO ₂ Emissions (t/year)	0.57	DFEE	40.50	TFEE	49.76
General Requirements Compliance	Pass	% DFEE<TFEE	18.60		
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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 90 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) 17.47 kgCO₂/m²
Dwelling Carbon Dioxide Emission Rate (DER) 10.91 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)49.8 kWh/m²/yr
Dwelling Fabric Energy Efficiency (DFEE)40.5 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)	0.11 (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: 4.85 (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: 6.63 m², No overhang
Windows facing East: 0.83 m², No overhang
Windows facing South: 6.46 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
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	45.1700 (1b)	x 2.4000 (2b)	= 108.4080 (1b) - (3b)
First floor	45.1700 (1c)	x 2.6000 (2c)	= 117.4420 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	90.3400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 225.8500 (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					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) = 0.1771 (8)
Pressure test					Yes
Measured/design AP50					4.8500
Infiltration rate					0.4196 (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) =	0.3567 (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	0.4548	0.4458	0.4369	0.3923	0.3834	0.3388	0.3388	0.3299	0.3567	0.3834	0.4013	0.4191 (22b)
Effective ac	0.6034	0.5994	0.5954	0.5770	0.5735	0.5574	0.5574	0.5544	0.5636	0.5735	0.5805	0.5878 (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)			13.9200	1.3258	18.4545		(27)
D			1.9100	1.4000	2.6740		(26a)
Ground floor			45.1700	0.1600	7.2272		(28a)
External wall	95.9200	15.8300	80.0900	0.1800	14.4162		(29a)
Joisted roof	45.1700		45.1700	0.1100	4.9687		(30)
Total net area of external elements Aum(A, m ²)			186.2600				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	47.7406		(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)							7.7541 (36)
Total fabric heat loss						(33) + (36) =	55.4947 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)							
(38)m	44.9716	44.6724	44.3791	43.0013	42.7436	41.5436	41.5436
Heat transfer coeff	100.4664	100.1671	99.8738	98.4961	98.2383	97.0383	97.0383
Average = Sum(39)m / 12 =							
HLP	1.1121	1.1088	1.1055	1.0903	1.0874	1.0741	1.0741
HLP (average)							
Days in month	31	28	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.6303 (42)
Average daily hot water use (litres/day)												96.6707 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	106.3378	102.4710	98.6041	94.7373	90.8705	87.0036	87.0036	90.8705	94.7373	98.6041	102.4710	106.3378 (44)
Energy content (annual)	157.6959	137.9218	142.3230	124.0806	119.0583	102.7383	95.2021	109.2458	110.5505	128.8360	140.6346	152.7200 (45)
Distribution loss (46)m = 0.15 x (45)m	23.6544	20.6883	21.3484	18.6121	17.8587	15.4107	14.2803	16.3869	16.5826	19.3254	21.0952	22.9080 (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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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 (57)
Combi loss	27.5613	24.8921	27.5415	26.6220	27.4869	26.5742	27.4437	27.4717	26.6002	27.5189	26.6581	27.5532 (61)
Total heat required for water heating calculated for each month	185.2572	162.8139	169.8645	150.7026	146.5451	129.3124	122.6458	136.7175	137.1508	156.3549	167.2926	180.2732 (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	185.2572	162.8139	169.8645	150.7026	146.5451	129.3124	122.6458	136.7175	137.1508	156.3549	167.2926	180.2732 (64)
Heat gains from water heating, kWh/month	59.3242	52.0820	54.2078	47.9123	46.4586	40.8040	38.5156	43.1922	43.4081	49.7177	53.4255	57.6677 (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	131.5173	131.5173	131.5173	131.5173	131.5173	131.5173	131.5173	131.5173	131.5173	131.5173	131.5173	131.5173 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	22.4642	19.9525	16.2265	12.2845	9.1828	7.7525	8.3769	10.8886	14.6146	18.5566	21.6583	23.0886 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	239.7019	242.1892	235.9212	222.5772	205.7329	189.9016	179.3253	176.8379	183.1060	196.4499	213.2943	229.1256 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.1517	36.1517	36.1517	36.1517	36.1517	36.1517	36.1517	36.1517	36.1517	36.1517	36.1517	36.1517 (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)	-105.2138	-105.2138	-105.2138	-105.2138	-105.2138	-105.2138	-105.2138	-105.2138	-105.2138	-105.2138	-105.2138	-105.2138 (71)
