

BASIC COMPLIANCE REPORT

Calculation Type: New Build (As Designed)

Property Reference	16 Springfield Road	Issued on Date	04/10/2021		
Assessment Reference	DS	Prop Type Ref			
Property	16, Springfield Road, Mangotsfield, Emersons Green, Bristol, BS16 9BN				
SAP Rating	83 B	DER	21.06	TER	22.17
Environmental	85 B	% DER<TER	5.01		
CO₂ Emissions (t/year)	1.03	DFEE	64.80	TFEE	65.98
General Requirements Compliance	Pass	% DFEE<TFEE	1.78		
Assessor Details	Mr. Yik Shun Wilson Ho, Energytest Ltd., Tel: 01142 302812, info@energytest.co.uk		Assessor ID	T635-0001	
Client					

SUMMARY FOR INPUT DATA FOR New Build (As Designed)

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)	22.17	kgCO ₂ /m ²	
Dwelling Carbon Dioxide Emission Rate (DER)	21.06	kgCO ₂ /m ²	Pass
	-1.11 (-5.0%)	kgCO ₂ /m ²	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	65.98	kWh/m ² /yr	
Dwelling Fabric Energy Efficiency (DFEE)	64.80	kWh/m ² /yr	
	-1.2 (-1.8%)	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
Floor	0.14 (max. 0.25)	0.14 (max. 0.70)	Pass
Roof	0.14 (max. 0.20)	0.14 (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	8.00 (design value)	
Maximum	10.0	Pass

Limiting System Efficiencies

4 Heating efficiency

Main heating system	Boiler system with radiators or underfloor - Mains gas Data from manufacturer - - Combi boiler Efficiency: 90% Minimum: 88%	Pass
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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 (Severn Valley)

Medium

Pass

Based on:

Overshading

Average

Windows facing North East

6.01 m², No overhang

Windows facing South East

6.02 m², No overhang

Windows facing South West

5.48 m², No overhang

Windows facing North West

1.89 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

Air permeability and pressure testing

3 Air permeability

Air permeability at 50 pascals

8.00 (design value)

Maximum

10.0

Pass

10 Key features

Photovoltaic array

0.50

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	85 B	% DER<TER	5.01		
CO₂ Emissions (t/year)	1.03	DFEE	64.80	TFEE	65.98
General Requirements Compliance	Pass	% DFEE<TFEE	1.78		
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REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

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DWELLING AS DESIGNED

Detached House, total floor area 62 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) 22.17 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) 21.06 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 66.0 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE) 64.8 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.18 (max. 0.30)	0.18 (max. 0.70)	OK
Floor	0.14 (max. 0.25)	0.14 (max. 0.70)	OK
Roof	0.14 (max. 0.20)	0.14 (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: 8.00 (design value)

Maximum 10.0 OK

4 Heating efficiency

Main heating system: Boiler system with radiators or underfloor - Mains gas

Data from manufacturer

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Combi boiler

Efficiency: 90%

Minimum: 88% 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 (Severn Valley): Medium OK

Based on:

Overshading:

Average

Windows facing North East: 6.01 m², No overhang

Windows facing South East: 6.02 m², No overhang

Windows facing South West: 5.48 m², No overhang

Windows facing North West: 1.89 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

