

Project Information

Building type Detached house

Reference	J5067-2		
Date	7 October 2019		
Client	DCM Architectural Consultants Ltd	Project	Unit 2
	25 Pigeon Lane		66 Borstal Hill
	Herne Bay		Whitstable
	Kent		Kent
	CT6 7EH		CT5 4NB

Code for Sustainable Homes

Assessor Name:	Mark Attlesey
Assessor No.:	ECMK300581
Ene 1:	Dwelling Emission Rating
TER:	18.40
DER:	18.26
% improvement:	0.8%
Credits:	0
Level:	n/a
Ene 2:	Fabric Energy Efficiency
Dwelling Type:	Detached house
FEE:	56.2
Target FEE:	46.0
Credits:	3
Ene 7:	Low and Zero Carbon Technologies
Energy is supplied by low or zero carbon technologies:	No
Reduction in CO2 emissions as a result:	n/a

	Standard case		Actual case		
	kWh/m ² /year	kg/m ² /year	kWh/m ² /year	kg/m ² /year	
DER		21.1979		18.2634	(ZC1)
CO2 emissions from appliances		15.6080		15.6080	(ZC2)
CO2 emissions from cooking		1.9770		1.9770	(ZC3)
Total CO2 emissions		38.7828		35.8484	(ZC4)
Residual CO2 emissions offset from biofuel CHP		0.0000		0.0000	(ZC5)
Additional allowable generation	0.0000		0.0000		(ZC6)
Resulting CO2 emissions offset		0.0000		0.0000	(ZC7)
Net CO2 emissions		38.7828		35.8484	(ZC8)

Reduction in emissions = 100 x (1 - (ZC8actual / ZC8standard))
 = 100 x (1 - (35.8484 / 38.7828))
 = 0%

Credits 0

Project Information

Building type Detached house

Reference	J5067-2	Project	Unit 2
Date	7 October 2019		66 Borstal Hill
Client	DCM Architectural Consultants Ltd		Whitstable
	25 Pigeon Lane		Kent
	Herne Bay		Kent
	Kent		CT54NB
	CT67EH		

SAP 2012 worksheet for New dwelling as designed - calculation of energy ratings

1. Overall dwelling dimensions

	Area (m²)	Av. Storey height (m)	Volume (m³)	
Ground floor (1)	46.23	2.31	106.79	(3a)
First floor	46.23	2.50	115.57	(3b)
Total floor area	92.46			(4)
Dwelling volume (m ³)			222.37	(5)

SAP 2012 worksheet for New dwelling as designed - calculation of energy ratings

2. Ventilation rate

	main + secondary + other heating		m³ per hour											
Number of chimneys	0 + 0 + 0	x 40	0.00	(6a)										
Number of open flues	0 + 0 + 0	x 20	0.00	(6b)										
Number of intermittent fans	4	x 10	40.00	(7a)										
Number of passive vents	0	x 10	0.00	(7b)										
Number of flueless gas fires	0	x 40	0.00	(7c)										
			Air changes per hour											
Infiltration due to chimneys, fans and flues			0.18	(8)										
Pressure test, result q50		5.00		(17)										
Air permeability			0.43	(18)										
Number of sides on which sheltered			2.00	(19)										
Shelter factor			0.85	(20)										
Infiltration rate incorporating shelter factor			0.37	(21)										
Infiltration rate modified for monthly wind speed														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	5.10	5.00	4.90	4.40	4.30	3.80	3.80	3.70	4.00	4.30	4.50	4.70		
													52.50	(22)
Wind Factor														
	1.27	1.25	1.23	1.10	1.07	0.95	0.95	0.93	1.00	1.07	1.13	1.18		
													13.13	(22a)
Adjusted infiltration rate (allowing for shelter and wind speed)														
	0.47	0.46	0.45	0.40	0.39	0.35	0.35	0.34	0.37	0.39	0.41	0.43		
													4.80	(22b)
Ventilation : natural ventilation, intermittent extract fans														
Effective air change rate														
	0.61	0.60	0.60	0.58	0.58	0.56	0.56	0.56	0.57	0.58	0.58	0.59	(25)	

SAP 2012 worksheet for New dwelling as designed - calculation of energy ratings

3. Heat losses and heat loss parameter

Element	Gross area, m ²	Openings m ²	Net area A, m ²	U-value W/m ² K	A x U W/K	kappa-value kJ/m ² K	A x K kJ/K	
Window - Double-glazed, argon filled, low-E, En=0.2, hard coat (East) Specified U-Value = 1.20			0.200	1.15 (1.20)	0.23			(27)
Window - Double-glazed, argon filled, low-E, En=0.2, hard coat (South) Specified U-Value = 1.20			0.550	1.15 (1.20)	0.63			(27)
Window - Double-glazed, argon filled, low-E, En=0.2, hard coat (West) Specified U-Value = 1.20			2.520	1.15 (1.20)	2.89			(27)
Window - Double-glazed, argon filled, low-E, En=0.2, hard coat (East) Specified U-Value = 1.20			4.330	1.15 (1.20)	4.96			(27)
Full glazed door - Double-glazed, argon filled, low-E, En=0.2, hard coat (West) Specified U-Value = 1.20			6.680	1.20	8.02			(26)
Full glazed door - Double-glazed, argon filled, low-E, En=0.2, hard coat (East) Specified U-Value = 1.20			3.780	1.20	4.54			(26)
Full glazed door - Double-glazed, argon filled, low-E, En=0.2, hard coat (South) Specified U-Value = 1.20			2.630	1.20	3.16			(26)
Rooflight at 70° or less - Double-glazed, argon filled, low-E, En=0.2, hard coat (n/a) Velux Specified U-Value = 1.20			4.670	1.15 (1.20)	5.35			(27)
Walls Dormer Cheeks - Weatherboard/Battens/9 OSB/51 Cavity/140 Timber Frame Insulated With 120 Celotex XR4000 Between Studs/12.5 P'bd			4.15	0.21	0.87	9.00	37.35	(29)
Walls Brick or (Weatherboard/Battens/100 Medium Dense Block)/51 Cavity/140 Timber Frame Insulated With 120 Celotex XR4000 Between Studs/12.5 P'bd			96.74	0.20	19.35	9.00	870.66	(29)
Ground floors Beam/Medium Dense Block/150 Kingspan TF70/Screed			46.23	0.12	5.55	75.00	3467.25	(28)

SAP 2012 worksheet for New dwelling as designed - calculation of energy ratings

3. Heat losses and heat loss parameter

Element	Gross area, m ²	Openings m ²	Net area A, m ²	U-value W/m ² K	A x U W/K	kappa-value kJ/m ² K	A x K kJ/K						
Flat roofs			3.36	0.15	0.50	9.00	30.24	(30)					
150 Kingspan TR27 Over Joists													
Pitched roofs insulated between rafters			51.06	0.12	6.13	9.00	459.54	(30)					
150 Kingspan K7 Between Rafters/52.5 Kingspan K118 Under Rafters With Breather Membrane													
Total area of external elements Sigma A, m ²							226.90	(31)					
Fabric heat loss, W/K							62.16	(33)					
Heat capacity							4865.04	(34)					
Thermal mass parameter, kJ/m ² K							52.62	(35)					
Effect of thermal bridges							34.04	(36)					
Total fabric heat loss							96.19	(37)					
Ventilation heat loss calculated monthly													
	44.65	44.34	44.04	42.62	42.35	41.11	41.11	40.88	41.59	42.35	42.89	43.45	(38)
Heat transfer coefficient, W/K													
	140.85	140.54	140.23	138.81	138.54	137.30	137.30	137.07	137.78	138.54	139.08	139.64	138.81 (39)
Heat loss parameter (HLP), W/m ² K													
	1.52	1.52	1.52	1.50	1.50	1.48	1.48	1.48	1.49	1.50	1.50	1.51	
HLP (average)													1.50 (40)
Number of days in month (Table 1a)													
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
31	28	31	30	31	30	31	31	30	31	30	31		

SAP 2012 worksheet for New dwelling as designed - calculation of energy ratings

4. Water heating energy requirements

												kWh/year	
Assumed occupancy, N												2.66	(42)
Annual average hot water usage in litres per day Vd,average												97.33	(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage in litres per day for each month													
107.06	103.17	99.27	95.38	91.49	87.59	87.59	91.49	95.38	99.27	103.17	107.06	(44)	
Energy content of hot water used													
158.76	138.86	143.29	124.92	119.86	103.43	95.85	109.99	111.30	129.71	141.59	153.75	(45)	
Energy content (annual)												1531.31	(45)
Distribution loss													
23.81	20.83	21.49	18.74	17.98	15.52	14.38	16.50	16.69	19.46	21.24	23.06	(46)	
store loss determined from EN 13203-2 tests, taken from boiler data record													
Hot water storage volume (litres)												0.00	(50)
Hot water cylinder loss factor (kWh/day)												0.0000	(51)
Volume factor												0.0000	(52)
Temperature factor												0.0000	(53)
Energy lost from store (kWh/day)												0.00	(55)
Total storage loss													
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(56)	
Net storage loss													
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(57)	
Primary loss													
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(59)	
Combi loss calculated for each month													
17.45	15.73	17.33	16.64	17.10	16.44	16.92	17.04	16.55	17.24	16.80	17.41	(61)	
Total heat required for water heating calculated for each month													
176.21	154.58	160.62	141.56	136.97	119.88	112.77	127.02	127.85	146.94	158.39	171.17	(62)	
Output from water heater for each month, kWh/month													
176.21	154.58	160.62	141.56	136.97	119.88	112.77	127.02	127.85	146.94	158.39	171.17	(64)	
												1733.95	(64)
Heat gains from water heating, kWh/month													
57.15	50.10	51.98	45.70	44.13	38.50	36.10	40.83	41.14	47.44	51.28	55.48	(65)	

SAP 2012 worksheet for New dwelling as designed - calculation of energy ratings

5. Internal gains

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Metabolic gains, Watts													
159.48	159.48	159.48	159.48	159.48	159.48	159.48	159.48	159.48	159.48	159.48	159.48	159.48	(66)
Lighting gains													
57.96	51.48	41.86	31.69	23.69	20.00	21.61	28.09	37.71	47.88	55.88	59.57		(67)
Appliances gains													
363.48	367.25	357.75	337.51	311.97	287.96	271.93	268.15	277.66	297.89	323.44	347.44		(68)
Cooking gains													
53.61	53.61	53.61	53.61	53.61	53.61	53.61	53.61	53.61	53.61	53.61	53.61	53.61	(69)
Pumps and fans gains													
3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	(70)
Losses e.g. evaporation (negative values)													
-106.32	-106.32	-106.32	-106.32	-106.32	-106.32	-106.32	-106.32	-106.32	-106.32	-106.32	-106.32	-106.32	(71)
Water heating gains													
76.82	74.56	69.86	63.47	59.32	53.48	48.52	54.88	57.15	63.76	71.22	74.56		(72)
Total internal gains													
608.02	603.05	579.23	542.44	504.74	471.20	451.82	460.89	482.27	519.29	560.30	591.34		(73)

6. Solar gains (calculation for January)

	Area & Flux	g & FF	Shading	Gains
Window - Double-glazed, argon filled, low-E, En=0.2, hard coat (East) Specified U-Value = 1.20	0.9 x 0.200 19.64	0.72 x 0.70	0.77	1.3720
Window - Double-glazed, argon filled, low-E, En=0.2, hard coat (South) Specified U-Value = 1.20	0.9 x 0.550 46.75	0.72 x 0.70	0.77	8.9811
Window - Double-glazed, argon filled, low-E, En=0.2, hard coat (West) Specified U-Value = 1.20	0.9 x 2.520 19.64	0.72 x 0.70	0.77	17.2867
Window - Double-glazed, argon filled, low-E, En=0.2, hard coat (East) Specified U-Value = 1.20	0.9 x 4.330 19.64	0.72 x 0.70	0.77	29.7029
Full glazed door - Double-glazed, argon filled, low-E, En=0.2, hard coat (West) Specified U-Value = 1.20	0.9 x 6.680 19.64	0.72 x 0.70	0.77	45.8234
Full glazed door - Double-glazed, argon filled, low-E, En=0.2, hard coat (East) Specified U-Value = 1.20	0.9 x 3.780 19.64	0.72 x 0.70	0.77	25.9300
Full glazed door - Double-glazed, argon filled, low-E, En=0.2, hard coat (South) Specified U-Value = 1.20	0.9 x 2.630 46.75	0.72 x 0.70	0.77	42.9458
Rooflight at 70° or less - Double-glazed, argon filled, low-E, En=0.2, hard coat (n/a) Velux Specified U-Value = 1.20	0.9 x 4.670 26.00	0.72 x 0.70	1.00	55.0761

SAP 2012 worksheet for New dwelling as designed - calculation of energy ratings

7. Mean internal temperature

Temperature during heating periods in the living area, Th1 (°C) 21.00 (85)
 Heating system responsiveness 1.00

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

tau

9.59	9.62	9.64	9.74	9.75	9.84	9.84	9.86	9.81	9.75	9.72	9.68
------	------	------	------	------	------	------	------	------	------	------	------

alpha

1.64	1.64	1.64	1.65	1.65	1.66	1.66	1.66	1.65	1.65	1.65	1.65
------	------	------	------	------	------	------	------	------	------	------	------

Utilisation factor for gains for living area

0.87	0.83	0.75	0.65	0.53	0.41	0.32	0.36	0.53	0.72	0.84	0.88
------	------	------	------	------	------	------	------	------	------	------	------

 (86)

Mean internal temperature in living area T1

17.39	17.87	18.62	19.48	20.16	20.62	20.82	20.78	20.39	19.43	18.25	17.29
-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------

 (87)

Temperature during heating periods in rest of dwelling Th2

19.67	19.67	19.68	19.69	19.69	19.70	19.70	19.70	19.69	19.69	19.68	19.68
-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------

 (88)

Utilisation factor for gains for rest of dwelling

0.86	0.81	0.73	0.61	0.48	0.35	0.24	0.27	0.46	0.68	0.82	0.87
------	------	------	------	------	------	------	------	------	------	------	------

 (89)

Mean internal temperature in the rest of dwelling T2

15.13	15.79	16.80	17.94	18.82	19.37	19.59	19.55	19.13	17.92	16.32	15.00
-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------

 (90)

Living area fraction (46.23/92.46) 0.50 (91)

Mean internal temperature (for the whole dwelling)

16.26	16.83	17.71	18.71	19.49	19.99	20.21	20.17	19.76	18.68	17.28	16.15
-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------

 (92)

Apply adjustment to the mean internal temperature, where appropriate

16.26	16.83	17.71	18.71	19.49	19.99	20.21	20.17	19.76	18.68	17.28	16.15
-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------

 (93)

8. Space heating requirement

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

Utilisation factor for gains

0.81	0.76	0.68	0.58	0.47	0.36	0.27	0.31	0.46	0.65	0.77	0.82
------	------	------	------	------	------	------	------	------	------	------	------

 (94)

Useful gains

677.10	787.08	874.13	900.88	818.14	624.10	445.72	454.30	597.43	667.59	647.93	642.41
--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------

 (95)

Monthly average external temperature

4.30	4.90	6.50	8.90	11.70	14.60	16.60	16.40	14.10	10.60	7.10	4.20
------	------	------	------	-------	-------	-------	-------	-------	-------	------	------

 (96)

Heat loss rate for mean internal temperature

1684.90	1676.65	1571.43	1361.72	1079.02	740.54	495.07	516.32	779.35	1119.13	1416.48	1668.45
---------	---------	---------	---------	---------	--------	--------	--------	--------	---------	---------	---------

 (97)

Fraction of month for heating

1.00	1.00	1.00	1.00	1.00	-	-	-	-	1.00	1.00	1.00
------	------	------	------	------	---	---	---	---	------	------	------

Space heating requirement for each month, kWh/month

749.81	597.79	518.79	331.81	194.10	-	-	-	-	335.94	553.36	763.37
--------	--------	--------	--------	--------	---	---	---	---	--------	--------	--------

Total space heating requirement per year (kWh/year) (October to May) 4044.96 (98)

Space heating requirement per m² (kWh/m²/year) 43.75 (99)

8c. Space cooling requirement - not applicable

SAP 2012 worksheet for New dwelling as designed - calculation of energy ratings

9a. Energy requirements

												kWh/year
No secondary heating system selected												
Fraction of space heat from main system(s)										1.0000		(202)
Efficiency of main heating system										92.80%		(206)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement												
749.81	597.79	518.79	331.81	194.10	-	-	-	-	335.94	553.36	763.37	(98)
Appendix Q - monthly energy saved (main heating system 1)												
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(210)
Space heating fuel (main heating system 1)												
807.98	644.17	559.04	357.55	209.16	-	-	-	-	362.01	596.29	822.60	(211)
Appendix Q - monthly energy saved (main heating system 2)												
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(212)
Space heating fuel (main heating system 2)												
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(213)
Appendix Q - monthly energy saved (secondary heating system)												
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(214)
Space heating fuel (secondary)												
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(215)
Water heating												
Water heating requirement												
176.21	154.58	160.62	141.56	136.97	119.88	112.77	127.02	127.85	146.94	158.39	171.17	(64)
Efficiency of water heater										87.10		(216)
89.27	89.23	89.15	88.98	88.66	87.10	87.10	87.10	87.10	88.96	89.18	89.29	(217)
Water heating fuel												
197.38	173.24	180.17	159.10	154.48	137.63	129.47	145.84	146.79	165.18	177.59	191.69	(219)
Annual totals												kWh/year
Space heating fuel used, main system 1										4358.79		(211)
Space heating fuel (secondary)										0.00		(215)
Water heating fuel										1958.56		(219)
Electricity for pumps, fans and electric keep-hot												
central heating pump										30.00		(230c)
boiler with a fan-assisted flue										45.00		(230e)
Total electricity for the above, kWh/year										75.00		(231)
Electricity for lighting (100.00% fixed LEL)										409.43		(232)
Energy saving/generation technologies												
Appendix Q -												
Energy saved or generated ():										0.000		(236a)
Energy used ():										0.000		(237a)
Total delivered energy for all uses										6801.78		(238)

SAP 2012 worksheet for New dwelling as designed - calculation of energy ratings

10a. Fuel costs using Table 12 prices

	kWh/year	Fuel price p/kWh	£/year	
Space heating - main system 1	4358.792	3.480	151.69	(240)
Space heating - main system 2	0.000	0.000	0.00	(241)
Water heating				
Water heating cost	1958.56	3.480	68.16	(247)
Mech vent fans cost	0.000	13.190	0.00	(249)
Pump/fan energy cost	75.000	13.190	9.89	(249)
Energy for lighting	409.426	13.190	54.00	(250)
Additional standing charges			120.00	(251)
Electricity generated - PVs	0.000	0.000	0.00	(252)
Appendix Q -				
Energy saved or generated ():	0.000	0.000	0.00	(253)
Energy used ():	0.000	0.000	0.00	(254)
Total energy cost			403.74	(255)

11a. SAP rating

Energy cost deflator		0.42	(256)
Energy cost factor (ECF)		1.23	(257)
SAP value		82.79	
SAP rating		83	(258)
SAP band		B	

12a. Carbon dioxide emissions

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating, main system 1	4358.79	0.216	941.50	(261)
Space heating, main system 2	0.00	0.000	0.00	(262)
Space heating, secondary	0.00	0.519	0.00	(263)
Water heating	1958.56	0.216	423.05	(264)
Space and water heating			1364.55	(265)
Electricity for pumps and fans	75.00	0.519	38.93	(267)
Electricity for lighting	409.43	0.519	212.49	(268)
Electricity generated - PVs	0.00	0.519	0.00	(269)
Electricity generated - µCHP	0.00	0.000	0.00	(269)
Appendix Q -				
Energy saved ():	0.00	0.000	0.00	(270)
Energy used ():	0.00	0.000	0.00	(271)
Total CO2, kg/year			1615.97	(272)

	kg/m ² /year	
CO2 emissions per m²	17.48	(273)
EI value	84.25	(273a)
EI rating	84	(274)
EI band	B	