Water heating gains (Table 5)	79.7368	77.5030	72.8599	66.5449	62.4443	56.6722	51.7683	58.0540	60.2890	66.8249	74.2021	77.5104 (72)
Total internal gains	407.3581	405.0999	390.4627	366.8618	342.8152	319.7815	304.9257	311.2356	323.4648	347.2866	374.6098	395.1797 (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			6.6300		10.6334		0.7600		0.7000		0.7700		25.9914 (74)
East			0.8300		19.6403		0.7600		0.7000		0.7700		6.0099 (76)
South			6.4600		46.7521		0.7600		0.7000		0.7700		111.3469 (78)
Solar gains	143.3483	243.7852	336.0559	426.3503	490.8181	494.2217	473.5068	423.6098	366.6538	269.7669	171.5415	122.8240	(83)
Total gains	550.7064	648.8851	726.5186	793.2120	833.6333	814.0032	778.4324	734.8454	690.1186	617.0534	546.1514	518.0037	(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	62.4449	62.6314	62.8154	63.6940	63.8612	64.6509	64.6509	64.7992	64.3444	63.8612	63.5240	63.1752
alpha	5.1630	5.1754	5.1877	5.2463	5.2574	5.3101	5.3101	5.3199	5.2896	5.2574	5.2349	5.2117
util living area	0.9979	0.9946	0.9859	0.9571	0.8761	0.7104	0.5381	0.5887	0.8301	0.9708	0.9952	0.9984 (86)
MIT	19.8189	19.9868	20.2329	20.5453	20.8072	20.9549	20.9914	20.9865	20.8948	20.5556	20.1289	19.7921 (87)
Th 2	19.9910	19.9937	19.9963	20.0088	20.0111	20.0220	20.0220	20.0240	20.0178	20.0111	20.0064	20.0015 (88)
util rest of house	0.9971	0.9928	0.9809	0.9412	0.8313	0.6223	0.4239	0.4725	0.7574	0.9569	0.9932	0.9979 (89)
MIT 2	18.9156	19.0848	19.3305	19.6435	19.8813	20.0014	20.0198	20.0202	19.9606	19.6598	19.2373	18.8974 (90)
Living area fraction	19.0886	19.2575	19.5033	19.8162	20.0586	20.1840	20.2059	20.2053	20.1395	19.8313	19.4080	19.0687 (92)
Temperature adjustment	19.0886	19.2575	19.5033	19.8162	20.0586	20.1840	20.2059	20.2053	20.1395	19.8313	19.4080	19.0687 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9962	0.9910	0.9777	0.9375	0.8338	0.6379	0.4459	0.4949	0.7676	0.9536	0.9916	0.9972 (94)
Ext temp.	548.6392	643.0512	710.3479	743.6142	695.0639	519.2535	347.1319	363.6845	529.7414	588.4353	541.5563	516.5699 (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	1485.7554	1438.1542	1298.6898	1075.2009	821.1358	541.8591	349.9085	368.4099	588.8563	906.8705	1215.5356	1476.5361 (97)
Space heating kWh	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 per m2	697.2145	534.3092	437.7264	238.7425	93.7975	0.0000	0.0000	0.0000	0.0000	236.9158	485.2651	714.2149 (98)
												3438.1858 (98)
												38.0583 (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													3790.7231 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	697.2145	534.3092	437.7264	238.7425	93.7975	0.0000	0.0000	0.0000	0.0000	236.9158	485.2651	714.2149	(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)	768.7039	589.0950	482.6091	263.2221	103.4151	0.0000	0.0000	0.0000	0.0000	261.2081	535.0222	787.4475	(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	185.2572	162.8139	169.8645	150.7026	146.5451	129.3124	122.6458	136.7175	137.1508	156.3549	167.2926	180.2732	(64)
Efficiency of water heater (217)m	90.0975	90.0302	89.8994	89.5956	88.9719	87.9000	87.9000	87.9000	87.9000	89.5657	89.9653	90.1214	(217)
Fuel for water heating, kWh/month	205.6186	180.8436	188.9495	168.2032	164.7094	147.1131	139.5288	155.5375	156.0305	174.5701	185.9524	200.0337	(219)
Water heating fuel used												2067.0903	(219)
Annual totals kWh/year													
Space heating fuel - main system												3790.7231	(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)												396.7250	(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												5319.1033	(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	3790.7231	0.2160	818.7962	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	2067.0903	0.2160	446.4915	(264)
Space and water heating			1265.2877	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	396.7250	0.5190	205.9003	(268)
Energy saving/generation technologies				
PV Unit	-1010.4350	0.5190	-524.4158	(269)
Total CO2, kg/year			985.6972	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			10.9100	(273)

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

DER			10.9100	ZC1
Total Floor Area		TFA	90.3400	
Assumed number of occupants		N	2.6303	
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190	