Photovoltaic array 0.50 kW

FULL SAP CALCULATION PRINTOUT

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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 (m ²)	Storey height (m)	Volume (m ³)
Ground floor	31.4500 (1b)	2.4300 (2b)	76.4235 (1b) - (3b)
First floor	30.0700 (1c)	2.6800 (2c)	80.5876 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.5200		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 157.0111 (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				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) =	0.1911 (8)
Pressure test					Yes
Measured/design AP50					8.0000
Infiltration rate					0.5911 (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) =		0.5024 (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	0.6406	0.6280	0.6155	0.5526	0.5401	0.4773	0.4773	0.4647	0.5024	0.5401	0.5652	0.5903 (22b)
Effective ac	0.7052	0.6972	0.6894	0.6527	0.6458	0.6139	0.6139	0.6080	0.6262	0.6458	0.6597	0.6742 (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)			19.4000	1.3258	25.7197		(27)					
D			1.9300	1.4000	2.7020		(26a)					
Ground floor			31.4500	0.1400	4.4030		(28a)					
External wall	123.2200	21.3300	101.8900	0.1800	18.3402		(29a)					
Joisted roof	31.4500		31.4500	0.1400	4.4030		(30)					
Total net area of external elements Aum(A, m ²)			186.1200				(31)					
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	55.5679	(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)							16.1394 (36)					
Total fabric heat loss						(33) + (36) =	71.7073 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	36.5372	36.1244	35.7198	33.8193	33.4638	31.8085	31.8085	31.5020	32.4461	33.4638	34.1831	34.9351 (38)
Heat transfer coeff	108.2445	107.8317	107.4271	105.5266	105.1711	103.5158	103.5158	103.2093	104.1534	105.1711	105.8904	106.6424 (39)
Average = Sum(39)m / 12 =												105.5249 (39)
HLP	1.7595	1.7528	1.7462	1.7153	1.7095	1.6826	1.6826	1.6777	1.6930	1.7095	1.7212	1.7335 (40)
HLP (average)												1.7153 (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												2.0243 (42)
Average daily hot water use (litres/day)												82.2764 (43)
Daily hot water use	90.5040	87.2130	83.9219	80.6308	77.3398	74.0487	74.0487	77.3398	80.6308	83.9219	87.2130	90.5040 (44)
Energy conte	134.2148	117.3852	121.1310	105.6049	101.3304	87.4405	81.0264	92.9790	94.0895	109.6522	119.6940	129.9799 (45)
Energy content (annual)												Total = Sum(45)m = 1294.5278 (45)
Distribution loss (46)m = 0.15 x (45)m												
Water storage loss:	20.1322	17.6078	18.1696	15.8407	15.1996	13.1161	12.1540	13.9469	14.1134	16.4478	17.9541	19.4970 (46)
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	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	46.1199	40.1419	42.7657	39.7632	39.4115	36.5172	37.7344	39.4115	39.7632	42.7657	43.0091	46.1199	46.1199	46.1199	46.1199	46.1199	46.1199	46.1199	46.1199	46.1199	46.1199	46.1199	46.1199	46.1199	(61)	
Solar input	180.3347	157.5270	163.8966	145.3681	140.7419	123.9576	118.7609	132.3905	133.8526	152.4179	162.7031	176.0998	176.0998	176.0998	176.0998	176.0998	176.0998	176.0998	176.0998	176.0998	176.0998	176.0998	176.0998	176.0998	176.0998	(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	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)
Heat gains from water heating, kWh/month	180.3347	157.5270	163.8966	145.3681	140.7419	123.9576	118.7609	132.3905	133.8526	152.4179	162.7031	176.0998	176.0998	176.0998	176.0998	176.0998	176.0998	176.0998	176.0998	176.0998	176.0998	176.0998	176.0998	176.0998	176.0998	(64)
	56.1564	49.0660	50.9675	45.0544	43.5452	38.2032	36.3749	40.7684	41.2255	47.1508	50.5505	54.7483	54.7483	54.7483	54.7483	54.7483	54.7483	54.7483	54.7483	54.7483	54.7483	54.7483	54.7483	54.7483	54.7483	(65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)	
(66)m	101.2134	101.2134	101.2134	101.2134	101.2134	101.2134	101.2134	101.2134	101.2134	101.2134	101.2134	101.2134	101.2134	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	15.7586	13.9966	11.3828	8.6175	6.4417	5.4384	5.8763	7.6383	10.2521	13.0174	15.1932	16.1966	(67)	
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	176.7635	178.5977	173.9755	164.1352	151.7137	140.0392	132.2400	130.4057	135.0280	144.8682	157.2897	168.9642	(68)	
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.1213	33.1213	33.1213	33.1213	33.1213	33.1213	33.1213	33.1213	33.1213	33.1213	33.1213	33.1213	(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)	-80.9707	-80.9707	-80.9707	-80.9707	-80.9707	-80.9707	-80.9707	-80.9707	-80.9707	-80.9707	-80.9707	-80.9707	(71)	
Water heating gains (Table 5)	75.4790	73.0149	68.5047	62.5756	58.5286	53.0601	48.8910	54.7962	57.2577	63.3747	70.2091	73.5864	(72)	
Total internal gains	324.3651	321.9733	310.2270	291.6924	273.0480	254.9017	243.3713	249.2043	258.9018	277.6243	299.0560	315.1112	(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	(74)						
Northeast	6.0100	11.2829	0.7600	0.7000	0.7700	25.0001	(75)						
Southeast	6.0200	36.7938	0.7600	0.7000	0.7700	81.6613	(77)						
Southwest	5.4800	36.7938	0.7600	0.7000	0.7700	74.3362	(79)						
Northwest	1.8900	11.2829	0.7600	0.7000	0.7700	7.8619	(81)						
Solar gains	188.8596	332.6131	484.0891	648.4072	770.6275	784.5660	748.2856	654.1209	540.5236	375.4257	228.1980	160.3382	(83)
Total gains	513.2247	654.5864	794.3162	940.0996	1043.6755	1039.4677	991.6570	903.3252	799.4254	653.0501	527.2541	475.4494	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	39.4683	39.6193	39.7686	40.4848	40.6216	41.2712	41.2712	41.3938	41.0186	40.6216	40.3457	40.0612	(85)
tau	3.6312	3.6413	3.6512	3.6990	3.7081	3.7514	3.7514	3.7596	3.7346	3.7081	3.6897	3.6707	(86)
alpha	0.9926	0.9819	0.9562	0.8886	0.7613	0.5890	0.4456	0.5023	0.7449	0.9347	0.9853	0.9943	(86)
util living area	19.2161	19.4961	19.9009	20.3889	20.7458	20.9301	20.9810	20.9707	20.8289	20.3304	19.6832	19.1801	(87)
MIT	19.4985	19.5032	19.5079	19.5299	19.5340	19.5533	19.5533	19.5569	19.5459	19.5340	19.5257	19.5169	(88)
Th 2	0.9899	0.9757	0.9409	0.8506	0.6864	0.4750	0.3057	0.3557	0.6383	0.9034	0.9792	0.9923	(89)
util rest of house	17.9361	18.2157	18.6127	19.0841	19.3851	19.5269	19.5497	19.5506	19.4667	19.0497	18.4202	17.9140	(90)
Living area fraction	18.4689	18.7487	19.1490	19.6273	19.9515	20.1110	20.1456	20.1417	20.0338	19.5828	18.9460	18.4410	(91)
MIT 2	18.4689	18.7487	19.1490	19.6273	19.9515	20.1110	20.1456	20.1417	20.0338	19.5828	18.9460	18.4410	(92)
Temperature adjustment	18.4689	18.7487	19.1490	19.6273	19.9515	20.1110	20.1456	20.1417	20.0338	19.5828	18.9460	18.4410	(93)
adjusted MIT	18.4689	18.7487	19.1490	19.6273	19.9515	20.1110	20.1456	20.1417	20.0338	19.5828	18.9460	18.4410	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(94)
Useful gains	506.7726	635.9344	743.6832	802.4172	740.7472	541.7066	361.4178	376.9623	541.8743	590.8384	514.5516	470.8305	(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	1533.7090	1493.3270	1358.8410	1132.0145	867.8190	570.4757	367.0213	386.1828	618.0240	944.7304	1254.3727	1518.6981	(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	764.0407	576.1678	457.6774	237.3100	94.5414	0.0000	0.0000	0.0000	0.0000	263.2956	532.6711	779.6135	(98)
Space heating												3705.3176	(98)
Space heating per m2												60.2295	(99)