Calculation of stars for heating and DHW

Main heating energy efficiency	$(3.48 / 0.8980) \times (1 + (0.29 \times 0.00)) = 3.8753$, stars = 4
Main heating environmental impact	$(0.2160 / 0.8980) \times (1 + (0.29 \times 0.00)) = 0.2405$, stars = 4
Water heating energy efficiency	$3.48 / 0.8843 = 3.9354$, stars = 4
Water heating environmental impact	$0.2160 / 0.8843 = 0.2443$, stars = 4

Project Information

Building type Detached house

Reference	J5067-2	Project	Unit 2
Date	7 October 2019		66 Borstal Hill
Client	DCM Architectural Consultants Ltd		Whitstable
	25 Pigeon Lane		Kent
	Herne Bay		Kent
	Kent		CT54NB
	CT67EH		

SAP 2012 worksheet for notional dwelling - calculation of target emissions

1. Overall dwelling dimensions

	Area (m²)	Av. Storey height (m)	Volume (m³)	
Ground floor (1)	46.23	2.31	106.79	(3a)
First floor	46.23	2.50	115.57	(3b)
Total floor area	92.46			(4)
Dwelling volume (m ³)			222.37	(5)

SAP 2012 worksheet for notional dwelling - calculation of target emissions

2. Ventilation rate

	main + secondary + other heating		m³ per hour										
Number of chimneys	0 + 0 + 0	x 40	0.00	(6a)									
Number of open flues	0 + 0 + 0	x 20	0.00	(6b)									
Number of intermittent fans	3	x 10	30.00	(7a)									
Number of passive vents	0	x 10	0.00	(7b)									
Number of flueless gas fires	0	x 40	0.00	(7c)									
			Air changes per hour										
Infiltration due to chimneys, fans and flues			0.13	(8)									
Pressure test, result q50	5.00			(17)									
Air permeability			0.38	(18)									
Number of sides on which sheltered			2.00	(19)									
Shelter factor			0.85	(20)									
Infiltration rate incorporating shelter factor			0.33	(21)									
Infiltration rate modified for monthly wind speed													
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
5.10	5.00	4.90	4.40	4.30	3.80	3.80	3.70	4.00	4.30	4.50	4.70		
												52.50	(22)
Wind Factor													
1.27	1.25	1.23	1.10	1.07	0.95	0.95	0.93	1.00	1.07	1.13	1.18		
												13.13	(22a)
Adjusted infiltration rate (allowing for shelter and wind speed)													
0.42	0.41	0.40	0.36	0.35	0.31	0.31	0.30	0.33	0.35	0.37	0.38		
												4.29	(22b)
Ventilation : natural ventilation, intermittent extract fans													
Effective air change rate													
0.59	0.58	0.58	0.56	0.56	0.55	0.55	0.55	0.55	0.56	0.57	0.57		
													(25)

SAP 2012 worksheet for notional dwelling - calculation of target emissions

3. Heat losses and heat loss parameter

Element	Gross area, m ²	Openings m ²	Net area A, m ²	U-value W/m ² K	A x U W/K	
Window - Double-glazed, air-filled, low-E, En=0.1, soft coat (South) Specified U-Value = 1.20			0.500	1.33 (1.40)	0.66	(27)
Window - Double-glazed, air-filled, low-E, En=0.1, soft coat (West) Specified U-Value = 1.20			2.300	1.33 (1.40)	3.05	(27)
Window - Double-glazed, air-filled, low-E, En=0.1, soft coat (East) Specified U-Value = 1.20			3.950	1.33 (1.40)	5.24	(27)
Window - Double-glazed, air-filled, low-E, En=0.1, soft coat (East) Specified U-Value = 1.20			0.180	1.33 (1.40)	0.24	(27)
Full glazed door - Double-glazed, air-filled, low-E, En=0.1, soft coat (West) Specified U-Value = 1.20			6.090	1.40	8.53	(26)
Full glazed door - Double-glazed, air-filled, low-E, En=0.1, soft coat (East) Specified U-Value = 1.20			3.450	1.40	4.83	(26)
Full glazed door - Double-glazed, air-filled, low-E, En=0.1, soft coat (South) Specified U-Value = 1.20			2.400	1.40	3.36	(26)
Rooflight at 70° or less - Double-glazed, air-filled, low-E, En=0.1, soft coat (n/a) Velux Specified U-Value = 1.20			4.260	1.59 (1.70)	6.78	(27)
Walls Brick or (Weatherboard/Battens/100 Medium Dense Block)/51 Cavity/140 Timber Frame Insulated With 120 Celotex XR4000 Between Studs/12.5 P'bd			98.54	0.18	17.74	(29)
Walls Dormer Cheeks - Weatherboard/Battens/9 OSB/51 Cavity/140 Timber Frame Insulated With 120 Celotex XR4000 Between Studs/12.5 P'bd			4.17	0.18	0.75	(29)
Ground floors Beam/Medium Dense Block/150 Kingspan TF70/Screed			46.23	0.13	6.01	(28)

SAP 2012 worksheet for notional dwelling - calculation of target emissions

3. Heat losses and heat loss parameter

Element	Gross area, m ²	Openings m ²	Net area A, m ²	U-value W/m ² K	A x U W/K								
Flat roofs			3.36	0.13	0.44	(30)							
150 Kingspan TR27 Over Joists													
Pitched roofs insulated between rafters			51.47	0.13	6.69	(30)							
150 Kingspan K7 Between Rafters/52.5 Kingspan K118 Under Rafters With Breather Membrane													
Total area of external elements Sigma A, m ²					226.90	(31)							
Fabric heat loss, W/K					64.31	(33)							
Thermal mass parameter, kJ/m ² K (user-specified TMP)					250.00	(35)							
Effect of thermal bridges					11.34	(36)							
Total fabric heat loss					75.65	(37)							
Ventilation heat loss calculated monthly													
	43.08	42.83	42.58	41.44	41.23	40.23	40.23	40.05	40.62	41.23	41.66	42.11	(38)
Heat transfer coefficient, W/K													
	118.73	118.48	118.24	117.10	116.88	115.89	115.89	115.71	116.27	116.88	117.32	117.77	117.10 (39)
Heat loss parameter (HLP), W/m ² K													
	1.28	1.28	1.28	1.27	1.26	1.25	1.25	1.25	1.26	1.26	1.27	1.27	1.27 (40)
HLP (average)													
Number of days in month (Table 1a)													
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
31	28	31	30	31	30	31	31	30	31	30	31		

SAP 2012 worksheet for notional dwelling - calculation of target emissions

4. Water heating energy requirements

kWh/year

Assumed occupancy, N 2.66 (42)
 Annual average hot water usage in litres per day Vd,average 97.33 (43)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

Hot water usage in litres per day for each month

107.06	103.17	99.27	95.38	91.49	87.59	87.59	91.49	95.38	99.27	103.17	107.06	(44)
--------	--------	-------	-------	-------	-------	-------	-------	-------	-------	--------	--------	------

Energy content of hot water used

158.76	138.86	143.29	124.92	119.86	103.43	95.85	109.99	111.30	129.71	141.59	153.75	(45)
--------	--------	--------	--------	--------	--------	-------	--------	--------	--------	--------	--------	------

Energy content (annual) 1531.31 (45)

Distribution loss

23.81	20.83	21.49	18.74	17.98	15.52	14.38	16.50	16.69	19.46	21.24	23.06	(46)
-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	------

Hot water storage volume (litres) 0.00 (50)

Hot water cylinder loss factor (kWh/day) 0.0000 (51)

Volume factor 0.0000 (52)

Temperature factor 0.0000 (53)

Energy lost from store (kWh/day) 0.00 (55)

Total storage loss

0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(56)
------	------	------	------	------	------	------	------	------	------	------	------	------

Net storage loss

0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(57)
------	------	------	------	------	------	------	------	------	------	------	------	------

Primary loss

0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(59)
------	------	------	------	------	------	------	------	------	------	------	------	------

Combi loss calculated for each month

50.96	46.03	50.59	47.04	46.62	43.20	44.64	46.62	47.04	50.59	49.32	50.96	(61)
-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	------

Total heat required for water heating calculated for each month

209.72	184.88	193.87	171.96	166.49	146.63	140.48	156.61	158.34	180.30	190.90	204.71	(62)
--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	------

Output from water heater for each month, kWh/month

209.72	184.88	193.87	171.96	166.49	146.63	140.48	156.61	158.34	180.30	190.90	204.71	(64)
--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	------

2104.89 (64)

Heat gains from water heating, kWh/month

65.53	57.68	60.29	53.30	51.51	45.19	43.03	48.23	48.77	55.78	59.41	63.86	(65)
-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	------

SAP 2012 worksheet for notional dwelling - calculation of target emissions

5. Internal gains

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains, Watts												
132.90	132.90	132.90	132.90	132.90	132.90	132.90	132.90	132.90	132.90	132.90	132.90	(66)
Lighting gains												
23.66	21.01	17.09	12.94	9.67	8.16	8.82	11.47	15.39	19.54	22.81	24.31	(67)
Appliances gains												
243.53	246.06	239.69	226.13	209.02	192.94	182.19	179.66	186.03	199.59	216.70	232.79	(68)
Cooking gains												
36.29	36.29	36.29	36.29	36.29	36.29	36.29	36.29	36.29	36.29	36.29	36.29	(69)
Pumps and fans gains												
3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	(70)
Losses e.g. evaporation (negative values)												
-106.32	-106.32	-106.32	-106.32	-106.32	-106.32	-106.32	-106.32	-106.32	-106.32	-106.32	-106.32	(71)
Water heating gains												
88.08	85.83	81.03	74.02	69.23	62.77	57.83	64.82	67.73	74.97	82.51	85.84	(72)
Total internal gains												
421.13	418.77	403.68	378.96	353.79	329.73	314.71	321.82	335.02	359.96	387.89	408.81	(73)

6. Solar gains (calculation for January)

	Area & Flux	g & FF	Shading	Gains
Window - Double-glazed, air-filled, low-E, En=0.1, soft coat (South) Specified U-Value = 1.20	0.9 x 0.500 19.64	0.63 x 0.70	0.77	7.1440
Window - Double-glazed, air-filled, low-E, En=0.1, soft coat (West) Specified U-Value = 1.20	0.9 x 2.300 19.64	0.63 x 0.70	0.77	13.8053
Window - Double-glazed, air-filled, low-E, En=0.1, soft coat (East) Specified U-Value = 1.20	0.9 x 3.950 19.64	0.63 x 0.70	0.77	23.7092
Window - Double-glazed, air-filled, low-E, En=0.1, soft coat (East) Specified U-Value = 1.20	0.9 x 0.180 19.64	0.63 x 0.70	0.77	1.0804
Full glazed door - Double-glazed, air-filled, low-E, En=0.1, soft coat (West) Specified U-Value = 1.20	0.9 x 6.090 19.64	0.63 x 0.70	0.77	36.5541
Full glazed door - Double-glazed, air-filled, low-E, En=0.1, soft coat (East) Specified U-Value = 1.20	0.9 x 3.450 19.64	0.63 x 0.70	0.77	20.7080
Full glazed door - Double-glazed, air-filled, low-E, En=0.1, soft coat (South) Specified U-Value = 1.20	0.9 x 2.400 46.75	0.63 x 0.70	0.77	34.2913
Rooflight at 70° or less - Double-glazed, air-filled, low-E, En=0.1, soft coat (n/a) Velux Specified U-Value = 1.20	0.9 x 4.260 26.00	0.63 x 0.70	1.00	43.9606

SAP 2012 worksheet for notional dwelling - calculation of target emissions

7. Mean internal temperature

Temperature during heating periods in the living area, Th1 (°C) 21.00 (85)
 Heating system responsiveness 1.00

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

tau

54.08	54.19	54.30	54.83	54.93	55.40	55.40	55.49	55.22	54.93	54.73	54.52
-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------

alpha

4.61	4.61	4.62	4.66	4.66	4.69	4.69	4.70	4.68	4.66	4.65	4.63
------	------	------	------	------	------	------	------	------	------	------	------

Utilisation factor for gains for living area

1.00	0.99	0.97	0.89	0.73	0.54	0.40	0.46	0.73	0.95	0.99	1.00
------	------	------	------	------	------	------	------	------	------	------	------

(86)

Mean internal temperature in living area T1

19.63	19.86	20.22	20.63	20.89	20.98	21.00	20.99	20.92	20.52	19.98	19.59
-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------

(87)

Temperature during heating periods in rest of dwelling Th2

19.85	19.86	19.86	19.87	19.87	19.88	19.88	19.88	19.87	19.87	19.87	19.86
-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------

(88)

Utilisation factor for gains for rest of dwelling

1.00	0.99	0.96	0.86	0.67	0.45	0.30	0.35	0.64	0.93	0.99	1.00
------	------	------	------	------	------	------	------	------	------	------	------

(89)

Mean internal temperature in the rest of dwelling T2

18.04	18.38	18.90	19.47	19.77	19.86	19.88	19.88	19.81	19.33	18.57	17.99
-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------

(90)

Living area fraction (46.23/92.46) 0.50 (91)

Mean internal temperature (for the whole dwelling)

18.84	19.12	19.56	20.05	20.33	20.42	20.44	20.43	20.37	19.93	19.28	18.79
-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------

(92)

Apply adjustment to the mean internal temperature, where appropriate

18.84	19.12	19.56	20.05	20.33	20.42	20.44	20.43	20.37	19.93	19.28	18.79
-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------

(93)

8. Space heating requirement

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

Utilisation factor for gains

0.99	0.99	0.95	0.86	0.69	0.50	0.35	0.40	0.69	0.93	0.99	1.00
------	------	------	------	------	------	------	------	------	------	------	------

(94)

Useful gains

599.30	754.34	917.62	1017.69	924.18	660.65	442.43	462.64	671.04	716.03	605.44	556.87
--------	--------	--------	---------	--------	--------	--------	--------	--------	--------	--------	--------

(95)

Monthly average external temperature

4.30	4.90	6.50	8.90	11.70	14.60	16.60	16.40	14.10	10.60	7.10	4.20
------	------	------	------	-------	-------	-------	-------	-------	-------	------	------

(96)

Heat loss rate for mean internal temperature

1725.89	1684.82	1544.36	1305.84	1008.59	674.65	444.55	466.78	728.49	1089.97	1428.41	1718.10
---------	---------	---------	---------	---------	--------	--------	--------	--------	---------	---------	---------

(97)

Fraction of month for heating

1.00	1.00	1.00	1.00	1.00	-	-	-	-	1.00	1.00	1.00
------	------	------	------	------	---	---	---	---	------	------	------

Space heating requirement for each month, kWh/month

838.18	625.28	466.29	207.46	62.80	-	-	-	-	278.21	592.53	863.95
--------	--------	--------	--------	-------	---	---	---	---	--------	--------	--------

Total space heating requirement per year (kWh/year) (October to May) 3934.71 (98)

Space heating requirement per m² (kWh/m²/year) 42.56 (99)

SAP 2012 worksheet for notional dwelling - calculation of target emissions

9a. Energy requirements

kWh/year

No secondary heating system selected
 Fraction of space heat from main system(s) 1.0000 (202)
 Efficiency of main heating system 93.40% (206)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

Space heating requirement												
838.18	625.28	466.29	207.46	62.80	-	-	-	-	278.21	592.53	863.95	(98)

Appendix Q - monthly energy saved (main heating system 1)												
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(210)

Space heating fuel (main heating system 1)												
897.41	669.46	499.24	222.12	67.23	-	-	-	-	297.87	634.40	925.00	(211)

Appendix Q - monthly energy saved (main heating system 2)												
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(212)

Space heating fuel (main heating system 2)												
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(213)

Appendix Q - monthly energy saved (secondary heating system)												
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(214)

Space heating fuel (secondary)												
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(215)

Water heating requirement												
209.72	184.88	193.87	171.96	166.49	146.63	140.48	156.61	158.34	180.30	190.90	204.71	(64)

Efficiency of water heater												80.30 (216)
88.18	87.88	87.18	85.52	82.83	80.30	80.30	80.30	80.30	86.14	87.71	88.27	(217)

Water heating fuel												
237.83	210.39	222.39	201.06	200.98	182.60	174.95	195.03	197.18	209.31	217.65	231.91	(219)

Annual totals												kWh/year
Space heating fuel used, main system 1											4212.75 (211)	
Space heating fuel (secondary)											0.00 (215)	
Water heating fuel											2481.27 (219)	
Electricity for pumps, fans and electric keep-hot												
central heating pump											30.00 (230c)	
boiler with a fan-assisted flue											45.00 (230e)	
Total electricity for the above, kWh/year											75.00 (231)	
Electricity for lighting (100.00% fixed LEL)											417.77 (232)	
Energy saving/generation technologies												
Appendix Q -												
Energy saved or generated ():											0.000 (236a)	
Energy used ():											0.000 (237a)	

Total delivered energy for all uses											7186.80 (238)
-------------------------------------	--	--	--	--	--	--	--	--	--	--	---------------

10a. Does not apply

11a. Does not apply

SAP 2012 worksheet for notional dwelling - calculation of target emissions

12a. Carbon dioxide emissions

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating, main system 1	4212.75	0.216	909.95	(261)
Space heating, main system 2	0.00	0.000	0.00	(262)
Space heating, secondary	0.00	0.519	0.00	(263)
Water heating	2481.27	0.216	535.96	(264)
Space and water heating			1445.91	(265)
Electricity for pumps and fans	75.00	0.519	38.93	(267)
Electricity for lighting	417.77	0.519	216.82	(268)
Electricity generated - PVs	0.00	0.519	0.00	(269)
Electricity generated - µCHP	0.00	0.000	0.00	(269)
Appendix Q -				
Energy saved ():	0.00	0.000	0.00	(270)
Energy used ():	0.00	0.000	0.00	(271)
Total CO2, kg/year			1701.66	(272)

	kg/m²/year	
Emissions per m² for space and water heating	15.64	(272a)
Emissions per m² for lighting	2.35	(272b)
Emissions per m² for pumps and fans	0.42	(272c)
Target Carbon Dioxide Emission Rate (TER)	18.40	(273)
= (15.6382 x 1.00) + 2.3450 + 0.4210		

Project Information

Building type Detached house

Reference	J5067-2	Project	Unit 2
Date	7 October 2019		66 Borstal Hill
Client	DCM Architectural Consultants Ltd		Whitstable
	25 Pigeon Lane		Kent
	Herne Bay		Kent
	Kent		CT54NB
	CT67EH		

SAP 2012 worksheet for New dwelling as designed - calculation of dwelling emissions

1. Overall dwelling dimensions

	Area (m²)	Av. Storey height (m)	Volume (m³)	
Ground floor (1)	46.23	2.31	106.79	(3a)
First floor	46.23	2.50	115.57	(3b)
Total floor area	92.46			(4)
Dwelling volume (m ³)			222.37	(5)

SAP 2012 worksheet for New dwelling as designed - calculation of dwelling emissions

2. Ventilation rate

	main + secondary + other heating		m³ per hour										
Number of chimneys	0 + 0 + 0	x 40	0.00	(6a)									
Number of open flues	0 + 0 + 0	x 20	0.00	(6b)									
Number of intermittent fans	4	x 10	40.00	(7a)									
Number of passive vents	0	x 10	0.00	(7b)									
Number of flueless gas fires	0	x 40	0.00	(7c)									
			Air changes per hour										
Infiltration due to chimneys, fans and flues			0.18	(8)									
Pressure test, result q50		5.00		(17)									
Air permeability			0.43	(18)									
Number of sides on which sheltered			2.00	(19)									
Shelter factor			0.85	(20)									
Infiltration rate incorporating shelter factor			0.37	(21)									
Infiltration rate modified for monthly wind speed													
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
5.10	5.00	4.90	4.40	4.30	3.80	3.80	3.70	4.00	4.30	4.50	4.70		
												52.50	(22)
Wind Factor													
1.27	1.25	1.23	1.10	1.07	0.95	0.95	0.93	1.00	1.07	1.13	1.18		
												13.13	(22a)
Adjusted infiltration rate (allowing for shelter and wind speed)													
0.47	0.46	0.45	0.40	0.39	0.35	0.35	0.34	0.37	0.39	0.41	0.43		
												4.80	(22b)
Ventilation : natural ventilation, intermittent extract fans													
Effective air change rate													
0.61	0.60	0.60	0.58	0.58	0.56	0.56	0.56	0.57	0.58	0.58	0.59	(25)	