CO2 emissions from appliances, equation (L14)			15.7231	ZC2
CO2 emissions from cooking, equation (L16)			2.0160	ZC3
Total CO2 emissions			28.6491	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			28.6491	ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Built)



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	45.1700 (1b)	x 2.4000 (2b)	= 108.4080 (1b) - (3b)
First floor	45.1700 (1c)	x 2.6000 (2c)	= 117.4420 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	90.3400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	225.8500 (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	+	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)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					30.0000 / (5) = 0.1328 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3828 (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) =	0.3254 (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	0.4149	0.4068	0.3986	0.3579	0.3498	0.3091	0.3091	0.3010	0.3254	0.3498	0.3661	0.3824 (22b)
Effective ac	0.5861	0.5827	0.5795	0.5641	0.5612	0.5478	0.5478	0.5453	0.5529	0.5612	0.5670	0.5731 (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			1.9100	1.2000	2.2920			(26a)				
TER Opening Type (Uw = 1.40)			13.9200	1.3258	18.4545			(27)				
Ground floor			45.1700	0.1300	5.8721			(28a)				
External wall	95.9200	15.8300	80.0900	0.1800	14.4162			(29a)				
Joisted roof	45.1700		45.1700	0.1300	5.8721			(30)				
Total net area of external elements Aum(A, m2)			186.2600					(31)				
Fabric heat loss, W/K = Sum (A x U)			(26) ... (30) + (32) =		46.9069			(33)				
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								250.0000 (35)				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)								9.9244 (36)				
Total fabric heat loss						(33) + (36) =		56.8313 (37)				
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 43.6800	Feb 43.4309	Mar 43.1867	Apr 42.0399	May 41.8253	Jun 40.8265	Jul 40.8265	Aug 40.6415	Sep 41.2113	Oct 41.8253	Nov 42.2594	Dec 42.7132 (38)
Heat transfer coeff	100.5113	100.2622	100.0181	98.8713	98.6567	97.6579	97.6579	97.4729	98.0426	98.6567	99.0908	99.5445 (39)
Average = Sum(39)m / 12 =												98.8702 (39)
HLP	Jan 1.1126	Feb 1.1098	Mar 1.1071	Apr 1.0944	May 1.0921	Jun 1.0810	Jul 1.0810	Aug 1.0790	Sep 1.0853	Oct 1.0921	Nov 1.0969	Dec 1.1019 (40)
HLP (average)												1.0944 (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												2.6303 (42)
Average daily hot water use (litres/day)												96.6707 (43)
Daily hot water use	106.3378	102.4710	98.6041	94.7373	90.8705	87.0036	87.0036	90.8705	94.7373	98.6041	102.4710	106.3378 (44)
Energy conte	157.6959	137.9218	142.3230	124.0806	119.0583	102.7383	95.2021	109.2458	110.5505	128.8360	140.6346	152.7200 (45)
Energy content (annual)										Total = Sum(45)m =		1521.0067 (45)
Distribution loss (46)m = 0.15 x (45)m	23.6544	20.6883	21.3484	18.6121	17.8587	15.4107	14.2803	16.3869	16.5826	19.3254	21.0952	22.9080 (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)
If cylinder contains dedicated solar storage												

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Combi 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 (57)
Total heat required for water heating calculated for each month	50.9589	46.0274	50.2476	46.7198	46.3066	42.9059	44.3361	46.3066	46.7198	50.2476	49.3151	50.9589 (61)
Solar input	208.6548	183.9492	192.5705	170.8004	165.3649	145.6442	139.5382	155.5524	157.2703	179.0836	189.9496	203.6789 (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	208.6548	183.9492	192.5705	170.8004	165.3649	145.6442	139.5382	155.5524	157.2703	179.0836	189.9496	203.6789 (64)
	65.1736	57.3659	59.8843	52.9367	51.1635	44.8869	42.7387	47.9009	48.4380	55.3999	59.0898	63.5191 (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	131.5173	131.5173	131.5173	131.5173	131.5173	131.5173	131.5173	131.5173	131.5173	131.5173	131.5173	131.5173	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	22.4642	19.9525	16.2265	12.2845	9.1828	7.7525	8.3769	10.8886	14.6146	18.5566	21.6583	23.0886	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	239.7019	242.1892	235.9212	222.5772	205.7329	189.9016	179.3253	176.8379	183.1060	196.4499	213.2943	229.1256	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	36.1517	36.1517	36.1517	36.1517	36.1517	36.1517	36.1517	36.1517	36.1517	36.1517	36.1517	36.1517	(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)	-105.2138	-105.2138	-105.2138	-105.2138	-105.2138	-105.2138	-105.2138	-105.2138	-105.2138	-105.2138	-105.2138	-105.2138	(71)