8c. Space cooling requirement

Not applicable

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

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 %)													89.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													4140.0197 (211)
Space heating requirement	764.0407	576.1678	457.6774	237.3100	94.5414	0.0000	0.0000	0.0000	0.0000	263.2956	532.6711	779.6135	(98)
Space heating efficiency (main heating system 1)	89.5000	89.5000	89.5000	89.5000	89.5000	0.0000	0.0000	0.0000	0.0000	89.5000	89.5000	89.5000	(210)
Space heating fuel (main heating system)	853.6768	643.7629	511.3714	265.1508	105.6329	0.0000	0.0000	0.0000	0.0000	294.1850	595.1633	871.0765	(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	180.3347	157.5270	163.8966	145.3681	140.7419	123.9576	118.7609	132.3905	133.8526	152.4179	162.7031	176.0998	(64)
Efficiency of water heater (217)m	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	89.5000	(216)
Fuel for water heating, kWh/month	201.4913	176.0078	183.1247	162.4224	157.2536	138.5002	132.6937	147.9224	149.5560	170.2993	181.7912	196.7595	(219)
Water heating fuel used													1997.8221 (219)
Annual totals kWh/year													
Space heating fuel - main system													4140.0197 (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)													278.3017 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV Unit 0 (0.80 * 0.50 * 1029 * 1.00) =										-411.6747			-411.6747 (233)
Total delivered energy for all uses													6079.4688 (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	4140.0197	0.2160	894.2442	(261)
Space heating - secondary	0.0000	0.0000	0.0000	(263)
Water heating (other fuel)	1997.8221	0.2160	431.5296	(264)
Space and water heating			1325.7738	(265)
Pumps and fans	75.0000	0.5190	38.9250	(267)
Energy for lighting	278.3017	0.5190	144.4386	(268)
Energy saving/generation technologies				
PV Unit	-411.6747	0.5190	-213.6592	(269)
Total CO2, kg/year			1295.4782	(272)
Dwelling Carbon Dioxide Emission Rate (DER)			21.0600	(273)

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

DER			21.0600	ZC1
Total Floor Area		TFA	61.5200	
Assumed number of occupants		N	2.0243	
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190	
CO2 emissions from appliances, equation (L14)			17.0264	ZC2
CO2 emissions from cooking, equation (L16)			2.7240	ZC3
Total CO2 emissions			40.8104	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			40.8104	ZC8