SAP 2012 worksheet for New dwelling as designed - calculation of dwelling emissions

3. Heat losses and heat loss parameter

Element	Gross area, m ²	Openings m ²	Net area A, m ²	U-value W/m ² K	A x U W/K	kappa-value kJ/m ² K	A x K kJ/K	
Window - Double-glazed, argon filled, low-E, En=0.2, hard coat (East) Specified U-Value = 1.20			0.200	1.15 (1.20)	0.23			(27)
Window - Double-glazed, argon filled, low-E, En=0.2, hard coat (East) Specified U-Value = 1.20			4.330	1.15 (1.20)	4.96			(27)
Window - Double-glazed, argon filled, low-E, En=0.2, hard coat (West) Specified U-Value = 1.20			2.520	1.15 (1.20)	2.89			(27)
Window - Double-glazed, argon filled, low-E, En=0.2, hard coat (South) Specified U-Value = 1.20			0.550	1.15 (1.20)	0.63			(27)
Full glazed door - Double-glazed, argon filled, low-E, En=0.2, hard coat (South) Specified U-Value = 1.20			2.630	1.20	3.16			(26)
Full glazed door - Double-glazed, argon filled, low-E, En=0.2, hard coat (East) Specified U-Value = 1.20			3.780	1.20	4.54			(26)
Full glazed door - Double-glazed, argon filled, low-E, En=0.2, hard coat (West) Specified U-Value = 1.20			6.680	1.20	8.02			(26)
Rooflight at 70° or less - Double-glazed, argon filled, low-E, En=0.2, hard coat (n/a) Velux Specified U-Value = 1.20			4.670	1.15 (1.20)	5.35			(27)
Walls Dormer Cheeks - Weatherboard/Battens/9 OSB/51 Cavity/140 Timber Frame Insulated With 120 Celotex XR4000 Between Studs/12.5 P'bd			4.15	0.21	0.87	9.00	37.35	(29)
Walls Brick or (Weatherboard/Battens/100 Medium Dense Block)/51 Cavity/140 Timber Frame Insulated With 120 Celotex XR4000 Between Studs/12.5 P'bd			96.74	0.20	19.35	9.00	870.66	(29)
Ground floors Beam/Medium Dense Block/150 Kingspan TF70/Screed			46.23	0.12	5.55	75.00	3467.25	(28)

SAP 2012 worksheet for New dwelling as designed - calculation of dwelling emissions

3. Heat losses and heat loss parameter

Element	Gross area, m ²	Openings m ²	Net area A, m ²	U-value W/m ² K	A x U W/K	kappa-value kJ/m ² K	A x K kJ/K						
Flat roofs			3.36	0.15	0.50	9.00	30.24	(30)					
150 Kingspan TR27 Over Joists													
Pitched roofs insulated between rafters			51.06	0.12	6.13	9.00	459.54	(30)					
150 Kingspan K7 Between Rafters/52.5 Kingspan K118 Under Rafters With Breather Membrane													
Total area of external elements Sigma A, m ²							226.90	(31)					
Fabric heat loss, W/K							62.16	(33)					
Heat capacity							0.00	(34)					
Thermal mass parameter, kJ/m ² K							52.62	(35)					
Effect of thermal bridges							34.04	(36)					
Total fabric heat loss							96.19	(37)					
Ventilation heat loss calculated monthly													
	44.65	44.34	44.04	42.62	42.35	41.11	41.11	40.88	41.59	42.35	42.89	43.45	(38)
Heat transfer coefficient, W/K													
	140.85	140.54	140.23	138.81	138.54	137.30	137.30	137.07	137.78	138.54	139.08	139.64	138.81 (39)
Heat loss parameter (HLP), W/m ² K													
	1.52	1.52	1.52	1.50	1.50	1.48	1.48	1.48	1.49	1.50	1.50	1.51	
HLP (average)													1.50 (40)
Number of days in month (Table 1a)													
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
31	28	31	30	31	30	31	31	30	31	30	31		

SAP 2012 worksheet for New dwelling as designed - calculation of dwelling emissions

4. Water heating energy requirements

												kWh/year	
Assumed occupancy, N												2.66	(42)
Annual average hot water usage in litres per day Vd,average												97.33	(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage in litres per day for each month													
107.06	103.17	99.27	95.38	91.49	87.59	87.59	91.49	95.38	99.27	103.17	107.06	(44)	
Energy content of hot water used													
158.76	138.86	143.29	124.92	119.86	103.43	95.85	109.99	111.30	129.71	141.59	153.75	(45)	
Energy content (annual)												1531.31	(45)
Distribution loss													
23.81	20.83	21.49	18.74	17.98	15.52	14.38	16.50	16.69	19.46	21.24	23.06	(46)	
store loss determined from EN 13203-2 tests, taken from boiler data record													
Hot water storage volume (litres)												0.00	(50)
Hot water cylinder loss factor (kWh/day)												0.0000	(51)
Volume factor												0.0000	(52)
Temperature factor												0.0000	(53)
Energy lost from store (kWh/day)												0.00	(55)
Total storage loss													
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(56)	
Net storage loss													
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(57)	
Primary loss													
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(59)	
Combi loss calculated for each month													
17.45	15.73	17.33	16.64	17.10	16.44	16.92	17.04	16.55	17.24	16.80	17.41	(61)	
Total heat required for water heating calculated for each month													
176.21	154.58	160.62	141.56	136.97	119.88	112.77	127.02	127.85	146.94	158.39	171.17	(62)	
Output from water heater for each month, kWh/month													
176.21	154.58	160.62	141.56	136.97	119.88	112.77	127.02	127.85	146.94	158.39	171.17	(64)	
												1733.95	(64)
Heat gains from water heating, kWh/month													
57.15	50.10	51.98	45.70	44.13	38.50	36.10	40.83	41.14	47.44	51.28	55.48	(65)	

SAP 2012 worksheet for New dwelling as designed - calculation of dwelling emissions

5. Internal gains

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains, Watts												
132.90	132.90	132.90	132.90	132.90	132.90	132.90	132.90	132.90	132.90	132.90	132.90	(66)
Lighting gains												
23.18	20.59	16.75	12.68	9.48	8.00	8.65	11.24	15.08	19.15	22.35	23.83	(67)
Appliances gains												
243.53	246.06	239.69	226.13	209.02	192.94	182.19	179.66	186.03	199.59	216.70	232.79	(68)
Cooking gains												
36.29	36.29	36.29	36.29	36.29	36.29	36.29	36.29	36.29	36.29	36.29	36.29	(69)
Pumps and fans gains												
3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	(70)
Losses e.g. evaporation (negative values)												
-106.32	-106.32	-106.32	-106.32	-106.32	-106.32	-106.32	-106.32	-106.32	-106.32	-106.32	-106.32	(71)
Water heating gains												
76.82	74.56	69.86	63.47	59.32	53.48	48.52	54.88	57.15	63.76	71.22	74.56	(72)
Total internal gains												
409.40	407.07	392.16	368.15	343.68	320.28	305.23	311.65	324.13	348.37	376.14	397.05	(73)

6. Solar gains (calculation for January)

	Area & Flux	g & FF	Shading	Gains
Window - Double-glazed, argon filled, low-E, En=0.2, hard coat (East) Specified U-Value = 1.20	0.9 x 0.200 19.64	0.72 x 0.70	0.77	1.3720
Window - Double-glazed, argon filled, low-E, En=0.2, hard coat (East) Specified U-Value = 1.20	0.9 x 4.330 19.64	0.72 x 0.70	0.77	29.7029
Window - Double-glazed, argon filled, low-E, En=0.2, hard coat (West) Specified U-Value = 1.20	0.9 x 2.520 19.64	0.72 x 0.70	0.77	17.2867
Window - Double-glazed, argon filled, low-E, En=0.2, hard coat (South) Specified U-Value = 1.20	0.9 x 0.550 46.75	0.72 x 0.70	0.77	8.9811
Full glazed door - Double-glazed, argon filled, low-E, En=0.2, hard coat (South) Specified U-Value = 1.20	0.9 x 2.630 46.75	0.72 x 0.70	0.77	42.9458
Full glazed door - Double-glazed, argon filled, low-E, En=0.2, hard coat (East) Specified U-Value = 1.20	0.9 x 3.780 19.64	0.72 x 0.70	0.77	25.9300
Full glazed door - Double-glazed, argon filled, low-E, En=0.2, hard coat (West) Specified U-Value = 1.20	0.9 x 6.680 19.64	0.72 x 0.70	0.77	45.8234
Rooflight at 70° or less - Double-glazed, argon filled, low-E, En=0.2, hard coat (n/a) Velux Specified U-Value = 1.20	0.9 x 4.670 26.00	0.72 x 0.70	1.00	55.0761

SAP 2012 worksheet for New dwelling as designed - calculation of dwelling emissions

7. Mean internal temperature

Temperature during heating periods in the living area, Th1 (°C) 21.00 (85)
 Heating system responsiveness 1.00

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

tau

9.59	9.62	9.64	9.74	9.75	9.84	9.84	9.86	9.81	9.75	9.72	9.68
------	------	------	------	------	------	------	------	------	------	------	------

alpha

1.64	1.64	1.64	1.65	1.65	1.66	1.66	1.66	1.65	1.65	1.65	1.65
------	------	------	------	------	------	------	------	------	------	------	------

Utilisation factor for gains for living area

0.91	0.87	0.79	0.68	0.56	0.44	0.34	0.39	0.57	0.77	0.88	0.92
------	------	------	------	------	------	------	------	------	------	------	------

(86)

Mean internal temperature in living area T1

17.06	17.58	18.40	19.33	20.08	20.58	20.80	20.75	20.30	19.25	17.96	16.96
-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------

(87)

Temperature during heating periods in rest of dwelling Th2

19.67	19.67	19.68	19.69	19.69	19.70	19.70	19.70	19.69	19.69	19.68	19.68
-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------

(88)

Utilisation factor for gains for rest of dwelling

0.90	0.85	0.77	0.65	0.51	0.37	0.26	0.30	0.50	0.73	0.87	0.91
------	------	------	------	------	------	------	------	------	------	------	------

(89)

Mean internal temperature in the rest of dwelling T2

14.68	15.40	16.51	17.76	18.72	19.33	19.57	19.53	19.04	17.69	15.94	14.54
-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------

(90)

Living area fraction (46.23/92.46) 0.50 (91)

Mean internal temperature (for the whole dwelling)

15.87	16.49	17.45	18.55	19.40	19.95	20.19	20.14	19.67	18.47	16.95	15.75
-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------

(92)

Apply adjustment to the mean internal temperature, where appropriate

15.87	16.49	17.45	18.55	19.40	19.95	20.19	20.14	19.67	18.47	16.95	15.75
-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------

(93)

8. Space heating requirement

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

Utilisation factor for gains

0.86	0.80	0.72	0.61	0.50	0.39	0.29	0.33	0.50	0.69	0.82	0.87
------	------	------	------	------	------	------	------	------	------	------	------

(94)

Useful gains

545.90	674.78	787.99	844.00	784.88	607.15	437.34	442.88	565.59	596.39	538.41	509.67
--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------

(95)

Monthly average external temperature

4.30	4.90	6.50	8.90	11.70	14.60	16.60	16.40	14.10	10.60	7.10	4.20
------	------	------	------	-------	-------	-------	-------	-------	-------	------	------

(96)

Heat loss rate for mean internal temperature

1629.62	1629.19	1535.67	1339.44	1067.04	735.01	492.53	512.76	768.03	1090.20	1370.39	1612.81
---------	---------	---------	---------	---------	--------	--------	--------	--------	---------	---------	---------

(97)

Fraction of month for heating

1.00	1.00	1.00	1.00	1.00	-	-	-	-	1.00	1.00	1.00
------	------	------	------	------	---	---	---	---	------	------	------

Space heating requirement for each month, kWh/month

806.29	641.37	556.27	356.71	209.93	-	-	-	-	367.39	599.02	820.73
--------	--------	--------	--------	--------	---	---	---	---	--------	--------	--------

Total space heating requirement per year (kWh/year) (October to May) 4357.71 (98)

Space heating requirement per m² (kWh/m²/year) 47.13 (99)

8c. Space cooling requirement - not applicable

SAP 2012 worksheet for New dwelling as designed - calculation of dwelling emissions

9a. Energy requirements

kWh/year

No secondary heating system selected													
Fraction of space heat from main system(s)										1.0000		(202)	
Efficiency of main heating system										92.80%		(206)	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement													
806.29	641.37	556.27	356.71	209.93	-	-	-	-	367.39	599.02	820.73	(98)	
Appendix Q - monthly energy saved (main heating system 1)													
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(210)	
Space heating fuel (main heating system 1)													
868.84	691.13	599.43	384.39	226.22	-	-	-	-	395.90	645.50	884.41	(211)	
Appendix Q - monthly energy saved (main heating system 2)													
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(212)	
Space heating fuel (main heating system 2)													
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(213)	
Appendix Q - monthly energy saved (secondary heating system)													
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(214)	
Space heating fuel (secondary)													
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(215)	
Water heating													
Water heating requirement													
176.21	154.58	160.62	141.56	136.97	119.88	112.77	127.02	127.85	146.94	158.39	171.17	(64)	
Efficiency of water heater										87.10		(216)	
89.30	89.26	89.18	89.02	88.71	87.10	87.10	87.10	87.10	89.01	89.22	89.32	(217)	
Water heating fuel													
197.32	173.18	180.10	159.03	154.39	137.63	129.47	145.84	146.79	165.08	177.52	191.63	(219)	
Annual totals										kWh/year			
Space heating fuel used, main system 1										4695.81		(211)	
Space heating fuel (secondary)										0.00		(215)	
Water heating fuel										1957.97		(219)	
Electricity for pumps, fans and electric keep-hot													
central heating pump										30.00		(230c)	
boiler with a fan-assisted flue										45.00		(230e)	
Total electricity for the above, kWh/year										75.00		(231)	
Electricity for lighting (100.00% fixed LEL)										409.43		(232)	
Energy saving/generation technologies													
Appendix Q -													
Energy saved or generated ():										0.000		(236a)	
Energy used ():										0.000		(237a)	
Total delivered energy for all uses										7138.21		(238)	

10a. Does not apply

11a. Does not apply

SAP 2012 worksheet for New dwelling as designed - calculation of dwelling emissions

12a. Carbon dioxide emissions

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating, main system 1	4695.81	0.216	1014.30	(261)
Space heating, main system 2	0.00	0.000	0.00	(262)
Space heating, secondary	0.00	0.519	0.00	(263)
Water heating	1957.97	0.216	422.92	(264)
Space and water heating			1437.22	(265)
Electricity for pumps and fans	75.00	0.519	38.93	(267)
Electricity for lighting	409.43	0.519	212.49	(268)
Electricity generated - PVs	0.00	0.519	0.00	(269)
Electricity generated - µCHP	0.00	0.000	0.00	(269)
Appendix Q -				
Energy saved ():	0.00	0.000	0.00	(270)
Energy used ():	0.00	0.000	0.00	(271)
Total CO2, kg/year			1688.63	(272)
			kg/m²/year	
Dwelling Carbon Dioxide Emission Rate (DER)			18.26	(273)

Project Information

Building type Detached house

Reference	J5067-2		
Date	7 October 2019		
Client	DCM Architectural Consultants Ltd	Project	Unit 2
	25 Pigeon Lane		66 Borstal Hill
	Herne Bay		Whitstable
	Kent		Kent
	CT6 7EH		CT5 4NB

REGULATION COMPLIANCE REPORT - Approved Document L1A, 2012 Edition, England

assessed by program JPA Designer version 6.04a1, printed on 7/10/2019 at 16:22:30

New dwelling as designed**1 TER and DER**

Fuel for main heating system: Gas (mains) (fuel factor = 1.00)

Target Carbon Dioxide Emission Rate	TER = 18.40	
Dwelling Carbon Dioxide Emission Rate	DER = 18.26	OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	TFEE = 56.4	
Dwelling Fabric Energy Efficiency (DFEE)	DFEE = 56.2	OK

2a Thermal bridgingThermal bridging calculated using default ψ -value of 0.15**2b Fabric U-values**

<u>Element</u>	<u>Average</u>	<u>Highest</u>	
Wall	0.20 (max. 0.30)	0.21 (max. 0.70)	OK
Floor	0.12 (max. 0.25)	0.12 (max. 0.70)	OK
Roof	0.12 (max. 0.20)	0.15 (max. 0.35)	OK
Openings	1.20 (max. 2.00)	1.20 (max. 3.30)	OK

3 Air permeability

Air permeability at 50 pascals:	5.00	OK
Maximum :	10.00	

4 Heating efficiency

Main heating system:

Boiler and radiators, mains gas
Alpha InTec 40GSSource of efficiency: from boiler database
Alpha InTec 40GS

Efficiency: 88.9% SEDBUK2009	
Minimum: 88.0%	OK

Secondary heating system:

None -

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

(Also refer to "Domestic Building Services Compliance Guide" by the DCLG)

Space heating controls	Time and temperature zone control	OK
Hot water controls	No cylinder	
Boiler Interlock	Yes	OK
Hot water controls	No cylinder	

7 Low energy lights

Percentage of fixed lights with low-energy fittings: 100.0%
Minimum: 75.0% OK

8 Mechanical ventilation

Not applicable

9 Summertime temperature

Overheating risk (South East England): Slight OK
OK

Based on:

Thermal mass parameter :	52.62
Overshading :	Average or unknown (20-60 % sky blocked)
Orientation : East	
Ventilation rate :	8.00
Blinds/curtains :	
None with blinds/shutters closed 0.00% of daylight hours	

10 Key features

Ground floors U-value 0.12 W/m²K
Pitched roofs insulated between rafters U-value 0.12 W/m²K

Project Information

Building type Detached house

Reference	J5067-2		
Date	7 October 2019		
Client	DCM Architectural Consultants Ltd	Project	Unit 2
	25 Pigeon Lane		66 Borstal Hill
	Herne Bay		Whitstable
	Kent		Kent
	CT6 7EH		CT5 4NB

SAP 2012 input data Printed on 7 Oct 2019 at 04:22 PM

Unit 2, 66 Borstal Hill, Whitstable, Kent, CT5 4NB

Unit 2
66 Borstal Hill
Whitstable
Kent
CT5 4NB

Located in:	England
Region:	South East England
Postcode:	CT5 4NB
UPRN:	
Date of assessment:	2019-10-07
Date of certificate:	2019-10-07
Assessment type:	New dwelling as designed
Tenure:	Unknown
Transaction type:	New dwelling
Related party disclosure:	No related party
PCDF revision number:	367

Property description

Dwelling type:	Detached house	
Ground floor (1)	area = 46.23m ²	storey height = 2.31m
First floor	area = 46.23m ²	storey height = 2.50m
Living area:	46.23 (fraction 0.500)	

Front of dwelling faces: East

Doors

Full glazed door	area = 2.63	U = 1.20	- Double-glazed, argon filled, low-E, En=0.2, hard coat (South)
Full glazed door	area = 3.78	U = 1.20	- Double-glazed, argon filled, low-E, En=0.2, hard coat (East)
Full glazed door	area = 6.68	U = 1.20	- Double-glazed, argon filled, low-E, En=0.2, hard coat (West)

Windows

Window	area = 0.20	U = 1.20	- Double-glazed, argon filled, low-E, En=0.2, hard coat (East)
Overshading:	Average or unknown (20-60 % sky blocked)		
Window	area = 4.33	U = 1.20	- Double-glazed, argon filled, low-E, En=0.2, hard coat (East)

Project Information

Building type Detached house

Reference	J5067-2		
Date	7 October 2019		
Client	DCM Architectural Consultants Ltd	Project	Unit 2
	25 Pigeon Lane		66 Borstal Hill
	Herne Bay		Whitstable
	Kent		Kent
	CT6 7EH		CT5 4NB