Water heating gains (Table 5)	87.5989	85.3658	80.4896	73.5232	68.7682	62.3430	57.4445	64.3829	67.2750	74.4622	82.0691	85.3752	(72)
Total internal gains	415.2202	412.9628	398.0924	373.8401	349.1390	325.4522	310.6019	317.5646	330.4508	354.9239	382.4768	403.0445	(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			6.6300		10.6334		0.6300		0.7000		0.7700		21.5455 (74)
East			0.8300		19.6403		0.6300		0.7000		0.7700		4.9819 (76)
South			6.4600		46.7521		0.6300		0.7000		0.7700		92.3007 (78)
Solar gains	118.8282	202.0851	278.5727	353.4219	406.8624	409.6838	392.5122	351.1502	303.9367	223.6225	142.1989	101.8146	(83)
Total gains	534.0484	615.0479	676.6651	727.2621	756.0014	735.1361	703.1140	668.7148	634.3875	578.5464	524.6757	504.8591	(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	62.4170	62.5720	62.7248	63.4523	63.5903	64.2407	64.2407	64.3626	63.9886	63.5903	63.3118	63.0232	
alpha	5.1611	5.1715	5.1817	5.2302	5.2394	5.2827	5.2827	5.2908	5.2659	5.2394	5.2208	5.2015	
util living area	0.9982	0.9958	0.9896	0.9696	0.9090	0.7657	0.5927	0.6415	0.8661	0.9777	0.9960	0.9986	(86)
MIT	19.8010	19.9509	20.1821	20.4842	20.7580	20.9346	20.9863	20.9796	20.8664	20.5163	20.1027	19.7748	(87)
Th 2	19.9906	19.9928	19.9950	20.0054	20.0073	20.0164	20.0164	20.0181	20.0129	20.0073	20.0034	19.9993	(88)
util rest of house	0.9975	0.9943	0.9859	0.9576	0.8716	0.6789	0.4696	0.5188	0.8003	0.9666	0.9943	0.9982	(89)
MIT 2	18.3895	18.6098	18.9474	19.3877	19.7601	19.9704	20.0111	20.0092	19.9019	19.4397	18.8397	18.3575	(90)
Living area fraction	18.6598	18.8666	19.1839	19.5976	19.9512	20.1550	20.1978	20.1950	20.0866	19.6458	19.0815	18.6289	(91)
MIT	18.6598	18.8666	19.1839	19.5976	19.9512	20.1550	20.1978	20.1950	20.0866	19.6458	19.0815	18.6289	(92)
Temperature adjustment												0.0000	
adjusted MIT	18.6598	18.8666	19.1839	19.5976	19.9512	20.1550	20.1978	20.1950	20.0866	19.6458	19.0815	18.6289	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	532.0560	610.1212	664.2492	691.7870	657.0356	508.9740	346.7955	362.5265	511.3365	556.0366	520.5289	503.4341	(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	1443.3225	1400.3229	1268.6162	1057.6897	814.0380	542.4900	351.3558	369.9114	586.9404	892.4327	1187.2585	1436.3216	(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	677.9823	531.0155	449.6490	263.4499	116.8098	0.0000	0.0000	0.0000	0.0000	250.2787	480.0453	694.0683	(98)
Space heating												3463.2990	(98)
Space heating per m2												38.3363	(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												3708.0289 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	677.9823	531.0155	449.6490	263.4499	116.8098	0.0000	0.0000	0.0000	0.0000	250.2787	480.0453	694.0683 (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)	725.8911	568.5391	481.4229	282.0663	125.0641	0.0000	0.0000	0.0000	0.0000	267.9643	513.9672	743.1138 (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	208.6548	183.9492	192.5705	170.8004	165.3649	145.6442	139.5382	155.5524	157.2703	179.0836	189.9496	203.6789 (64)
Efficiency of water heater (217)m	87.8011	87.5663	87.1145	86.1386	84.1940	80.3000	80.3000	80.3000	80.3000	85.8939	87.2874	80.3000 (216)
Fuel for water heating, kWh/month	237.6448	210.0685	221.0545	198.2855	196.4094	181.3750	173.7711	193.7141	195.8534	208.4939	217.6140	231.7380 (219)
Water heating fuel used												2466.0223 (219)
Annual totals kWh/year												
Space heating fuel - main system												3708.0289 (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)												396.7250 (232)
Total delivered energy for all uses												6645.7762 (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	3708.0289	0.2160	800.9342 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2466.0223	0.2160	532.6608 (264)
Space and water heating			1333.5951 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	396.7250	0.5190	205.9003 (268)
Total CO2, kg/m2/year			1578.4203 (272)
Emissions per m2 for space and water heating			14.7620 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.2792 (272b)
Emissions per m2 for pumps and fans			0.4309 (272c)
Target Carbon Dioxide Emission Rate (TER) = (14.7620 * 1.00) + 2.2792 + 0.4309, rounded to 2 d.p.			17.4700 (273)