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	31.4500 (1b)	2.4300 (2b)	76.4235 (1b) - (3b)
First floor	30.0700 (1c)	2.6800 (2c)	80.5876 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	61.5200		(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 157.0111 (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				2 * 10 =	20.0000 (7a)							
Number of passive vents				0 * 10 =	0.0000 (7b)							
Number of flueless gas fires				0 * 40 =	0.0000 (7c)							
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =				20.0000 / (5) =	0.1274 (8)							
Pressure test				Yes								
Measured/design AP50				5.0000								
Infiltration rate					0.3774 (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) =		0.3208 (21)							
Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 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	0.4090	0.4010	0.3929	0.3528	0.3448	0.3047	0.3047	0.2967	0.3208	0.3448	0.3609	0.3769 (22b)
Effective ac	0.5836	0.5804	0.5772	0.5623	0.5595	0.5464	0.5464	0.5440	0.5514	0.5595	0.5651	0.5710 (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 Semi-glazed door			1.9300	1.2000	2.3160		(26a)					
TER Opening Type (Uw = 1.40)			13.4500	1.3258	17.8314		(27)					
Ground floor			31.4500	0.1300	4.0885		(28a)					
External wall	123.2200	15.3800	107.8400	0.1800	19.4112		(29a)					
Joisted roof	31.4500		31.4500	0.1300	4.0885		(30)					
Total net area of external elements Aum(A, m ²)			186.1200				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	47.7356		(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)							10.4657 (36)					
Total fabric heat loss						(33) + (36) =	58.2013 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 30.2402	Feb 30.0720	Mar 29.9070	Apr 29.1323	May 28.9874	Jun 28.3126	Jul 28.3126	Aug 28.1877	Sep 28.5725	Oct 28.9874	Nov 29.2806	Dec 29.5871 (38)
Heat transfer coeff	88.4416	88.2733	88.1084	87.3336	87.1887	86.5140	86.5140	86.3890	86.7739	87.1887	87.4819	87.7885 (39)
Average = Sum(39)m / 12 =												87.3330 (39)
HLP	Jan 1.4376	Feb 1.4349	Mar 1.4322	Apr 1.4196	May 1.4172	Jun 1.4063	Jul 1.4063	Aug 1.4042	Sep 1.4105	Oct 1.4172	Nov 1.4220	Dec 1.4270 (40)
HLP (average)												1.4196 (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												
Average daily hot water use (litres/day)												2.0243 (42)
Daily hot water use	90.5040	87.2130	83.9219	80.6308	77.3398	74.0487	74.0487	77.3398	80.6308	83.9219	87.2130	90.5040 (44)
Energy conte	134.2148	117.3852	121.1310	105.6049	101.3304	87.4405	81.0264	92.9790	94.0895	109.6522	119.6940	129.9799 (45)
Energy content (annual)												Total = Sum(45)m = 1294.5278 (45)
Distribution loss (46)m = 0.15 x (45)m												
Water storage loss:	20.1322	17.6078	18.1696	15.8407	15.1996	13.1161	12.1540	13.9469	14.1134	16.4478	17.9541	19.4970 (46)
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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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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	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	46.1199	40.1419	42.7657	39.7632	39.4115	36.5172	37.7344	39.4115	39.7632	42.7657	43.0091	46.1199	46.1199	46.1199	46.1199	46.1199	46.1199	46.1199	46.1199	46.1199	46.1199	46.1199	46.1199	46.1199	(61)	
Solar input	180.3347	157.5270	163.8966	145.3681	140.7419	123.9576	118.7609	132.3905	133.8526	152.4179	162.7031	176.0998	176.0998	176.0998	176.0998	176.0998	176.0998	176.0998	176.0998	176.0998	176.0998	176.0998	176.0998	176.0998	176.0998	(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	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)
Heat gains from water heating, kWh/month	180.3347	157.5270	163.8966	145.3681	140.7419	123.9576	118.7609	132.3905	133.8526	152.4179	162.7031	176.0998	176.0998	176.0998	176.0998	176.0998	176.0998	176.0998	176.0998	176.0998	176.0998	176.0998	176.0998	176.0998	176.0998	(64)