SAP 2012 input data Printed on 7 Oct 2019 at 04:22 PM

Unit 2, 66 Borstal Hill, Whitstable, Kent, CT5 4NB

Overshading: Average or unknown (20-60 % sky blocked)

Window area = 2.52 U = 1.20 - Double-glazed, argon filled, low-E, En=0.2, hard coat (West)

Overshading: Average or unknown (20-60 % sky blocked)

Window area = 0.55 U = 1.20 - Double-glazed, argon filled, low-E, En=0.2, hard coat (South)

Overshading: Average or unknown (20-60 % sky blocked)

Rooflights

Rooflight at 70° or less area = 4.67 U = 1.20 - Double-glazed, argon filled, low-E, En=0.2, hard coat (n/a)

Overshading: Very little (<20 % sky blocked)

Opaque Elements

Walls area = 4.15 U = 0.21, k = 9.0 Dormer Cheeks - Weatherboard/Battens/9 OSB/51 Cavity/140 Timber Frame Insulated With 120 Celotex XR4000 Between Studs/12.5 P'bd

Walls area = 96.74 U = 0.20, k = 9.0 Brick or (Weatherboard/Battens/100 Medium Dense Block)/51 Cavity/140 Timber Frame Insulated With 120 Celotex XR4000 Between Studs/12.5 P'bd

Ground floors area = 46.23 U = 0.12, k = 75.0 Beam/Medium Dense Block/150 Kingspan TF70/Screed

Roofs area = 3.36 U = 0.15, k = 9.0 150 Kingspan TR27 Over Joists

Roofs area = 51.06 U = 0.12, k = 9.0 150 Kingspan K7 Between Rafters/52.5 Kingspan K118 Under Rafters With Breather Membrane

Thermal bridges: NOT Accredited Construction Details (y = 0.1500)

Thermal mass: Calculated from k values

Pressure test: Yes (q50 - 5.00) : measured in this dwelling : Yes

Ventilation: Natural ventilation with intermittent extract fans

Number of chimneys: 0

Number of open flues: 0

Number of intermittent fans: 4

Number of passive stacks: 0

Number of sides sheltered: 2.00

Project Information

Building type Detached house

Reference	J5067-2		
Date	7 October 2019		
Client	DCM Architectural Consultants Ltd	Project	Unit 2
	25 Pigeon Lane		66 Borstal Hill
	Herne Bay		Whitstable
	Kent		Kent
	CT6 7EH		CT5 4NB

SAP 2012 input data Printed on 7 Oct 2019 at 04:22 PM

Unit 2, 66 Borstal Hill, Whitstable, Kent, CT5 4NB

Measured/design q50: 5.00

Main heating system: Central heating systems with radiators or underfloor heating
Gas boilers (including LPG) 1998 or later
Condensing combi with automatic ignition
Index : 16766
Eff 87.10% / 89.80% Alpha InTec 40GS
Radiators
Pump in heated space: Yes
Boiler has load or weather compensator: Yes
Boiler Interlock: Yes
Design flow temperature : Unknown
Central heating pump 2013 or later
Gas (mains)

Main heating controls: Time and temperature zone control

Boiler has load compensator: No

Boiler has weather compensator: Yes

Boiler has enhanced load compensator: No

Boiler interlock: Yes

Secondary heating system: None

Water heating: Combination boiler
Combination boiler type : Instantaneous
Solar panel: no

Water use <= 125 litres/person/day: Yes

Low energy lights: 100.0% of fixed lighting outlets

Total fixed lighting outlets: 25

Electricity tariff: Standard tariff

Photovoltaics 1: Peak kW: 0.00

Photovoltaics 2: Peak kW: 0.00

Project Information

Building type Detached house

Reference	J5067-2		
Date	7 October 2019		
Client	DCM Architectural Consultants Ltd	Project	Unit 2
	25 Pigeon Lane		66 Borstal Hill
	Herne Bay		Whitstable
	Kent		Kent
	CT6 7EH		CT5 4NB

SAP 2012 input data Printed on 7 Oct 2019 at 04:22 PM

Unit 2, 66 Borstal Hill, Whitstable, Kent, CT5 4NB

Photovoltaics 3: Peak kW: 0.00
Conservatory: No
Fixed air conditioning: No
Smoke Control Area: Not specified
Additional allowable electricity generation :
0.00kg/m²/year

SAP 2012 Overheating Assessment for New dwelling as designed

Dwelling type	Detached house
Number of storeys	2
Cross ventilation possible	Yes
Region	South East England
Front of dwelling faces	East
Overshading	Average or unknown (20-60 % sky blocked)
Overhangs	(as detailed below)
Thermal mass parameter	52.62 (calculated from construction elements)
Night ventilation	No
Ventilation rate during hot weather (ach)	8.00 (Windows fully open)

Summer ventilation heat loss coefficient	587.05	(P1)
Transmission heat loss coefficient	96.19	(37)
Summer heat loss coefficient	683.24	(P2)

Solar gains (calculation for July)

Orientation	Area	Flux	g & FF	Shading	Gains
East	0.9 x 0.20	110.22	0.72 x 0.70	0.90	9
South	0.9 x 0.55	108.01	0.72 x 0.70	0.90	24
West	0.9 x 2.52	110.22	0.72 x 0.70	0.90	113
East	0.9 x 4.33	110.22	0.72 x 0.70	0.90	195
n/a	0.9 x 4.67	189.00	0.72 x 0.70	1.00	400
Total					1328

	Jun	Jul	Aug	
Solar gains	1395	1328	1146	(P3)
Internal gains	468	449	458	
Total summer gains	1863	1777	1603	(P5)
Summer gain/loss ratio	2.73	2.60	2.35	(P6)
External temperature (South East England)	15.2	17.6	17.8	
Thermal mass temperature increment (TMP=52.6)	1.63	1.63	1.63	
Threshold temperature	19.56	21.83	21.78	(P7)
Likelihood of high internal temperature	Not sig.	Slight	Slight	
Assessment of likelihood of high internal temperature	Slight			

Predicted Energy Assessment

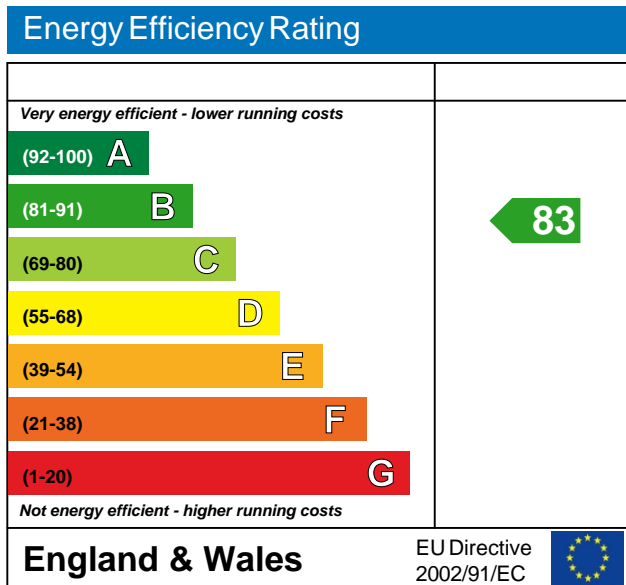
Unit 2
66 Borstal Hill
Whitstable
Kent
CT5 4NB
Ref: J5067-2

Dwelling type:
Date of assessment:
Produced by
Total floor area:

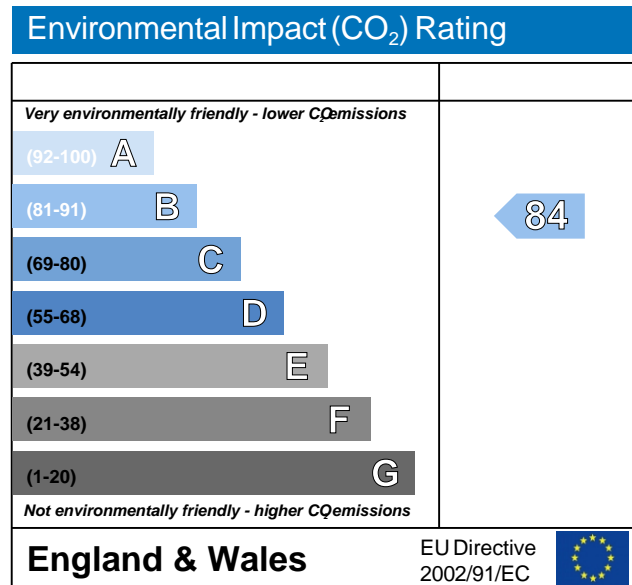
Detached house
7 October 2019
Thermcalc Limited
92 m²

This is a Predicted Energy Assessment for a property which is not yet complete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, an Energy Performance Certificate is required providing information about the energy performance of the completed property.

Energy performance has been assessed using the SAP 2012 methodology and is rated in terms of the energy use per square metre of floor area, energy efficiency based on fuel costs and environmental impact based on carbon dioxide (CO₂) emissions.



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.



The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO₂) emissions. The higher the rating the less impact it has on the environment.

Project Information

Building type Detached house

Reference	J5067-2	Project	Unit 2
Date	7 October 2019		66 Borstal Hill
Client	DCM Architectural Consultants Ltd		Whitstable
	25 Pigeon Lane		Kent
	Herne Bay		Kent
	Kent		CT54NB
	CT67EH		

SAP 2012 worksheet for - calculation of fabric energy efficiency

1. Overall dwelling dimensions

	Area (m²)	Av. Storey height (m)	Volume (m³)	
Ground floor (1)	46.23	2.31	106.79	(3a)
First floor	46.23	2.50	115.57	(3b)
Total floor area	92.46			(4)
Dwelling volume (m ³)			222.37	(5)

SAP 2012 worksheet for - calculation of fabric energy efficiency

2. Ventilation rate

	main + secondary + other heating		m³ per hour										
Number of chimneys	0 + 0 + 0	x 40	0.00	(6a)									
Number of open flues	0 + 0 + 0	x 20	0.00	(6b)									
Number of intermittent fans	3	x 10	30.00	(7a)									
Number of passive vents	0	x 10	0.00	(7b)									
Number of flueless gas fires	0	x 40	0.00	(7c)									
			Air changes per hour										
Infiltration due to chimneys, fans and flues			0.13	(8)									
Pressure test, result q50	5.00			(17)									
Air permeability			0.38	(18)									
Number of sides on which sheltered			2.00	(19)									
Shelter factor			0.85	(20)									
Infiltration rate incorporating shelter factor			0.33	(21)									
Infiltration rate modified for monthly wind speed													
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
5.10	5.00	4.90	4.40	4.30	3.80	3.80	3.70	4.00	4.30	4.50	4.70		
												52.50	(22)
Wind Factor													
1.27	1.25	1.23	1.10	1.07	0.95	0.95	0.93	1.00	1.07	1.13	1.18		
												13.13	(22a)
Adjusted infiltration rate (allowing for shelter and wind speed)													
0.42	0.41	0.40	0.36	0.35	0.31	0.31	0.30	0.33	0.35	0.37	0.38		
												4.29	(22b)
Ventilation : natural ventilation, intermittent extract fans													
Effective air change rate													
0.59	0.58	0.58	0.56	0.56	0.55	0.55	0.55	0.55	0.56	0.57	0.57		
													(25)

SAP 2012 worksheet for - calculation of fabric energy efficiency

3. Heat losses and heat loss parameter

Element	Gross area, m ²	Openings m ²	Net area A, m ²	U-value W/m ² K	A x U W/K	kappa-value kJ/m ² K	A x K kJ/K	
Window - Double-glazed, argon filled, low-E, En=0.2, hard coat (East) Specified U-Value = 1.20			0.200	1.15 (1.20)	0.23			(27)
Window - Double-glazed, argon filled, low-E, En=0.2, hard coat (South) Specified U-Value = 1.20			0.550	1.15 (1.20)	0.63			(27)
Window - Double-glazed, argon filled, low-E, En=0.2, hard coat (West) Specified U-Value = 1.20			2.520	1.15 (1.20)	2.89			(27)
Window - Double-glazed, argon filled, low-E, En=0.2, hard coat (East) Specified U-Value = 1.20			4.330	1.15 (1.20)	4.96			(27)
Full glazed door - Double-glazed, argon filled, low-E, En=0.2, hard coat (West) Specified U-Value = 1.20			6.680	1.20	8.02			(26)
Full glazed door - Double-glazed, argon filled, low-E, En=0.2, hard coat (East) Specified U-Value = 1.20			3.780	1.20	4.54			(26)
Full glazed door - Double-glazed, argon filled, low-E, En=0.2, hard coat (South) Specified U-Value = 1.20			2.630	1.20	3.16			(26)
Rooflight at 70° or less - Double-glazed, argon filled, low-E, En=0.2, hard coat (n/a) Velux Specified U-Value = 1.20			4.670	1.15 (1.20)	5.35			(27)
Walls Dormer Cheeks - Weatherboard/Battens/9 OSB/51 Cavity/140 Timber Frame Insulated With 120 Celotex XR4000 Between Studs/12.5 P'bd			4.15	0.21	0.87	9.00	37.35	(29)
Walls Brick or (Weatherboard/Battens/100 Medium Dense Block)/51 Cavity/140 Timber Frame Insulated With 120 Celotex XR4000 Between Studs/12.5 P'bd			96.74	0.20	19.35	9.00	870.66	(29)
Ground floors Beam/Medium Dense Block/150 Kingspan TF70/Screed			46.23	0.12	5.55	75.00	3467.25	(28)

SAP 2012 worksheet for - calculation of fabric energy efficiency

3. Heat losses and heat loss parameter

Element	Gross area, m ²	Openings m ²	Net area A, m ²	U-value W/m ² K	A x U W/K	kappa-value kJ/m ² K	A x K kJ/K						
Flat roofs			3.36	0.15	0.50	9.00	30.24	(30)					
150 Kingspan TR27 Over Joists													
Pitched roofs insulated between rafters			51.06	0.12	6.13	9.00	459.54	(30)					
150 Kingspan K7 Between Rafters/52.5 Kingspan K118 Under Rafters With Breather Membrane													
Total area of external elements Sigma A, m ²							226.90	(31)					
Fabric heat loss, W/K							62.16	(33)					
Heat capacity							4865.04	(34)					
Thermal mass parameter, kJ/m ² K							52.62	(35)					
Effect of thermal bridges							34.04	(36)					
Total fabric heat loss							96.19	(37)					
Ventilation heat loss calculated monthly													
	43.08	42.83	42.58	41.44	41.23	40.23	40.23	40.05	40.62	41.23	41.66	42.11	(38)
Heat transfer coefficient, W/K													
	139.27	139.02	138.78	137.63	137.42	136.43	136.43	136.24	136.81	137.42	137.85	138.30	137.63 (39)
Heat loss parameter (HLP), W/m ² K													
	1.51	1.50	1.50	1.49	1.49	1.48	1.48	1.47	1.48	1.49	1.49	1.50	
HLP (average)													1.49 (40)
Number of days in month (Table 1a)													
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
31	28	31	30	31	30	31	31	30	31	30	31		

SAP 2012 worksheet for - calculation of fabric energy efficiency

4. Water heating energy requirements

kWh/year

Assumed occupancy, N 2.66 (42)

Annual average hot water usage in litres per day Vd,average 97.33 (43)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

Hot water usage in litres per day for each month

107.06	103.17	99.27	95.38	91.49	87.59	87.59	91.49	95.38	99.27	103.17	107.06	(44)
--------	--------	-------	-------	-------	-------	-------	-------	-------	-------	--------	--------	------

Energy content of hot water used

158.76	138.86	143.29	124.92	119.86	103.43	95.85	109.99	111.30	129.71	141.59	153.75	(45)
--------	--------	--------	--------	--------	--------	-------	--------	--------	--------	--------	--------	------

Energy content (annual) 1531.31 (45)

Distribution loss

0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(46)
------	------	------	------	------	------	------	------	------	------	------	------	------

store loss determined from EN 13203-2 tests, taken from boiler data record

Hot water storage volume (litres) 0.00 (50)

Hot water cylinder loss factor (kWh/day) 0.0000 (51)

Volume factor 0.0000 (52)

Temperature factor 0.0000 (53)

Energy lost from store (kWh/day) 0.00 (55)

Total storage loss

0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(56)
------	------	------	------	------	------	------	------	------	------	------	------	------

Net storage loss

0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(57)
------	------	------	------	------	------	------	------	------	------	------	------	------

Primary loss

0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(59)
------	------	------	------	------	------	------	------	------	------	------	------	------

Combi loss calculated for each month

0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(61)
------	------	------	------	------	------	------	------	------	------	------	------	------

Total heat required for water heating calculated for each month

0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(62)
------	------	------	------	------	------	------	------	------	------	------	------	------

Output from water heater for each month, kWh/month

0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(64)
------	------	------	------	------	------	------	------	------	------	------	------	------

0.00 (64)

Heat gains from water heating, kWh/month

33.74	29.51	30.45	26.55	25.47	21.98	20.37	23.37	23.65	27.56	30.09	32.67	(65)
-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	------

SAP 2012 worksheet for - calculation of fabric energy efficiency

5. Internal gains

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains, Watts												
132.90	132.90	132.90	132.90	132.90	132.90	132.90	132.90	132.90	132.90	132.90	132.90	(66)
Lighting gains												
23.18	20.59	16.75	12.68	9.48	8.00	8.65	11.24	15.08	19.15	22.35	23.83	(67)
Appliances gains												
243.53	246.06	239.69	226.13	209.02	192.94	182.19	179.66	186.03	199.59	216.70	232.79	(68)
Cooking gains												
36.29	36.29	36.29	36.29	36.29	36.29	36.29	36.29	36.29	36.29	36.29	36.29	(69)
Pumps and fans gains												
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(70)
Losses e.g. evaporation (negative values)												
-106.32	-106.32	-106.32	-106.32	-106.32	-106.32	-106.32	-106.32	-106.32	-106.32	-106.32	-106.32	(71)
Water heating gains												
45.35	43.91	40.93	36.87	34.24	30.53	27.38	31.41	32.85	37.05	41.79	43.92	(72)
Total internal gains												
374.93	373.43	360.23	338.55	315.60	294.33	281.08	285.18	296.83	318.66	343.71	363.40	(73)

6. Solar gains (calculation for January)

	Area & Flux	g & FF	Shading	Gains
Window - Double-glazed, argon filled, low-E, En=0.2, hard coat (East) Specified U-Value = 1.20	0.9 x 0.200 19.64	0.72 x 0.70	0.77	1.3720
Window - Double-glazed, argon filled, low-E, En=0.2, hard coat (South) Specified U-Value = 1.20	0.9 x 0.550 46.75	0.72 x 0.70	0.77	8.9811
Window - Double-glazed, argon filled, low-E, En=0.2, hard coat (West) Specified U-Value = 1.20	0.9 x 2.520 19.64	0.72 x 0.70	0.77	17.2867
Window - Double-glazed, argon filled, low-E, En=0.2, hard coat (East) Specified U-Value = 1.20	0.9 x 4.330 19.64	0.72 x 0.70	0.77	29.7029
Full glazed door - Double-glazed, argon filled, low-E, En=0.2, hard coat (West) Specified U-Value = 1.20	0.9 x 6.680 19.64	0.72 x 0.70	0.77	45.8234
Full glazed door - Double-glazed, argon filled, low-E, En=0.2, hard coat (East) Specified U-Value = 1.20	0.9 x 3.780 19.64	0.72 x 0.70	0.77	25.9300
Full glazed door - Double-glazed, argon filled, low-E, En=0.2, hard coat (South) Specified U-Value = 1.20	0.9 x 2.630 46.75	0.72 x 0.70	0.77	42.9458
Rooflight at 70° or less - Double-glazed, argon filled, low-E, En=0.2, hard coat (n/a) Velux Specified U-Value = 1.20	0.9 x 4.670 26.00	0.72 x 0.70	1.00	55.0761

SAP 2012 worksheet for - calculation of fabric energy efficiency

7. Mean internal temperature

Temperature during heating periods in the living area, Th1 (°C) 21.00 (85)
 Heating system responsiveness 1.00

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

tau

9.70	9.72	9.74	9.82	9.83	9.91	9.91	9.92	9.88	9.83	9.80	9.77
------	------	------	------	------	------	------	------	------	------	------	------

alpha

1.65	1.65	1.65	1.65	1.66	1.66	1.66	1.66	1.66	1.66	1.65	1.65
------	------	------	------	------	------	------	------	------	------	------	------

Utilisation factor for gains for living area
 0.92 0.87 0.80 0.69 0.56 0.44 0.35 0.39 0.57 0.78 0.89 0.93 (86)

Mean internal temperature in living area T1
 17.03 17.56 18.38 19.33 20.08 20.57 20.80 20.75 20.30 19.22 17.93 16.92 (87)

Temperature during heating periods in rest of dwelling Th2
 19.68 19.68 19.69 19.70 19.70 19.71 19.71 19.71 19.70 19.70 19.69 19.69 (88)

Utilisation factor for gains for rest of dwelling
 0.91 0.86 0.78 0.65 0.52 0.38 0.26 0.30 0.51 0.74 0.87 0.92 (89)

Mean internal temperature in the rest of dwelling T2
 16.11 16.63 17.42 18.32 19.01 19.44 19.62 19.59 19.23 18.26 17.01 16.01 (90)

Living area fraction (46.23/92.46) 0.50 (91)

Mean internal temperature (for the whole dwelling)
 16.57 17.09 17.90 18.82 19.54 20.01 20.21 20.17 19.77 18.74 17.47 16.46 (92)

Apply adjustment to the mean internal temperature, where appropriate
 16.57 17.09 17.90 18.82 19.54 20.01 20.21 20.17 19.77 18.74 17.47 16.46 (93)

8. Space heating requirement

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

Utilisation factor for gains
 0.88 0.82 0.74 0.63 0.51 0.39 0.30 0.34 0.51 0.71 0.84 0.89 (94)

Useful gains
 527.33 662.79 783.11 844.19 785.49 606.78 436.20 441.65 564.31 590.91 524.15 490.18 (95)

Monthly average external temperature
 4.30 4.90 6.50 8.90 11.70 14.60 16.60 16.40 14.10 10.60 7.10 4.20 (96)

Heat loss rate for mean internal temperature
 1708.18 1694.98 1582.15 1365.95 1077.76 737.76 492.21 513.13 775.09 1119.00 1429.09 1695.87 (97)

Fraction of month for heating
 1.00 1.00 1.00 1.00 1.00 - - - - 1.00 1.00 1.00

Space heating requirement for each month, kWh/month
 878.55 693.63 594.48 375.67 217.45 - - - - 392.91 651.56 897.04

Total space heating requirement per year (kWh/year) (October to May) 4701.27 (98)

Space heating requirement per m² (kWh/m²/year) 50.85 (99)

SAP 2012 worksheet for - calculation of fabric energy efficiency

8c. Space cooling requirement

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
External temperatures												
-	-	-	-	-	14.60	16.60	16.40	-	-	-	-	
Heat loss rate W												
-	-	-	-	-	1282.40	1009.55	1035.44	-	-	-	-	(100)
Utilisation factor for loss												
-	-	-	-	-	0.73	0.78	0.75	-	-	-	-	(101)
Useful loss W												
-	-	-	-	-	936.70	787.45	773.51	-	-	-	-	(102)
Internal gains W												
0.00	0.00	0.00	0.00	0.00	445.26	427.68	434.42	0.00	0.00	0.00	0.00	
Solar gains W												
0.00	0.00	0.00	0.00	0.00	1394.74	1328.45	1145.52	0.00	0.00	0.00	0.00	
Gains W												
-	-	-	-	-	1839.99	1756.13	1579.94	-	-	-	-	(103)
Fraction of month for cooling												
0.00	0.00	0.00	0.00	0.00	1.00	1.00	1.00	0.00	0.00	0.00	0.00	(103a)
Space heating kWh												
-	-	-	-	-	71.15	-5.51	-16.63	-	-	-	-	(98)
Space cooling kWh												
-	-	-	-	-	650.37	720.70	599.98	-	-	-	-	(104)
Total										1971.05		(104)
Cooled fraction										1.00		(105)
Intermittency factor												
-	-	-	-	-	0.25	0.25	0.25	-	-	-	-	(106)
Space cooling requirement for month												
-	-	-	-	-	162.59	180.17	150.00	-	-	-	-	
Space cooling (June to August)										492.76		(107)
Space cooling requirement per m ² (kWh/m ² /year)										5.33		(108)

8f. Fabric Energy Efficiency

Energy for space heating	50.85	(99)
Energy for space cooling	5.33	(108)
Total	56.18	(109)
Dwelling Fabric Energy Efficiency	56.2	(109)

Project Information

Building type Detached house

Reference	J5067-2	Project	Unit 2
Date	7 October 2019		66 Borstal Hill
Client	DCM Architectural Consultants Ltd		Whitstable
	25 Pigeon Lane		Kent
	Herne Bay		CT54NB
	Kent		
	CT67EH		

SAP 2012 worksheet for - CSH Ene 7 standard case

1. Overall dwelling dimensions

	Area (m²)	Av. Storey height (m)	Volume (m³)	
Ground floor (1)	46.23	2.31	106.79	(3a)
First floor	46.23	2.50	115.57	(3b)
Total floor area	92.46			(4)
Dwelling volume (m ³)			222.37	(5)

2. Ventilation rate

	main + secondary + other heating		m ³ per hour										
Number of chimneys	0 + 0 + 0	x 40	0.00	(6a)									
Number of open flues	0 + 0 + 0	x 20	0.00	(6b)									
Number of intermittent fans	4	x 10	40.00	(7a)									
Number of passive vents	0	x 10	0.00	(7b)									
Number of flueless gas fires	0	x 40	0.00	(7c)									
			Air changes per hour										
Infiltration due to chimneys, fans and flues			0.18	(8)									
Pressure test, result q50	5.00			(17)									
Air permeability			0.43	(18)									
Number of sides on which sheltered			2.00	(19)									
Shelter factor			0.85	(20)									
Infiltration rate incorporating shelter factor			0.37	(21)									
Infiltration rate modified for monthly wind speed													
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
5.10	5.00	4.90	4.40	4.30	3.80	3.80	3.70	4.00	4.30	4.50	4.70		
												52.50	(22)
Wind Factor													
1.27	1.25	1.23	1.10	1.07	0.95	0.95	0.93	1.00	1.07	1.13	1.18		
												13.13	(22a)
Adjusted infiltration rate (allowing for shelter and wind speed)													
0.47	0.46	0.45	0.40	0.39	0.35	0.35	0.34	0.37	0.39	0.41	0.43		
												4.80	(22b)
Ventilation : natural ventilation, intermittent extract fans													
Effective air change rate													
0.61	0.60	0.60	0.58	0.58	0.56	0.56	0.56	0.57	0.58	0.58	0.59	(25)	

SAP 2012 worksheet for - CSH Ene 7 standard case

3. Heat losses and heat loss parameter

Element	Gross area, m ²	Openings m ²	Net area A, m ²	U-value W/m ² K	A x U W/K	kappa-value kJ/m ² K	A x K kJ/K	
Window - Double-glazed, argon filled, low-E, En=0.2, hard coat (East) Specified U-Value = 1.20			0.200	1.15 (1.20)	0.23			(27)
Window - Double-glazed, argon filled, low-E, En=0.2, hard coat (South) Specified U-Value = 1.20			0.550	1.15 (1.20)	0.63			(27)
Window - Double-glazed, argon filled, low-E, En=0.2, hard coat (West) Specified U-Value = 1.20			2.520	1.15 (1.20)	2.89			(27)
Window - Double-glazed, argon filled, low-E, En=0.2, hard coat (East) Specified U-Value = 1.20			4.330	1.15 (1.20)	4.96			(27)
Full glazed door - Double-glazed, argon filled, low-E, En=0.2, hard coat (West) Specified U-Value = 1.20			6.680	1.20	8.02			(26)
Full glazed door - Double-glazed, argon filled, low-E, En=0.2, hard coat (East) Specified U-Value = 1.20			3.780	1.20	4.54			(26)
Full glazed door - Double-glazed, argon filled, low-E, En=0.2, hard coat (South) Specified U-Value = 1.20			2.630	1.20	3.16			(26)
Rooflight at 70° or less - Double-glazed, argon filled, low-E, En=0.2, hard coat (n/a) Velux Specified U-Value = 1.20			4.670	1.15 (1.20)	5.35			(27)
Walls Dormer Cheeks - Weatherboard/Battens/9 OSB/51 Cavity/140 Timber Frame Insulated With 120 Celotex XR4000 Between Studs/12.5 P'bd			4.15	0.21	0.87	9.00	37.35	(29)
Walls Brick or (Weatherboard/Battens/100 Medium Dense Block)/51 Cavity/140 Timber Frame Insulated With 120 Celotex XR4000 Between Studs/12.5 P'bd			96.74	0.20	19.35	9.00	870.66	(29)
Ground floors Beam/Medium Dense Block/150 Kingspan TF70/Screed			46.23	0.12	5.55	75.00	3467.25	(28)

3. Heat losses and heat loss parameter

Element	Gross area, m ²	Openings m ²	Net area A, m ²	U-value W/m ² K	A x U W/K	kappa-value kJ/m ² K	A x K kJ/K						
Flat roofs			3.36	0.15	0.50	9.00	30.24	(30)					
150 Kingspan TR27 Over Joists													
Pitched roofs insulated between rafters			51.06	0.12	6.13	9.00	459.54	(30)					
150 Kingspan K7 Between Rafters/52.5 Kingspan K118 Under Rafters With Breather Membrane													
Total area of external elements Sigma A, m ²							226.90	(31)					
Fabric heat loss, W/K							62.16	(33)					
Heat capacity							4865.04	(34)					
Thermal mass parameter, kJ/m ² K							52.62	(35)					
Effect of thermal bridges							34.04	(36)					
Total fabric heat loss							96.19	(37)					
Ventilation heat loss calculated monthly													
	44.65	44.34	44.04	42.62	42.35	41.11	41.11	40.88	41.59	42.35	42.89	43.45	(38)
Heat transfer coefficient, W/K													
	140.85	140.54	140.23	138.81	138.54	137.30	137.30	137.07	137.78	138.54	139.08	139.64	138.81 (39)
Heat loss parameter (HLP), W/m ² K													
	1.52	1.52	1.52	1.50	1.50	1.48	1.48	1.48	1.49	1.50	1.50	1.51	
HLP (average)													1.50 (40)
Number of days in month (Table 1a)													
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
31	28	31	30	31	30	31	31	30	31	30	31		

4. Water heating energy requirements												kWh/year	
Assumed occupancy, N												2.66	(42)
Annual average hot water usage in litres per day Vd,average												97.33	(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage in litres per day for each month													
107.06	103.17	99.27	95.38	91.49	87.59	87.59	91.49	95.38	99.27	103.17	107.06		(44)
Energy content of hot water used													
158.76	138.86	143.29	124.92	119.86	103.43	95.85	109.99	111.30	129.71	141.59	153.75		
Energy content (annual)												1531.31	(45)
Distribution loss													
23.81	20.83	21.49	18.74	17.98	15.52	14.38	16.50	16.69	19.46	21.24	23.06		(46)
Hot water storage volume (litres)												150.00	(50)
Hot water cylinder loss factor (kWh/day)												0.0191	(51)
Volume factor												0.9283	(52)
Temperature factor												0.5400	(53)
Energy lost from hot water cylinder (kWh/day)												1.44	(55)
Total storage loss													
44.53	40.22	44.53	43.09	44.53	43.09	44.53	44.53	43.09	44.53	43.09	44.53		(56)
Net storage loss													
44.53	40.22	44.53	43.09	44.53	43.09	44.53	44.53	43.09	44.53	43.09	44.53		(57)
Primary loss													
23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
Total heat required for water heating calculated for each month													
226.55	200.09	211.08	190.52	187.66	169.04	163.64	177.78	176.90	197.50	207.19	221.55		(62)
Output from water heater for each month, kWh/month													
226.55	200.09	211.08	190.52	187.66	169.04	163.64	177.78	176.90	197.50	207.19	221.55		(64)
												2329.49	(64)
Heat gains from water heating, kWh/month													
107.02	95.15	101.88	94.02	94.09	86.87	86.10	90.80	89.49	97.36	99.56	105.36		(65)

5. Internal gains

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains, Watts												
132.90	132.90	132.90	132.90	132.90	132.90	132.90	132.90	132.90	132.90	132.90	132.90	(66)
Lighting gains												
23.18	20.59	16.75	12.68	9.48	8.00	8.65	11.24	15.08	19.15	22.35	23.83	(67)
Appliances gains												
243.53	246.06	239.69	226.13	209.02	192.94	182.19	179.66	186.03	199.59	216.70	232.79	(68)
Cooking gains												
36.29	36.29	36.29	36.29	36.29	36.29	36.29	36.29	36.29	36.29	36.29	36.29	(69)
Pumps and fans gains												
3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	(70)
Losses e.g. evaporation (negative values)												
-106.32	-106.32	-106.32	-106.32	-106.32	-106.32	-106.32	-106.32	-106.32	-106.32	-106.32	-106.32	(71)
Water heating gains												
143.85	141.60	136.93	130.58	126.46	120.66	115.73	122.05	124.29	130.86	138.28	141.61	(72)
Total internal gains												
476.43	474.12	459.23	435.26	410.83	387.46	372.43	378.82	391.27	415.47	443.20	464.09	(73)

6. Solar gains (calculation for January)

	Area & Flux	g & FF	Shading	Gains
Window - Double-glazed, argon filled, low-E, En=0.2, hard coat (East) Specified U-Value = 1.20	0.9 x 0.200 19.64	0.72 x 0.70	0.77	1.3720
Window - Double-glazed, argon filled, low-E, En=0.2, hard coat (South) Specified U-Value = 1.20	0.9 x 0.550 46.75	0.72 x 0.70	0.77	8.9811
Window - Double-glazed, argon filled, low-E, En=0.2, hard coat (West) Specified U-Value = 1.20	0.9 x 2.520 19.64	0.72 x 0.70	0.77	17.2867
Window - Double-glazed, argon filled, low-E, En=0.2, hard coat (East) Specified U-Value = 1.20	0.9 x 4.330 19.64	0.72 x 0.70	0.77	29.7029
Full glazed door - Double-glazed, argon filled, low-E, En=0.2, hard coat (West) Specified U-Value = 1.20	0.9 x 6.680 19.64	0.72 x 0.70	0.77	45.8234
Full glazed door - Double-glazed, argon filled, low-E, En=0.2, hard coat (East) Specified U-Value = 1.20	0.9 x 3.780 19.64	0.72 x 0.70	0.77	25.9300
Full glazed door - Double-glazed, argon filled, low-E, En=0.2, hard coat (South) Specified U-Value = 1.20	0.9 x 2.630 46.75	0.72 x 0.70	0.77	42.9458
Rooflight at 70° or less - Double-glazed, argon filled, low-E, En=0.2, hard coat (n/a) Velux Specified U-Value = 1.20	0.9 x 4.670 26.00	0.72 x 0.70	1.00	55.0761

SAP 2012 worksheet for - CSH Ene 7 standard case

7. Mean internal temperature

Temperature during heating periods in the living area, Th1 (°C) 21.00 (85)
 Heating system responsiveness 1.00

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

tau

9.59	9.62	9.64	9.74	9.75	9.84	9.84	9.86	9.81	9.75	9.72	9.68
------	------	------	------	------	------	------	------	------	------	------	------

alpha

1.64	1.64	1.64	1.65	1.65	1.66	1.66	1.66	1.65	1.65	1.65	1.65
------	------	------	------	------	------	------	------	------	------	------	------

Utilisation factor for gains for living area
 0.90 0.85 0.78 0.67 0.55 0.43 0.33 0.37 0.55 0.75 0.87 0.91 (86)

Mean internal temperature in living area T1
 17.18 17.69 18.48 19.39 20.11 20.59 20.81 20.76 20.34 19.32 18.07 17.08 (87)

Temperature during heating periods in rest of dwelling Th2
 19.67 19.67 19.68 19.69 19.69 19.70 19.70 19.70 19.69 19.69 19.68 19.68 (88)

Utilisation factor for gains for rest of dwelling
 0.89 0.84 0.76 0.63 0.50 0.36 0.25 0.29 0.48 0.71 0.85 0.90 (89)

Mean internal temperature in the rest of dwelling T2
 16.24 16.74 17.51 18.38 19.03 19.45 19.62 19.59 19.26 18.34 17.14 16.15 (90)

Living area fraction (46.23/92.46) 0.50 (91)

Mean internal temperature (for the whole dwelling)
 16.71 17.21 17.99 18.88 19.57 20.02 20.21 20.18 19.80 18.83 17.60 16.62 (92)

Apply adjustment to the mean internal temperature, where appropriate
 16.71 17.21 17.99 18.88 19.57 20.02 20.21 20.18 19.80 18.83 17.60 16.62 (93)

8. Space heating requirement

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

Utilisation factor for gains
 0.85 0.80 0.72 0.61 0.49 0.38 0.28 0.32 0.49 0.69 0.81 0.86 (94)

Useful gains
 599.61 725.21 832.79 879.10 808.20 619.44 443.15 450.52 585.77 634.90 588.18 564.14 (95)

Monthly average external temperature
 4.30 4.90 6.50 8.90 11.70 14.60 16.60 16.40 14.10 10.60 7.10 4.20 (96)

Heat loss rate for mean internal temperature
 1748.01 1730.64 1611.52 1385.83 1090.93 744.59 496.12 517.61 785.44 1140.51 1460.78 1733.89 (97)

Fraction of month for heating
 1.00 1.00 1.00 1.00 1.00 - - - - 1.00 1.00 1.00

Space heating requirement for each month, kWh/month
 854.41 675.65 579.37 364.85 210.35 - - - - 376.17 628.28 870.29

Total space heating requirement per year (kWh/year) (October to May) 4559.37 (98)

Space heating requirement per m² (kWh/m²/year) 49.31 (99)

8c. Space cooling requirement - not applicable

9a. Energy requirements

kWh/year

No secondary heating system selected
 Fraction of space heat from main system(s) 1.0000 (202)
 Efficiency of main heating system 88.80% (206)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

Space heating requirement												(98)
854.41	675.65	579.37	364.85	210.35	-	-	-	-	376.17	628.28	870.29	

Appendix Q - monthly energy saved (main heating system 1)												(210)
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	

Space heating fuel (main heating system 1)												(211)
962.17	760.87	652.45	410.87	236.88	-	-	-	-	423.62	707.52	980.06	

Appendix Q - monthly energy saved (main heating system 2)												(212)
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	

Space heating fuel (main heating system 2)												(213)
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	

Appendix Q - monthly energy saved (secondary heating system)												(214)
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	

Space heating fuel (secondary)												(215)
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	

Water heating requirement												(64)
226.55	200.09	211.08	190.52	187.66	169.04	163.64	177.78	176.90	197.50	207.19	221.55	

Efficiency of water heater												79.50 (216)
86.67	86.49	86.11	85.37	84.16	79.50	79.50	79.50	79.50	85.36	86.30	86.74	

Water heating fuel												(219)
261.38	231.34	245.13	223.17	222.98	212.63	205.83	223.62	222.52	231.37	240.09	255.41	

Annual totals		kWh/year
Space heating fuel used, main system 1	5134.43	(211)
Space heating fuel (secondary)	0.00	(215)
Water heating fuel	2775.46	(219)
Electricity for pumps, fans and electric keep-hot		
central heating pump	30.00	(230c)
boiler with a fan-assisted flue	45.00	(230e)
Total electricity for the above, kWh/year	75.00	(231)
Electricity for lighting (100.00% fixed LEL)	409.43	(232)
Energy saving/generation technologies		
Appendix Q -		
Energy saved or generated ():	0.000	(236a)
Energy used ():	0.000	(237a)
Total delivered energy for all uses	8394.32	(238)