	56.1564	49.0660	50.9675	45.0544	43.5452	38.2032	36.3749	40.7684	41.2255	47.1508	50.5505	54.7483	54.7483	54.7483	54.7483	54.7483	54.7483	54.7483	54.7483	54.7483	54.7483	54.7483	54.7483	54.7483	54.7483	(65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)
(66)m	101.2134	101.2134	101.2134	101.2134	101.2134	101.2134	101.2134	101.2134	101.2134	101.2134	101.2134	101.2134	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	15.7674	14.0045	11.3892	8.6224	6.4453	5.4414	5.8796	7.6426	10.2579	13.0247	15.2017	16.2057	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	176.7635	178.5977	173.9755	164.1352	151.7137	140.0392	132.2400	130.4057	135.0280	144.8682	157.2897	168.9642	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.1213	33.1213	33.1213	33.1213	33.1213	33.1213	33.1213	33.1213	33.1213	33.1213	33.1213	33.1213	(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)	-80.9707	-80.9707	-80.9707	-80.9707	-80.9707	-80.9707	-80.9707	-80.9707	-80.9707	-80.9707	-80.9707	-80.9707	(71)
Water heating gains (Table 5)	75.4790	73.0149	68.5047	62.5756	58.5286	53.0601	48.8910	54.7962	57.2577	63.3747	70.2091	73.5864	(72)
Total internal gains	324.3740	321.9812	310.2334	291.6972	273.0516	254.9047	243.3746	249.2086	258.9075	277.6316	299.0646	315.1203	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	g Specific data or Table 6c	FF	Access factor Table 6d	Gains W	(83)					
Northeast	4.1700	11.2829	0.6300	0.7000	0.7700	14.3791	(75)						
Southeast	4.1700	36.7938	0.6300	0.7000	0.7700	46.8903	(77)						
Southwest	3.8000	36.7938	0.6300	0.7000	0.7700	42.7298	(79)						
Northwest	1.3100	11.2829	0.6300	0.7000	0.7700	4.5172	(81)						
Solar gains	108.5163	191.1199	278.1702	372.6107	442.8612	450.8780	430.0255	375.9002	310.6054	215.7233	131.1205	92.1277	(83)
Total gains	432.8902	513.1011	588.4036	664.3079	715.9128	705.7827	673.4001	625.1088	569.5129	493.3549	430.1851	407.2480	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	48.3056	48.3977	48.4883	48.9184	48.9997	49.3819	49.3819	49.4533	49.2340	48.9997	48.8355	48.6650	(85)
tau	4.2204	4.2265	4.2326	4.2612	4.2666	4.2921	4.2921	4.2969	4.2823	4.2666	4.2557	4.2443	(86)
alpha	0.9960	0.9913	0.9794	0.9437	0.8569	0.7020	0.5430	0.5993	0.8304	0.9646	0.9922	0.9969	(86)
util living area	19.4829	19.6756	19.9817	20.3746	20.7127	20.9151	20.9781	20.9668	20.8166	20.3728	19.8521	19.4467	(87)
MIT	19.7346	19.7367	19.7387	19.7483	19.7501	19.7585	19.7585	19.7601	19.7553	19.7501	19.7465	19.7427	(88)
Th 2	0.9946	0.9883	0.9718	0.9221	0.8020	0.5967	0.4007	0.4550	0.7460	0.9467	0.9889	0.9958	(89)
util rest of house	17.7492	18.0307	18.4742	19.0347	19.4779	19.7048	19.7512	19.7476	19.6146	19.0449	18.2959	17.7016	(90)
Living area fraction	18.4709	18.7155	19.1018	19.5925	19.9919	20.2086	20.2620	20.2551	20.1150	19.5977	18.9437	18.4281	(91)
MIT 2	18.4709	18.7155	19.1018	19.5925	19.9919	20.2086	20.2620	20.2551	20.1150	19.5977	18.9437	18.4281	(92)
Temperature adjustment	18.4709	18.7155	19.1018	19.5925	19.9919	20.2086	20.2620	20.2551	20.1150	19.5977	18.9437	18.4281	(93)
adjusted MIT	18.4709	18.7155	19.1018	19.5925	19.9919	20.2086	20.2620	20.2551	20.1150	19.5977	18.9437	18.4281	(93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(94)
Useful gains	429.6869	505.3622	568.8805	610.3970	582.8046	450.0129	310.0919	322.2576	440.6614	465.6392	424.1546	404.8827	(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	1253.2980	1219.5381	1110.3234	933.8128	722.9594	485.2225	316.8099	333.0410	521.9456	784.4973	1036.1138	1249.0601	(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	612.7666	479.9262	402.8336	232.8594	104.2751	0.0000	0.0000	0.0000	0.0000	237.2304	440.6106	628.0680	(98)
Space heating												3138.5699	(98)
Space heating per m2												51.0171	(99)

8c. Space cooling requirement

Not applicable

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CALCULATION OF TARGET EMISSIONS 09 Jan 2014

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 %)													93.4000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3360.3533 (211)
Space heating requirement	612.7666	479.9262	402.8336	232.8594	104.2751	0.0000	0.0000	0.0000	0.0000	237.2304	440.6106	628.0680	(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)	656.0670	513.8396	431.2993	249.3141	111.6436	0.0000	0.0000	0.0000	0.0000	253.9940	471.7458	672.4497	(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	180.3347	157.5270	163.8966	145.3681	140.7419	123.9576	118.7609	132.3905	133.8526	152.4179	162.7031	176.0998	(64)
Efficiency of water heater (217)m	87.8865	87.6749	87.2271	86.2314	84.3088	80.3000	80.3000	80.3000	80.3000	86.1608	87.4342	87.9768	(217)
Fuel for water heating, kWh/month	205.1904	179.6718	187.8964	168.5790	166.9363	154.3682	147.8965	164.8699	166.6907	176.8993	186.0863	200.1661	(219)
Water heating fuel used													2105.2509 (219)
Annual totals kWh/year													
Space heating fuel - main system													3360.3533 (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)													278.4578 (232)
Total delivered energy for all uses													5819.0619 (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	3360.3533	0.2160	725.8363 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2105.2509	0.2160	454.7342 (264)
Space and water heating			1180.5705 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	278.4578	0.5190	144.5196 (268)
Total CO2, kg/m2/year			1364.0151 (272)
Emissions per m2 for space and water heating			19.1900 (272a)
Fuel factor (mains gas)			1.0000
Emissions per m2 for lighting			2.3491 (272b)
Emissions per m2 for pumps and fans			0.6327 (272c)
Target Carbon Dioxide Emission Rate (TER) = (19.1900 * 1.00) + 2.3491 + 0.6327, rounded to 2 d.p.			22.1700 (273)