10a. Does not apply

11a. Does not apply

12a. Carbon dioxide emissions

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating, main system 1	5134.43	0.216	1109.04	(261)
Space heating, main system 2	0.00	0.000	0.00	(262)
Space heating, secondary	0.00	0.519	0.00	(263)
Water heating	2775.46	0.216	599.50	(264)
Space and water heating			1708.54	(265)
Electricity for pumps and fans	75.00	0.519	38.93	(267)
Electricity for lighting	409.43	0.519	212.49	(268)
Electricity generated - PVs	0.00	0.519	0.00	(269)
Electricity generated - µCHP	0.00	0.000	0.00	(269)
Appendix Q -				
Energy saved ():	0.00	0.000	0.00	(270)
Energy used ():	0.00	0.000	0.00	(271)
Total CO2, kg/year			1959.95	(272)
			kg/m²/year	
Dwelling Carbon Dioxide Emission Rate (DER)			21.20	(273)

Project Information

Building type Detached house

Reference	J5067-2	Project	Unit 2
Date	7 October 2019		66 Borstal Hill
Client	DCM Architectural Consultants Ltd		Whitstable
	25 Pigeon Lane		Kent
	Herne Bay		Kent
	Kent		CT54NB
	CT67EH		

1. Overall dwelling dimensions

	Area (m²)	Av. Storey height (m)	Volume (m³)	
Ground floor (1)	46.23	2.31	106.79	(3a)
First floor	46.23	2.50	115.57	(3b)
Total floor area	92.46			(4)
Dwelling volume (m ³)			222.37	(5)

2. Ventilation rate

	main + secondary + other heating		m³ per hour											
Number of chimneys	0 + 0 + 0	x 40	0.00	(6a)										
Number of open flues	0 + 0 + 0	x 20	0.00	(6b)										
Number of intermittent fans	3	x 10	30.00	(7a)										
Number of passive vents	0	x 10	0.00	(7b)										
Number of flueless gas fires	0	x 40	0.00	(7c)										
			Air changes per hour											
Infiltration due to chimneys, fans and flues			0.13	(8)										
Pressure test, result q50		5.00		(17)										
Air permeability			0.38	(18)										
Number of sides on which sheltered			2.00	(19)										
Shelter factor			0.85	(20)										
Infiltration rate incorporating shelter factor			0.33	(21)										
Infiltration rate modified for monthly wind speed														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	5.10	5.00	4.90	4.40	4.30	3.80	3.80	3.70	4.00	4.30	4.50	4.70		
													52.50	(22)
Wind Factor														
	1.27	1.25	1.23	1.10	1.07	0.95	0.95	0.93	1.00	1.07	1.13	1.18		
													13.13	(22a)
Adjusted infiltration rate (allowing for shelter and wind speed)														
	0.42	0.41	0.40	0.36	0.35	0.31	0.31	0.30	0.33	0.35	0.37	0.38		
													4.29	(22b)
Ventilation : natural ventilation, intermittent extract fans														
Effective air change rate														
	0.59	0.58	0.58	0.56	0.56	0.55	0.55	0.55	0.55	0.56	0.57	0.57		(25)

3. Heat losses and heat loss parameter

Element	Gross area, m ²	Openings m ²	Net area A, m ²	U-value W/m ² K	A x U W/K	kappa-value kJ/m ² K	A x K kJ/K	
Window - Double-glazed, air-filled, low-E, En=0.1, soft coat (East) Specified U-Value = 1.20			3.950	1.33 (1.40)	5.24			(27)
Window - Double-glazed, air-filled, low-E, En=0.1, soft coat (West) Specified U-Value = 1.20			2.300	1.33 (1.40)	3.05			(27)
Window - Double-glazed, air-filled, low-E, En=0.1, soft coat (South) Specified U-Value = 1.20			0.500	1.33 (1.40)	0.66			(27)
Window - Double-glazed, air-filled, low-E, En=0.1, soft coat (East) Specified U-Value = 1.20			0.180	1.33 (1.40)	0.24			(27)
Full glazed door - Double-glazed, air-filled, low-E, En=0.1, soft coat (South) Specified U-Value = 1.20			2.400	1.40	3.36			(26)
Full glazed door - Double-glazed, air-filled, low-E, En=0.1, soft coat (East) Specified U-Value = 1.20			3.450	1.40	4.83			(26)
Full glazed door - Double-glazed, air-filled, low-E, En=0.1, soft coat (West) Specified U-Value = 1.20			6.090	1.40	8.53			(26)
Rooflight at 70° or less - Double-glazed, air-filled, low-E, En=0.1, soft coat (n/a) Velux Specified U-Value = 1.20			4.260	1.59 (1.70)	6.78			(27)
Walls Brick or (Weatherboard/Battens/100 Medium Dense Block)/51 Cavity/140 Timber Frame Insulated With 120 Celotex XR4000 Between Studs/12.5 P'bd			98.54	0.18	17.74	9.00	886.86	(29)
Walls Dormer Cheeks - Weatherboard/Battens/9 OSB/51 Cavity/140 Timber Frame Insulated With 120 Celotex XR4000 Between Studs/12.5 P'bd			4.17	0.18	0.75	9.00	37.53	(29)
Ground floors Beam/Medium Dense Block/150 Kingspan TF70/Screed			46.23	0.13	6.01	75.00	3467.25	(28)

3. Heat losses and heat loss parameter

Element	Gross area, m ²	Openings m ²	Net area A, m ²	U-value W/m ² K	A x U W/K	kappa-value kJ/m ² K	A x K kJ/K							
Flat roofs			3.36	0.13	0.44	9.00	30.24	(30)						
150 Kingspan TR27 Over Joists														
Pitched roofs insulated between rafters			51.47	0.13	6.69	9.00	463.23	(30)						
150 Kingspan K7 Between Rafters/52.5 Kingspan K118 Under Rafters With Breather Membrane														
Total area of external elements Sigma A, m ²							226.90	(31)						
Fabric heat loss, W/K							64.31	(33)						
Thermal mass parameter, kJ/m ² K (user-specified TMP)							250.00	(35)						
Effect of thermal bridges							11.34	(36)						
Total fabric heat loss							75.65	(37)						
Ventilation heat loss calculated monthly														
	43.08	42.83	42.58	41.44	41.23	40.23	40.23	40.05	40.62	41.23	41.66	42.11	(38)	
Heat transfer coefficient, W/K														
	118.73	118.48	118.24	117.10	116.88	115.89	115.89	115.71	116.27	116.88	117.32	117.77	117.10	(39)
Heat loss parameter (HLP), W/m ² K														
	1.28	1.28	1.28	1.27	1.26	1.25	1.25	1.25	1.26	1.26	1.27	1.27	1.27	(40)
HLP (average)														
Number of days in month (Table 1a)														
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
31	28	31	30	31	30	31	31	30	31	30	31			

4. Water heating energy requirements

												kWh/year	
Assumed occupancy, N												2.66	(42)
Annual average hot water usage in litres per day Vd,average												97.33	(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage in litres per day for each month													
107.06	103.17	99.27	95.38	91.49	87.59	87.59	91.49	95.38	99.27	103.17	107.06	(44)	
Energy content of hot water used													
158.76	138.86	143.29	124.92	119.86	103.43	95.85	109.99	111.30	129.71	141.59	153.75	(45)	
Energy content (annual)												1531.31	(45)
Distribution loss													
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(46)	
Hot water storage volume (litres)												0.00	(50)
Hot water cylinder loss factor (kWh/day)												0.0000	(51)
Volume factor												0.0000	(52)
Temperature factor												0.0000	(53)
Energy lost from store (kWh/day)												0.00	(55)
Total storage loss													
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(56)	
Net storage loss													
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(57)	
Primary loss													
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(59)	
Combi loss calculated for each month													
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(61)	
Total heat required for water heating calculated for each month													
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(62)	
Output from water heater for each month, kWh/month													
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(64)	
												0.00	(64)
Heat gains from water heating, kWh/month													
33.74	29.51	30.45	26.55	25.47	21.98	20.37	23.37	23.65	27.56	30.09	32.67	(65)	

5. Internal gains

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains, Watts												
132.90	132.90	132.90	132.90	132.90	132.90	132.90	132.90	132.90	132.90	132.90	132.90	(66)
Lighting gains												
23.66	21.01	17.09	12.94	9.67	8.16	8.82	11.47	15.39	19.54	22.81	24.31	(67)
Appliances gains												
243.53	246.06	239.69	226.13	209.02	192.94	182.19	179.66	186.03	199.59	216.70	232.79	(68)
Cooking gains												
36.29	36.29	36.29	36.29	36.29	36.29	36.29	36.29	36.29	36.29	36.29	36.29	(69)
Pumps and fans gains												
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(70)
Losses e.g. evaporation (negative values)												
-106.32	-106.32	-106.32	-106.32	-106.32	-106.32	-106.32	-106.32	-106.32	-106.32	-106.32	-106.32	(71)
Water heating gains												
45.35	43.91	40.93	36.87	34.24	30.53	27.38	31.41	32.85	37.05	41.79	43.92	(72)
Total internal gains												
375.40	373.85	360.57	338.81	315.79	294.50	281.26	285.41	297.14	319.05	344.17	363.88	(73)

6. Solar gains (calculation for January)

	Area & Flux	g & FF	Shading	Gains
Window - Double-glazed, air-filled, low-E, En=0.1, soft coat (East) Specified U-Value = 1.20	0.9 x 3.950 19.64	0.63 x 0.70	0.77	23.7092
Window - Double-glazed, air-filled, low-E, En=0.1, soft coat (West) Specified U-Value = 1.20	0.9 x 2.300 19.64	0.63 x 0.70	0.77	13.8053
Window - Double-glazed, air-filled, low-E, En=0.1, soft coat (South) Specified U-Value = 1.20	0.9 x 0.500 46.75	0.63 x 0.70	0.77	7.1440
Window - Double-glazed, air-filled, low-E, En=0.1, soft coat (East) Specified U-Value = 1.20	0.9 x 0.180 19.64	0.63 x 0.70	0.77	1.0804
Full glazed door - Double-glazed, air-filled, low-E, En=0.1, soft coat (South) Specified U-Value = 1.20	0.9 x 2.400 46.75	0.63 x 0.70	0.77	34.2913
Full glazed door - Double-glazed, air-filled, low-E, En=0.1, soft coat (East) Specified U-Value = 1.20	0.9 x 3.450 19.64	0.63 x 0.70	0.77	20.7080
Full glazed door - Double-glazed, air-filled, low-E, En=0.1, soft coat (West) Specified U-Value = 1.20	0.9 x 6.090 19.64	0.63 x 0.70	0.77	36.5541
Rooflight at 70° or less - Double-glazed, air-filled, low-E, En=0.1, soft coat (n/a) Velux Specified U-Value = 1.20	0.9 x 4.260 26.00	0.63 x 0.70	1.00	43.9606

7. Mean internal temperature

Temperature during heating periods in the living area, Th1 (°C) 21.00 (85)
 Heating system responsiveness 1.00

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

tau

54.08	54.19	54.30	54.83	54.93	55.40	55.40	55.49	55.22	54.93	54.73	54.52
-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------

alpha

4.61	4.61	4.62	4.66	4.66	4.69	4.69	4.70	4.68	4.66	4.65	4.63
------	------	------	------	------	------	------	------	------	------	------	------

Utilisation factor for gains for living area

1.00	0.99	0.97	0.90	0.74	0.55	0.41	0.47	0.75	0.96	1.00	1.00
------	------	------	------	------	------	------	------	------	------	------	------

(86)

Mean internal temperature in living area T1

19.58	19.82	20.19	20.61	20.88	20.98	21.00	20.99	20.91	20.49	19.94	19.54
-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------

(87)

Temperature during heating periods in rest of dwelling Th2

19.85	19.86	19.86	19.87	19.87	19.88	19.88	19.88	19.87	19.87	19.87	19.86
-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------

(88)

Utilisation factor for gains for rest of dwelling

1.00	0.99	0.96	0.87	0.68	0.46	0.31	0.36	0.66	0.94	0.99	1.00
------	------	------	------	------	------	------	------	------	------	------	------

(89)

Mean internal temperature in the rest of dwelling T2

18.57	18.81	19.17	19.57	19.80	19.87	19.88	19.88	19.83	19.47	18.94	18.54
-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------

(90)

Living area fraction (46.23/92.46) 0.50 (91)

Mean internal temperature (for the whole dwelling)

19.08	19.31	19.68	20.09	20.34	20.42	20.44	20.43	20.37	19.98	19.44	19.04
-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------

(92)

Apply adjustment to the mean internal temperature, where appropriate

19.08	19.31	19.68	20.09	20.34	20.42	20.44	20.43	20.37	19.98	19.44	19.04
-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------

(93)

8. Space heating requirement

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

Utilisation factor for gains

1.00	0.99	0.96	0.88	0.71	0.51	0.36	0.42	0.71	0.95	0.99	1.00
------	------	------	------	------	------	------	------	------	------	------	------

(94)

Useful gains

554.73	712.68	883.62	998.19	917.13	659.20	442.18	462.03	663.87	686.50	564.09	512.77
--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------

(95)

Monthly average external temperature

4.30	4.90	6.50	8.90	11.70	14.60	16.60	16.40	14.10	10.60	7.10	4.20
------	------	------	------	-------	-------	-------	-------	-------	-------	------	------

(96)

Heat loss rate for mean internal temperature

1754.68	1707.51	1558.03	1310.67	1009.48	674.70	444.54	466.75	728.70	1096.24	1447.63	1747.88
---------	---------	---------	---------	---------	--------	--------	--------	--------	---------	---------	---------

(97)

Fraction of month for heating

1.00	1.00	1.00	1.00	1.00	-	-	-	-	1.00	1.00	1.00
------	------	------	------	------	---	---	---	---	------	------	------

Space heating requirement for each month, kWh/month

892.76	668.53	501.76	224.98	68.71	-	-	-	-	304.85	636.14	918.92
--------	--------	--------	--------	-------	---	---	---	---	--------	--------	--------

Total space heating requirement per year (kWh/year) (October to May) 4216.66 (98)

Space heating requirement per m² (kWh/m²/year) 45.61 (99)

8c. Space cooling requirement

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
External temperatures												
-	-	-	-	-	14.60	16.60	16.40	-	-	-	-	
Heat loss rate W												
-	-	-	-	-	1089.37	857.59	879.36	-	-	-	-	(100)
Utilisation factor for loss												
-	-	-	-	-	0.94	0.97	0.95	-	-	-	-	(101)
Useful loss W												
-	-	-	-	-	1019.21	829.02	834.49	-	-	-	-	(102)
Internal gains W												
0.00	0.00	0.00	0.00	0.00	445.66	428.12	435.00	0.00	0.00	0.00	0.00	
Solar gains W												
0.00	0.00	0.00	0.00	0.00	1113.11	1060.21	914.21	0.00	0.00	0.00	0.00	
Gains W												
-	-	-	-	-	1558.77	1488.32	1349.20	-	-	-	-	(103)
Fraction of month for cooling												
0.00	0.00	0.00	0.00	0.00	1.00	1.00	1.00	0.00	0.00	0.00	0.00	(103a)
Space heating kWh												
-	-	-	-	-	1228.60	1433.88	1415.88	-	-	-	-	(98)
Space cooling kWh												
-	-	-	-	-	388.48	490.53	382.95	-	-	-	-	(104)
Total											1261.95	(104)
Cooled fraction											1.00	(105)
Intermittency factor												
-	-	-	-	-	0.25	0.25	0.25	-	-	-	-	(106)
Space cooling requirement for month												
-	-	-	-	-	97.12	122.63	95.74	-	-	-	-	
Space cooling (June to August)											315.49	(107)
Space cooling requirement per m ² (kWh/m ² /year)											3.41	(108)

8f. Fabric Energy Efficiency

	kWh/year	
Energy for space heating	45.61	(99)
Energy for space cooling	3.41	(108)
Total	49.02	(109)
Target Fabric Energy Efficiency	56.4	(109)
= 49.0174 x 1.15, rounded to 1 d.p.		

Project Information

Building type Detached house

Reference J5067-2

Date 7 October 2019

Client	DCM Architectural Consultants Ltd	Project	Unit 2
	25 Pigeon Lane		66 Borstal Hill
	Herne Bay		Whitstable
	Kent		Kent
	CT6 7EH		CT5 4NB

SAP 2012 worksheet for - calculation of Heat Demand**1. Overall dwelling dimensions**

	Area (m²)	Av. Storey height (m)	Volume (m³)	
Ground floor (1)	46.23	2.31	106.79	(3a)
First floor	46.23	2.50	115.57	(3b)
Total floor area	92.46			(4)
Dwelling volume (m ³)			222.37	(5)

SAP 2012 worksheet for - calculation of Heat Demand

2. Ventilation rate

	main + secondary + other heating		m³ per hour										
Number of chimneys	0 + 0 + 0	x 40	0.00	(6a)									
Number of open flues	0 + 0 + 0	x 20	0.00	(6b)									
Number of intermittent fans	4	x 10	40.00	(7a)									
Number of passive vents	0	x 10	0.00	(7b)									
Number of flueless gas fires	0	x 40	0.00	(7c)									
			Air changes per hour										
Infiltration due to chimneys, fans and flues			0.18	(8)									
Pressure test, result q50	5.00			(17)									
Air permeability			0.43	(18)									
Number of sides on which sheltered			2.00	(19)									
Shelter factor			0.85	(20)									
Infiltration rate incorporating shelter factor			0.37	(21)									
Infiltration rate modified for monthly wind speed													
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
5.70	5.40	5.10	4.50	4.60	4.10	4.20	4.30	4.50	4.90	5.00	5.30		
												57.60	(22)
Wind Factor													
1.43	1.35	1.27	1.13	1.15	1.02	1.05	1.07	1.13	1.23	1.25	1.32		
												14.40	(22a)
Adjusted infiltration rate (allowing for shelter and wind speed)													
0.52	0.49	0.47	0.41	0.42	0.37	0.38	0.39	0.41	0.45	0.46	0.48		
												5.26	(22b)
Ventilation : natural ventilation, intermittent extract fans													
Effective air change rate													
0.64	0.62	0.61	0.58	0.59	0.57	0.57	0.58	0.58	0.60	0.60	0.62		
													(25)

SAP 2012 worksheet for - calculation of Heat Demand

3. Heat losses and heat loss parameter

Element	Gross area, m ²	Openings m ²	Net area A, m ²	U-value W/m ² K	A x U W/K	kappa-value kJ/m ² K	A x K kJ/K	
Window - Double-glazed, argon filled, low-E, En=0.2, hard coat (East) Specified U-Value = 1.20			0.200	1.15 (1.20)	0.23			(27)
Window - Double-glazed, argon filled, low-E, En=0.2, hard coat (South) Specified U-Value = 1.20			0.550	1.15 (1.20)	0.63			(27)
Window - Double-glazed, argon filled, low-E, En=0.2, hard coat (West) Specified U-Value = 1.20			2.520	1.15 (1.20)	2.89			(27)
Window - Double-glazed, argon filled, low-E, En=0.2, hard coat (East) Specified U-Value = 1.20			4.330	1.15 (1.20)	4.96			(27)
Full glazed door - Double-glazed, argon filled, low-E, En=0.2, hard coat (West) Specified U-Value = 1.20			6.680	1.20	8.02			(26)
Full glazed door - Double-glazed, argon filled, low-E, En=0.2, hard coat (East) Specified U-Value = 1.20			3.780	1.20	4.54			(26)
Full glazed door - Double-glazed, argon filled, low-E, En=0.2, hard coat (South) Specified U-Value = 1.20			2.630	1.20	3.16			(26)
Rooflight at 70° or less - Double-glazed, argon filled, low-E, En=0.2, hard coat (n/a) Velux Specified U-Value = 1.20			4.670	1.15 (1.20)	5.35			(27)
Walls Dormer Cheeks - Weatherboard/Battens/9 OSB/51 Cavity/140 Timber Frame Insulated With 120 Celotex XR4000 Between Studs/12.5 P'bd			4.15	0.21	0.87	9.00	37.35	(29)
Walls Brick or (Weatherboard/Battens/100 Medium Dense Block)/51 Cavity/140 Timber Frame Insulated With 120 Celotex XR4000 Between Studs/12.5 P'bd			96.74	0.20	19.35	9.00	870.66	(29)
Ground floors Beam/Medium Dense Block/150 Kingspan TF70/Screed			46.23	0.12	5.55	75.00	3467.25	(28)

SAP 2012 worksheet for - calculation of Heat Demand

3. Heat losses and heat loss parameter

Element	Gross area, m ²	Openings m ²	Net area A, m ²	U-value W/m ² K	A x U W/K	kappa-value kJ/m ² K	A x K kJ/K						
Flat roofs			3.36	0.15	0.50	9.00	30.24	(30)					
150 Kingspan TR27 Over Joists													
Pitched roofs insulated between rafters			51.06	0.12	6.13	9.00	459.54	(30)					
150 Kingspan K7 Between Rafters/52.5 Kingspan K118 Under Rafters With Breather Membrane													
Total area of external elements Sigma A, m ²							226.90	(31)					
Fabric heat loss, W/K							62.16	(33)					
Heat capacity							4865.04	(34)					
Thermal mass parameter, kJ/m ² K							52.62	(35)					
Effect of thermal bridges							34.04	(36)					
Total fabric heat loss							96.19	(37)					
Ventilation heat loss calculated monthly													
	46.64	45.62	44.65	42.89	43.17	41.84	42.09	42.35	42.89	44.04	44.34	45.29	(38)
Heat transfer coefficient, W/K													
	142.83	141.81	140.85	139.08	139.36	138.03	138.28	138.54	139.08	140.23	140.54	141.48	140.01 (39)
Heat loss parameter (HLP), W/m ² K													
	1.54	1.53	1.52	1.50	1.51	1.49	1.50	1.50	1.50	1.52	1.52	1.53	
HLP (average)													1.51 (40)
Number of days in month (Table 1a)													
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
31	28	31	30	31	30	31	31	30	31	30	31		

SAP 2012 worksheet for - calculation of Heat Demand

4. Water heating energy requirements

kWh/year

Assumed occupancy, N 2.66 (42)
 Annual average hot water usage in litres per day Vd,average 97.33 (43)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

Hot water usage in litres per day for each month

107.06	103.17	99.27	95.38	91.49	87.59	87.59	91.49	95.38	99.27	103.17	107.06	(44)
--------	--------	-------	-------	-------	-------	-------	-------	-------	-------	--------	--------	------

Energy content of hot water used

158.76	138.86	143.29	124.92	119.86	103.43	95.85	109.99	111.30	129.71	141.59	153.75	(45)
--------	--------	--------	--------	--------	--------	-------	--------	--------	--------	--------	--------	------

Energy content (annual) 1531.31 (45)

Distribution loss

23.81	20.83	21.49	18.74	17.98	15.52	14.38	16.50	16.69	19.46	21.24	23.06	(46)
-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	------

store loss determined from EN 13203-2 tests, taken from boiler data record

Hot water storage volume (litres) 0.00 (50)

Hot water cylinder loss factor (kWh/day) 0.0000 (51)

Volume factor 0.0000 (52)

Temperature factor 0.0000 (53)

Energy lost from store (kWh/day) 0.00 (55)

Total storage loss

0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(56)
------	------	------	------	------	------	------	------	------	------	------	------	------

Net storage loss

0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(57)
------	------	------	------	------	------	------	------	------	------	------	------	------

Primary loss

0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(59)
------	------	------	------	------	------	------	------	------	------	------	------	------

Combi loss calculated for each month

17.45	15.73	17.33	16.64	17.10	16.44	16.92	17.04	16.55	17.24	16.80	17.41	(61)
-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	------

Total heat required for water heating calculated for each month

176.21	154.58	160.62	141.56	136.97	119.88	112.77	127.02	127.85	146.94	158.39	171.17	(62)
--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	------

Output from water heater for each month, kWh/month

176.21	154.58	160.62	141.56	136.97	119.88	112.77	127.02	127.85	146.94	158.39	171.17	(64)
--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	------

1733.95 (64)

Water heating demand

1734 (64)

Heat gains from water heating, kWh/month

57.15	50.10	51.98	45.70	44.13	38.50	36.10	40.83	41.14	47.44	51.28	55.48	(65)
-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	------

SAP 2012 worksheet for - calculation of Heat Demand

5. Internal gains

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains, Watts												
159.48	159.48	159.48	159.48	159.48	159.48	159.48	159.48	159.48	159.48	159.48	159.48	(66)
Lighting gains												
57.96	51.48	41.86	31.69	23.69	20.00	21.61	28.09	37.71	47.88	55.88	59.57	(67)
Appliances gains												
363.48	367.25	357.75	337.51	311.97	287.96	271.93	268.15	277.66	297.89	323.44	347.44	(68)
Cooking gains												
53.61	53.61	53.61	53.61	53.61	53.61	53.61	53.61	53.61	53.61	53.61	53.61	(69)
Pumps and fans gains												
3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	(70)
Losses e.g. evaporation (negative values)												
-106.32	-106.32	-106.32	-106.32	-106.32	-106.32	-106.32	-106.32	-106.32	-106.32	-106.32	-106.32	(71)
Water heating gains												
76.82	74.56	69.86	63.47	59.32	53.48	48.52	54.88	57.15	63.76	71.22	74.56	(72)
Total internal gains												
608.02	603.05	579.23	542.44	504.74	471.20	451.82	460.89	482.27	519.29	560.30	591.34	(73)

6. Solar gains (calculation for January)

	Area & Flux	g & FF	Shading	Gains
Window - Double-glazed, argon filled, low-E, En=0.2, hard coat (East) Specified U-Value = 1.20	0.9 x 0.200 23.77	0.72 x 0.70	0.77	1.6601
Window - Double-glazed, argon filled, low-E, En=0.2, hard coat (South) Specified U-Value = 1.20	0.9 x 0.550 53.90	0.72 x 0.70	0.77	10.3539
Window - Double-glazed, argon filled, low-E, En=0.2, hard coat (West) Specified U-Value = 1.20	0.9 x 2.520 23.77	0.72 x 0.70	0.77	20.9173
Window - Double-glazed, argon filled, low-E, En=0.2, hard coat (East) Specified U-Value = 1.20	0.9 x 4.330 23.77	0.72 x 0.70	0.77	35.9413
Full glazed door - Double-glazed, argon filled, low-E, En=0.2, hard coat (West) Specified U-Value = 1.20	0.9 x 6.680 23.77	0.72 x 0.70	0.77	55.4475
Full glazed door - Double-glazed, argon filled, low-E, En=0.2, hard coat (East) Specified U-Value = 1.20	0.9 x 3.780 23.77	0.72 x 0.70	0.77	31.3760
Full glazed door - Double-glazed, argon filled, low-E, En=0.2, hard coat (South) Specified U-Value = 1.20	0.9 x 2.630 53.90	0.72 x 0.70	0.77	49.5106
Rooflight at 70° or less - Double-glazed, argon filled, low-E, En=0.2, hard coat (n/a) Velux Specified U-Value = 1.20	0.9 x 4.670 32.00	0.72 x 0.70	1.00	67.7860

SAP 2012 worksheet for - calculation of Heat Demand

7. Mean internal temperature

Temperature during heating periods in the living area, Th1 (°C) 21.00 (85)
 Heating system responsiveness 1.00

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

tau

9.46	9.53	9.59	9.72	9.70	9.79	9.77	9.75	9.72	9.64	9.62	9.55
------	------	------	------	------	------	------	------	------	------	------	------

alpha

1.63	1.64	1.64	1.65	1.65	1.65	1.65	1.65	1.65	1.64	1.64	1.64
------	------	------	------	------	------	------	------	------	------	------	------

Utilisation factor for gains for living area
 0.85 0.81 0.73 0.59 0.46 0.32 0.20 0.21 0.40 0.65 0.80 0.87 (86)

Mean internal temperature in living area T1
 17.78 18.13 18.94 19.82 20.43 20.79 20.95 20.94 20.70 19.88 18.76 17.77 (87)

Temperature during heating periods in rest of dwelling Th2
 19.65 19.66 19.67 19.68 19.68 19.69 19.69 19.69 19.68 19.68 19.67 19.66 (88)

Utilisation factor for gains for rest of dwelling
 0.84 0.79 0.70 0.55 0.40 0.25 0.11 0.11 0.32 0.60 0.77 0.85 (89)

Mean internal temperature in the rest of dwelling T2
 15.67 16.15 17.23 18.38 19.13 19.54 19.68 19.67 19.47 18.51 17.02 15.66 (90)

Living area fraction (46.23/92.46) 0.50 (91)

Mean internal temperature (for the whole dwelling)
 16.72 17.14 18.08 19.10 19.78 20.17 20.31 20.31 20.08 19.20 17.89 16.72 (92)

Apply adjustment to the mean internal temperature, where appropriate
 16.72 17.14 18.08 19.10 19.78 20.17 20.31 20.31 20.08 19.20 17.89 16.72 (93)

8. Space heating requirement

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

Utilisation factor for gains
 0.79 0.74 0.65 0.53 0.41 0.28 0.15 0.16 0.35 0.58 0.73 0.80 (94)

Useful gains
 692.49 785.70 866.24 899.91 751.49 527.45 280.02 265.55 495.26 639.91 655.36 641.15 (95)

Monthly average external temperature
 5.50 5.80 7.60 10.00 13.10 15.90 18.20 18.30 15.90 12.30 8.70 5.80 (96)

Heat loss rate for mean internal temperature
 1603.17 1608.12 1476.44 1265.29 930.92 589.02 291.88 278.10 581.77 967.04 1291.08 1544.38 (97)

Fraction of month for heating
 1.00 1.00 1.00 1.00 1.00 - - - - 1.00 1.00 1.00

Space heating requirement for each month, kWh/month
 677.55 552.67 453.99 263.08 133.49 - - - - 243.38 457.72 672.00

Total space heating requirement per year (kWh/year) (October to May) 3453.88 (98)

Space heating requirement per m² (kWh/m²/year) 37.36 (99)

Space heating demand 3454 (98)

Water heating demand 1734 (64)

8c. Space cooling requirement - not applicable

Project Information

Building type Detached house

Reference J5067-2

Date 7 October 2019

Client	DCM Architectural Consultants Ltd	Project	Unit 2
	25 Pigeon Lane		66 Borstal Hill
	Herne Bay		Whitstable
	Kent		Kent
	CT6 7EH		CT5 4NB

SAP 2012 worksheet for - calculation of EPC Costs, Emissions And Primary Energy**1. Overall dwelling dimensions**

	Area (m²)	Av. Storey height (m)	Volume (m³)	
Ground floor (1)	46.23	2.31	106.79	(3a)
First floor	46.23	2.50	115.57	(3b)
Total floor area	92.46			(4)
Dwelling volume (m ³)			222.37	(5)

SAP 2012 worksheet for - calculation of EPC Costs, Emissions And Primary Energy

2. Ventilation rate

	main + secondary + other heating		m³ per hour										
Number of chimneys	0 + 0 + 0	x 40	0.00	(6a)									
Number of open flues	0 + 0 + 0	x 20	0.00	(6b)									
Number of intermittent fans	4	x 10	40.00	(7a)									
Number of passive vents	0	x 10	0.00	(7b)									
Number of flueless gas fires	0	x 40	0.00	(7c)									
			Air changes per hour										
Infiltration due to chimneys, fans and flues			0.18	(8)									
Pressure test, result q50	5.00			(17)									
Air permeability			0.43	(18)									
Number of sides on which sheltered			2.00	(19)									
Shelter factor			0.85	(20)									
Infiltration rate incorporating shelter factor			0.37	(21)									
Infiltration rate modified for monthly wind speed													
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
5.70	5.40	5.10	4.50	4.60	4.10	4.20	4.30	4.50	4.90	5.00	5.30		
												57.60	(22)
Wind Factor													
1.43	1.35	1.27	1.13	1.15	1.02	1.05	1.07	1.13	1.23	1.25	1.32		
												14.40	(22a)
Adjusted infiltration rate (allowing for shelter and wind speed)													
0.52	0.49	0.47	0.41	0.42	0.37	0.38	0.39	0.41	0.45	0.46	0.48		
												5.26	(22b)
Ventilation : natural ventilation, intermittent extract fans													
Effective air change rate													
0.64	0.62	0.61	0.58	0.59	0.57	0.57	0.58	0.58	0.60	0.60	0.62	(25)	

SAP 2012 worksheet for - calculation of EPC Costs, Emissions And Primary Energy

3. Heat losses and heat loss parameter

Element	Gross area, m ²	Openings m ²	Net area A, m ²	U-value W/m ² K	A x U W/K	kappa-value kJ/m ² K	A x K kJ/K	
Window - Double-glazed, argon filled, low-E, En=0.2, hard coat (East) Specified U-Value = 1.20			0.200	1.15 (1.20)	0.23			(27)
Window - Double-glazed, argon filled, low-E, En=0.2, hard coat (South) Specified U-Value = 1.20			0.550	1.15 (1.20)	0.63			(27)
Window - Double-glazed, argon filled, low-E, En=0.2, hard coat (West) Specified U-Value = 1.20			2.520	1.15 (1.20)	2.89			(27)
Window - Double-glazed, argon filled, low-E, En=0.2, hard coat (East) Specified U-Value = 1.20			4.330	1.15 (1.20)	4.96			(27)
Full glazed door - Double-glazed, argon filled, low-E, En=0.2, hard coat (West) Specified U-Value = 1.20			6.680	1.20	8.02			(26)
Full glazed door - Double-glazed, argon filled, low-E, En=0.2, hard coat (East) Specified U-Value = 1.20			3.780	1.20	4.54			(26)
Full glazed door - Double-glazed, argon filled, low-E, En=0.2, hard coat (South) Specified U-Value = 1.20			2.630	1.20	3.16			(26)
Rooflight at 70° or less - Double-glazed, argon filled, low-E, En=0.2, hard coat (n/a) Velux Specified U-Value = 1.20			4.670	1.15 (1.20)	5.35			(27)
Walls Dormer Cheeks - Weatherboard/Battens/9 OSB/51 Cavity/140 Timber Frame Insulated With 120 Celotex XR4000 Between Studs/12.5 P'bd			4.15	0.21	0.87	9.00	37.35	(29)
Walls Brick or (Weatherboard/Battens/100 Medium Dense Block)/51 Cavity/140 Timber Frame Insulated With 120 Celotex XR4000 Between Studs/12.5 P'bd			96.74	0.20	19.35	9.00	870.66	(29)
Ground floors Beam/Medium Dense Block/150 Kingspan TF70/Screed			46.23	0.12	5.55	75.00	3467.25	(28)

SAP 2012 worksheet for - calculation of EPC Costs, Emissions And Primary Energy

3. Heat losses and heat loss parameter

Element	Gross area, m ²	Openings m ²	Net area A, m ²	U-value W/m ² K	A x U W/K	kappa-value kJ/m ² K	A x K kJ/K							
Flat roofs			3.36	0.15	0.50	9.00	30.24	(30)						
150 Kingspan TR27 Over Joists														
Pitched roofs insulated between rafters			51.06	0.12	6.13	9.00	459.54	(30)						
150 Kingspan K7 Between Rafters/52.5 Kingspan K118 Under Rafters With Breather Membrane														
Total area of external elements Sigma A, m ²							226.90	(31)						
Fabric heat loss, W/K							62.16	(33)						
Heat capacity							4865.04	(34)						
Thermal mass parameter, kJ/m ² K							52.62	(35)						
Effect of thermal bridges							34.04	(36)						
Total fabric heat loss							96.19	(37)						
Ventilation heat loss calculated monthly														
	46.64	45.62	44.65	42.89	43.17	41.84	42.09	42.35	42.89	44.04	44.34	45.29	(38)	
Heat transfer coefficient, W/K														
	142.83	141.81	140.85	139.08	139.36	138.03	138.28	138.54	139.08	140.23	140.54	141.48	140.01	(39)
Heat loss parameter (HLP), W/m ² K														
	1.54	1.53	1.52	1.50	1.51	1.49	1.50	1.50	1.50	1.52	1.52	1.53		
HLP (average)													1.51	(40)
Number of days in month (Table 1a)														
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
31	28	31	30	31	30	31	31	30	31	30	31			

SAP 2012 worksheet for - calculation of EPC Costs, Emissions And Primary Energy

4. Water heating energy requirements

kWh/year

Assumed occupancy, N 2.66 (42)
 Annual average hot water usage in litres per day Vd,average 97.33 (43)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

Hot water usage in litres per day for each month

107.06	103.17	99.27	95.38	91.49	87.59	87.59	91.49	95.38	99.27	103.17	107.06	(44)
--------	--------	-------	-------	-------	-------	-------	-------	-------	-------	--------	--------	------

Energy content of hot water used

158.76	138.86	143.29	124.92	119.86	103.43	95.85	109.99	111.30	129.71	141.59	153.75	(45)
--------	--------	--------	--------	--------	--------	-------	--------	--------	--------	--------	--------	------

Energy content (annual) 1531.31 (45)

Distribution loss

23.81	20.83	21.49	18.74	17.98	15.52	14.38	16.50	16.69	19.46	21.24	23.06	(46)
-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	------

store loss determined from EN 13203-2 tests, taken from boiler data record

Hot water storage volume (litres) 0.00 (50)

Hot water cylinder loss factor (kWh/day) 0.0000 (51)

Volume factor 0.0000 (52)

Temperature factor 0.0000 (53)

Energy lost from store (kWh/day) 0.00 (55)

Total storage loss

0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(56)
------	------	------	------	------	------	------	------	------	------	------	------	------

Net storage loss

0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(57)
------	------	------	------	------	------	------	------	------	------	------	------	------

Primary loss

0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(59)
------	------	------	------	------	------	------	------	------	------	------	------	------

Combi loss calculated for each month

17.45	15.73	17.33	16.64	17.10	16.44	16.92	17.04	16.55	17.24	16.80	17.41	(61)
-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	------

Total heat required for water heating calculated for each month

176.21	154.58	160.62	141.56	136.97	119.88	112.77	127.02	127.85	146.94	158.39	171.17	(62)
--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	------

Output from water heater for each month, kWh/month

176.21	154.58	160.62	141.56	136.97	119.88	112.77	127.02	127.85	146.94	158.39	171.17	(64)
--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	------

1733.95 (64)

Heat gains from water heating, kWh/month

57.15	50.10	51.98	45.70	44.13	38.50	36.10	40.83	41.14	47.44	51.28	55.48	(65)
-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	------

SAP 2012 worksheet for - calculation of EPC Costs, Emissions And Primary Energy

5. Internal gains

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Metabolic gains, Watts													
159.48	159.48	159.48	159.48	159.48	159.48	159.48	159.48	159.48	159.48	159.48	159.48	159.48	(66)
Lighting gains													
57.96	51.48	41.86	31.69	23.69	20.00	21.61	28.09	37.71	47.88	55.88	59.57		(67)
Appliances gains													
363.48	367.25	357.75	337.51	311.97	287.96	271.93	268.15	277.66	297.89	323.44	347.44		(68)
Cooking gains													
53.61	53.61	53.61	53.61	53.61	53.61	53.61	53.61	53.61	53.61	53.61	53.61	53.61	(69)
Pumps and fans gains													
3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	(70)
Losses e.g. evaporation (negative values)													
-106.32	-106.32	-106.32	-106.32	-106.32	-106.32	-106.32	-106.32	-106.32	-106.32	-106.32	-106.32	-106.32	(71)
Water heating gains													
76.82	74.56	69.86	63.47	59.32	53.48	48.52	54.88	57.15	63.76	71.22	74.56		(72)
Total internal gains													
608.02	603.05	579.23	542.44	504.74	471.20	451.82	460.89	482.27	519.29	560.30	591.34		(73)

6. Solar gains (calculation for January)

	Area & Flux	g & FF	Shading	Gains
Window - Double-glazed, argon filled, low-E, En=0.2, hard coat (East) Specified U-Value = 1.20	0.9 x 0.200 23.77	0.72 x 0.70	0.77	1.6601
Window - Double-glazed, argon filled, low-E, En=0.2, hard coat (South) Specified U-Value = 1.20	0.9 x 0.550 53.90	0.72 x 0.70	0.77	10.3539
Window - Double-glazed, argon filled, low-E, En=0.2, hard coat (West) Specified U-Value = 1.20	0.9 x 2.520 23.77	0.72 x 0.70	0.77	20.9173
Window - Double-glazed, argon filled, low-E, En=0.2, hard coat (East) Specified U-Value = 1.20	0.9 x 4.330 23.77	0.72 x 0.70	0.77	35.9413
Full glazed door - Double-glazed, argon filled, low-E, En=0.2, hard coat (West) Specified U-Value = 1.20	0.9 x 6.680 23.77	0.72 x 0.70	0.77	55.4475
Full glazed door - Double-glazed, argon filled, low-E, En=0.2, hard coat (East) Specified U-Value = 1.20	0.9 x 3.780 23.77	0.72 x 0.70	0.77	31.3760
Full glazed door - Double-glazed, argon filled, low-E, En=0.2, hard coat (South) Specified U-Value = 1.20	0.9 x 2.630 53.90	0.72 x 0.70	0.77	49.5106
Rooflight at 70° or less - Double-glazed, argon filled, low-E, En=0.2, hard coat (n/a) Velux Specified U-Value = 1.20	0.9 x 4.670 32.00	0.72 x 0.70	1.00	67.7860

SAP 2012 worksheet for - calculation of EPC Costs, Emissions And Primary Energy

7. Mean internal temperature

Temperature during heating periods in the living area, Th1 (°C) 21.00 (85)
 Heating system responsiveness 1.00

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

tau

9.46	9.53	9.59	9.72	9.70	9.79	9.77	9.75	9.72	9.64	9.62	9.55
------	------	------	------	------	------	------	------	------	------	------	------

alpha

1.63	1.64	1.64	1.65	1.65	1.65	1.65	1.65	1.65	1.64	1.64	1.64
------	------	------	------	------	------	------	------	------	------	------	------

Utilisation factor for gains for living area
 0.85 0.81 0.73 0.59 0.46 0.32 0.20 0.21 0.40 0.65 0.80 0.87 (86)

Mean internal temperature in living area T1
 17.78 18.13 18.94 19.82 20.43 20.79 20.95 20.94 20.70 19.88 18.76 17.77 (87)

Temperature during heating periods in rest of dwelling Th2
 19.65 19.66 19.67 19.68 19.68 19.69 19.69 19.69 19.68 19.68 19.67 19.66 (88)

Utilisation factor for gains for rest of dwelling
 0.84 0.79 0.70 0.55 0.40 0.25 0.11 0.11 0.32 0.60 0.77 0.85 (89)

Mean internal temperature in the rest of dwelling T2
 15.67 16.15 17.23 18.38 19.13 19.54 19.68 19.67 19.47 18.51 17.02 15.66 (90)

Living area fraction (46.23/92.46) 0.50 (91)

Mean internal temperature (for the whole dwelling)
 16.72 17.14 18.08 19.10 19.78 20.17 20.31 20.31 20.08 19.20 17.89 16.72 (92)

Apply adjustment to the mean internal temperature, where appropriate
 16.72 17.14 18.08 19.10 19.78 20.17 20.31 20.31 20.08 19.20 17.89 16.72 (93)

8. Space heating requirement

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

Utilisation factor for gains
 0.79 0.74 0.65 0.53 0.41 0.28 0.15 0.16 0.35 0.58 0.73 0.80 (94)

Useful gains
 692.49 785.70 866.24 899.91 751.49 527.45 280.02 265.55 495.26 639.91 655.36 641.15 (95)

Monthly average external temperature
 5.50 5.80 7.60 10.00 13.10 15.90 18.20 18.30 15.90 12.30 8.70 5.80 (96)

Heat loss rate for mean internal temperature
 1603.17 1608.12 1476.44 1265.29 930.92 589.02 291.88 278.10 581.77 967.04 1291.08 1544.38 (97)

Fraction of month for heating
 1.00 1.00 1.00 1.00 1.00 - - - - 1.00 1.00 1.00

Space heating requirement for each month, kWh/month
 677.55 552.67 453.99 263.08 133.49 - - - - 243.38 457.72 672.00

Total space heating requirement per year (kWh/year) (October to May) 3453.88 (98)

Space heating requirement per m² (kWh/m²/year) 37.36 (99)

8c. Space cooling requirement - not applicable

SAP 2012 worksheet for - calculation of EPC Costs, Emissions And Primary Energy

9a. Energy requirements

												kWh/year
No secondary heating system selected												
Fraction of space heat from main system(s)										1.0000		(202)
Efficiency of main heating system										92.80%		(206)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement												
677.55	552.67	453.99	263.08	133.49	-	-	-	-	243.38	457.72	672.00	(98)
Appendix Q - monthly energy saved (main heating system 1)												
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(210)
Space heating fuel (main heating system 1)												
730.12	595.54	489.21	283.49	143.85	-	-	-	-	262.26	493.23	724.14	(211)
Appendix Q - monthly energy saved (main heating system 2)												
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(212)
Space heating fuel (main heating system 2)												
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(213)
Appendix Q - monthly energy saved (secondary heating system)												
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(214)
Space heating fuel (secondary)												
0.00	0.00	0.00	0.00	0.00	-	-	-	-	0.00	0.00	0.00	(215)
Water heating												
Water heating requirement												
176.21	154.58	160.62	141.56	136.97	119.88	112.77	127.02	127.85	146.94	158.39	171.17	(64)
Efficiency of water heater										87.10		(216)
89.23	89.20	89.08	88.84	88.41	87.10	87.10	87.10	87.10	88.76	89.09	89.24	(217)
Water heating fuel												
197.48	173.31	180.31	159.35	154.92	137.63	129.47	145.84	146.79	165.54	177.78	191.81	(219)
Annual totals												kWh/year
Space heating fuel used, main system 1										3721.85		(211)
Space heating fuel (secondary)										0.00		(215)
Water heating fuel										1960.22		(219)
Electricity for pumps, fans and electric keep-hot												
central heating pump										30.00		(230c)
boiler with a fan-assisted flue										45.00		(230e)
Total electricity for the above, kWh/year										75.00		(231)
Electricity for lighting (100.00% fixed LEL)										409.43		(232)
Energy saving/generation technologies												
Appendix Q -												
Energy saved or generated ():										0.000		(236a)
Energy used ():										0.000		(237a)
Total delivered energy for all uses										6166.50		(238)

SAP 2012 worksheet for - calculation of EPC Costs, Emissions And Primary Energy

10a. Fuel costs using PCDF prices (rev 367)

	kWh/year	Fuel price p/kWh	£/year	
Space heating - main system 1	3721.853	4.040	150.36	(240)
Space heating - main system 2	0.000	0.000	0.00	(241)
Water heating				
Water heating cost	1960.22	4.040	79.19	(247)
Mech vent fans cost	0.000	14.460	0.00	(249)
Pump/fan energy cost	75.000	14.460	10.85	(249)
Energy for lighting	409.426	14.460	59.20	(250)
Additional standing charges			113.00	(251)
Electricity generated - PVs	0.000	0.000	0.00	(252)
Appendix Q -				
Energy saved or generated ():	0.000	-1.000	0.00	(253)
Energy used ():	0.000	-1.000	0.00	(254)
Total energy cost			412.60	(255)

12a. Carbon dioxide emissions

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating, main system 1	3721.85	0.216	803.92	(261)
Space heating, main system 2	0.00	0.000	0.00	(262)
Space heating, secondary	0.00	0.519	0.00	(263)
Water heating	1960.22	0.216	423.41	(264)
Space and water heating			1227.33	(265)
Electricity for pumps and fans	75.00	0.519	38.93	(267)
Electricity for lighting	409.43	0.519	212.49	(268)
Electricity generated - PVs	0.00	0.519	0.00	(269)
Electricity generated - µCHP	0.00	0.000	0.00	(269)
Appendix Q -				
Energy saved ():	0.00	0.000	0.00	(270)
Energy used ():	0.00	0.000	0.00	(271)
Total CO2, kg/year			1478.75	(272)

SAP 2012 worksheet for - calculation of EPC Costs, Emissions And Primary Energy

13a. Primary energy

	Energy kWh/year	Primary factor	P. Energy (kWh/year)	
Space heating, main	3721.85	1.220	4540.66	(261)
Space heating, main system 2	0.00	0.000	0.00	(262)
Space heating, secondary	0.00	3.070	0.00	(263)
Water heating	1960.22	1.220	2391.47	(264)
Space and water heating			6932.14	(265)
Electricity for pumps/fans	75.00	3.070	230.25	(267)
Electricity for lighting	409.43	3.070	1256.94	(268)
Electricity generated - PV	0.00	3.070	0.00	(269)
Electricity generated - µCHP	0.00	0.000	0.00	(269)
Electricity generated - wind	0.00	3.070	0.00	(269)
New energy-saving technology :				
Energy saved ():	0.00	0.000	0.00	(270)
Energy used ():	0.00	0.000	0.00	(271)
Primary energy kWh/year			8419.32	(272)
Primary energy kWh/m²/year			91.06	(273)

Project Information

Building type Detached house

Reference J5067-2

Date 7 October 2019

Client	DCM Architectural Consultants Ltd	Project	Unit 2
	25 Pigeon Lane		66 Borstal Hill
	Herne Bay		Whitstable
	Kent		Kent
	CT6 7EH		CT5 4NB

SAP 2012 worksheet for New dwelling as designed - calculation of energy ratings for improved dwelling**1. Overall dwelling dimensions**

	Area (m²)	Av. Storey height (m)	Volume (m³)	
Ground floor (1)	46.23	2.31	106.79	(3a)
First floor	46.23	2.50	115.57	(3b)
Total floor area	92.46			(4)
Dwelling volume (m ³)			222.37	(5)

2. Ventilation rate

	main + secondary + other heating		m ³ per hour										
Number of chimneys	0 + 0 + 0	x 40	0.00	(6a)									
Number of open flues	0 + 0 + 0	x 20	0.00	(6b)									
Number of intermittent fans	4	x 10	40.00	(7a)									
Number of passive vents	0	x 10	0.00	(7b)									
Number of flueless gas fires	0	x 40	0.00	(7c)									
			Air changes per hour										
Infiltration due to chimneys, fans and flues			0.18	(8)									
Pressure test, result q50	5.00			(17)									
Air permeability			0.43	(18)									
Number of sides on which sheltered			2.00	(19)									
Shelter factor			0.85	(20)									
Infiltration rate incorporating shelter factor			0.37	(21)									
Infiltration rate modified for monthly wind speed													
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
5.10	5.00	4.90	4.40	4.30	3.80	3.80	3.70	4.00	4.30	4.50	4.70		
												52.50	(22)
Wind Factor													
1.27	1.25	1.23	1.10	1.07	0.95	0.95	0.93	1.00	1.07	1.13	1.18		
												13.13	(22a)
Adjusted infiltration rate (allowing for shelter and wind speed)													
0.47	0.46	0.45	0.40	0.39	0.35	0.35	0.34	0.37	0.39	0.41	0.43		
												4.80	(22b)
Ventilation : natural ventilation, intermittent extract fans													
Effective air change rate													
0.61	0.60	0.60	0.58	0.58	0.56	0.56	0.56	0.57	0.58	0.58	0.59	(25)	

SAP 2012 worksheet for New dwelling as designed - calculation of energy ratings for improved dwelling

3. Heat losses and heat loss parameter

Element	Gross area, m ²	Openings m ²	Net area A, m ²	U-value W/m ² K	A x U W/K	kappa-value kJ/m ² K	A x K kJ/K	
Window - Double-glazed, argon filled, low-E, En=0.2, hard coat (East) Specified U-Value = 1.20			0.200	1.15 (1.20)	0.23			(27)
Window - Double-glazed, argon filled, low-E, En=0.2, hard coat (South) Specified U-Value = 1.20			0.550	1.15 (1.20)	0.63			(27)
Window - Double-glazed, argon filled, low-E, En=0.2, hard coat (West) Specified U-Value = 1.20			2.520	1.15 (1.20)	2.89			(27)
Window - Double-glazed, argon filled, low-E, En=0.2, hard coat (East) Specified U-Value = 1.20			4.330	1.15 (1.20)	4.96			(27)
Full glazed door - Double-glazed, argon filled, low-E, En=0.2, hard coat (West) Specified U-Value = 1.20			6.680	1.20	8.02			(26)
Full glazed door - Double-glazed, argon filled, low-E, En=0.2, hard coat (East) Specified U-Value = 1.20			3.780	1.20	4.54			(26)
Full glazed door - Double-glazed, argon filled, low-E, En=0.2, hard coat (South) Specified U-Value = 1.20			2.630	1.20	3.16			(26)
Rooflight at 70° or less - Double-glazed, argon filled, low-E, En=0.2, hard coat (n/a) Velux Specified U-Value = 1.20			4.670	1.15 (1.20)	5.35			(27)
Walls Dormer Cheeks - Weatherboard/Battens/9 OSB/51 Cavity/140 Timber Frame Insulated With 120 Celotex XR4000 Between Studs/12.5 P'bd			4.15	0.21	0.87	9.00	37.35	(29)
Walls Brick or (Weatherboard/Battens/100 Medium Dense Block)/51 Cavity/140 Timber Frame Insulated With 120 Celotex XR4000 Between Studs/12.5 P'bd			96.74	0.20	19.35	9.00	870.66	(29)
Ground floors Beam/Medium Dense Block/150 Kingspan TF70/Screed			46.23	0.12	5.55	75.00	3467.25	(28)

SAP 2012 worksheet for New dwelling as designed - calculation of energy ratings for improved dwelling

3. Heat losses and heat loss parameter

Element	Gross area, m ²	Openings m ²	Net area A, m ²	U-value W/m ² K	A x U W/K	kappa-value kJ/m ² K	A x K kJ/K						
Flat roofs			3.36	0.15	0.50	9.00	30.24	(30)					
150 Kingspan TR27 Over Joists													
Pitched roofs insulated between rafters			51.06	0.12	6.13	9.00	459.54	(30)					
150 Kingspan K7 Between Rafters/52.5 Kingspan K118 Under Rafters With Breather Membrane													
Total area of external elements Sigma A, m ²							226.90	(31)					
Fabric heat loss, W/K							62.16	(33)					
Heat capacity							4865.04	(34)					
Thermal mass parameter, kJ/m ² K							52.62	(35)					
Effect of thermal bridges							34.04	(36)					
Total fabric heat loss							96.19	(37)					
Ventilation heat loss calculated monthly													
	44.65	44.34	44.04	42.62	42.35	41.11	41.11	40.88	41.59	42.35	42.89	43.45	(38)
Heat transfer coefficient, W/K													
	140.85	140.54	140.23	138.81	138.54	137.30	137.30	137.07	137.78	138.54	139.08	139.64	138.81 (39)
Heat loss parameter (HLP), W/m ² K													
	1.52	1.52	1.52	1.50	1.50	1.48	1.48	1.48	1.49	1.50	1.50	1.51	
HLP (average)													1.50 (40)
Number of days in month (Table 1a)													
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
31	28	31	30	31	30	31	31	30	31	30	31		

SAP 2012 worksheet for New dwelling as designed - calculation of energy ratings for improved dwelling

4. Water heating energy requirements

kWh/year

Assumed occupancy, N 2.66 (42)
 Annual average hot water usage in litres per day Vd,average 97.33 (43)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

Hot water usage in litres per day for each month

107.06	103.17	99.27	95.38	91.49	87.59	87.59	91.49	95.38	99.27	103.17	107.06
--------	--------	-------	-------	-------	-------	-------	-------	-------	-------	--------	--------

(44)

Energy content of hot water used

158.76	138.86	143.29	124.92	119.86	103.43	95.85	109.99	111.30	129.71	141.59	153.75
--------	--------	--------	--------	--------	--------	-------	--------	--------	--------	--------	--------

Energy content (annual) 1531.31 (45)

Distribution loss

23.81	20.83	21.49	18.74	17.98	15.52	14.38	16.50	16.69	19.46	21.24	23.06
-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------

(46)

store loss determined from EN 13203-2 tests, taken from boiler data record

Hot water storage volume (litres) 0.00 (50)

Hot water cylinder loss factor (kWh/day) 0.0000 (51)

Volume factor 0.0000 (52)

Temperature factor 0.0000 (53)

Energy lost from store (kWh/day) 0.00 (55)

Total storage loss

0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
------	------	------	------	------	------	------	------	------	------	------	------

(56)

Net storage loss

0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
------	------	------	------	------	------	------	------	------	------	------	------

(57)

Primary loss factor

1.00	1.00	0.94	0.70	0.45	0.44	0.44	0.48	0.76	0.94	1.00	1.00
------	------	------	------	------	------	------	------	------	------	------	------

Primary loss

0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
------	------	------	------	------	------	------	------	------	------	------	------

(59)

Combi loss calculated for each month

17.45	15.73	17.33	16.64	17.10	16.44	16.92	17.04	16.55	17.24	16.80	17.41
-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------

(61)

Total heat required for water heating calculated for each month

176.21	154.58	160.62	141.56	136.97	119.88	112.77	127.02	127.85	146.94	158.39	171.17
--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------

(62)

- Aperture area of solar panel 3.0000 (H1)
- Collector zero-loss efficiency 0.7000 (H2)
- Collector heat loss coefficient 1.8000 (H3)
- Collector 2nd order heat loss coefficient 0.0050 (H3a)
- Collector effective heat loss coefficient 1.8063 (H3b)
- Collector performance ratio 2.5804 (H4)
- Annual solar radiation per m² 1079.5246 (H5)
- Overshading factor 0.8000 (H6)
- Solar energy available 1813.6014 (H7)
- Adjustment factor for showers 1.0000 (H7a)
- Solar/load ratio 1.1843 (H8)
- Solar utilisation factor 0.5702 (H9)
- Collector performance factor 0.8793 (H10)
- Dedicated solar storage volume 75.0000 (H11)
- Effective solar volume 75.0000 (H13)
- Daily hot water demand 97.3255 (H14)
- Volume ratio Veff/V 0.7706 (H15)
- Veff/V factor 0.9479 (H16)
- Solar input -861.8464 (H17)

Solar DHW input

-24.99	-41.70	-71.03	-95.19	-117.60	-115.62	-114.09	-99.68	-78.07	-53.31	-29.64	-20.91
--------	--------	--------	--------	---------	---------	---------	--------	--------	--------	--------	--------

(63)

Output from water heater for each month, kWh/month

151.22	112.88	89.59	46.37	19.37	4.26	0.00	27.34	49.78	93.63	128.74	150.25
--------	--------	-------	-------	-------	------	------	-------	-------	-------	--------	--------

(64)

Heat gains from water heating, kWh/month 873.43 (64)

Heat gains from water heating, kWh/month

57.15	56.10	51.98	45.70	44.13	38.59	36.10	40.83	41.14	47.14	51.28	55.48
-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------

(65)

SAP 2012 worksheet for New dwelling as designed - calculation of energy ratings for improved dwelling

5. Internal gains

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Metabolic gains, Watts													
159.48	159.48	159.48	159.48	159.48	159.48	159.48	159.48	159.48	159.48	159.48	159.48	159.48	(66)
Lighting gains													
57.96	51.48	41.86	31.69	23.69	20.00	21.61	28.09	37.71	47.88	55.88	59.57		(67)
Appliances gains													
363.48	367.25	357.75	337.51	311.97	287.96	271.93	268.15	277.66	297.89	323.44	347.44		(68)
Cooking gains													
53.61	53.61	53.61	53.61	53.61	53.61	53.61	53.61	53.61	53.61	53.61	53.61	53.61	(69)
Pumps and fans gains													
3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	(70)
Losses e.g. evaporation (negative values)													
-106.32	-106.32	-106.32	-106.32	-106.32	-106.32	-106.32	-106.32	-106.32	-106.32	-106.32	-106.32	-106.32	(71)
Water heating gains													
76.82	74.56	69.86	63.47	59.32	53.48	48.52	54.88	57.15	63.76	71.22	74.56		(72)
Total internal gains													
608.02	603.05	579.23	542.44	504.74	471.20	451.82	460.89	482.27	519.29	560.30	591.34		(73)