Building type Detached house

Reference J5067-3

Date 7 October 2019

Client DCM Architectural Consultants Ltd Project Unit 3

25 Pigeon Lane 66 Borstal Hill
Herne Bay Whitstable
Kent Kent
CT67EH CT54NB

#### Code for Sustainable Homes

Assessor Name: Mark Attlesey
Assessor No.: ECMK300581

Ene 1: Dwelling Emission Rating

TER: 18.80
DER: 18.50
% improvement: 1.6%
Credits: 0
Level: n/a

Ene 2: Fabric Energy Efficiency

Dwelling Type: Detached house

FEE: 57.1 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: No

reduction in OOZ cirilosions as a result.	11/4				
	Standar	rd case	Actual	case	
	kWh/m²/year	kg/m²/year	kWh/m²/year	kg/m²/year	
DER		21.4644		18.4981	(ZC1)
CO2 emissions from appliances		15.6080		15.6080	(ZC2)
CO2 emissions from cooking		1.9770		1.9770	(ZC3)
Total CO2 emissions		39.0494		36.0830	(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		39.0494		36.0830	(ZC8)

Reduction in emissions = 100 x (1 - (ZC8actual / ZC8standard))

 $= 100 \times (1 - (36.0830 / 39.0494))$ 

= 0%

0

Credits

Building type Detached house

Reference J5067-3

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Client DCM Architectural Consultants Ltd Project Unit 3

25 Pigeon Lane 66 Borstal Hill
Herne Bay Whitstable
Kent Kent
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# SAP 2012 worksheet for New dwelling as designed - calculation of energy ratings

#### 1. Overall dwelling dimensions

	Area	Av. Storey	Volume	
	(m²)	height (m)	(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 (m³)			222.37	(5)

#### 2. Ventilation rate

											m³ per ho	our
							main + s	eondar	y + othe	r		
Numbe	or of object	0010					heating $0 + 0 + 0$	,	x 40		0.00	(60)
	er of chim er of oper						0 + 0 + 0 0 + 0 + 0		x 40 x 20		0.00 0.00	(6a)
	er of oper er of inter						4		x ∠0 x 10		40.00	(6b)
	er of pass		-				0		x 10 x 10		0.00	(7a)
	er of fluel						0		x 10 x 40		0.00	(7b) (7c)
Numbe	ei oi iiuei	ess yas ı	iies				U	•	X 40		0.00	(70)
											Air chang	jes per hour
Infiltrat	tion due t	o chimne	eys, fans	and flues	3						0.18	(8)
Pressu	ire test, r	esult q50	)						5.00			(17)
Air per	meability	,									0.43	(18)
Numbe	er of side	s on whic	ch shelte	red							2.00	(19)
Shelte	rfactor										0.85	(20)
Infiltrat	tion rate i	ncorpora	iting shel	ter factor							0.37	(21)
Infiltrat	tion rate r	nodified <sup>1</sup>	for mont	hly wind s	peed							
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 F	actor											
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)
Adjuste	ed infiltra	tion rate	(allowing	g for shelt	er and w	ind spee	ed)					
0.47	0.46	0.45	0.40	0.39	0.35	0.35	0.34	0.37	0.39	0.41	0.43	
					1						4.80	(22b)
				ntermitter	nt extrac	t fans						
Effectiv	ve air cha	inge 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)

	es and heat lo	•						
Element	Gross	Openings	Netarea	U-value	AxU	kappa-valu		
	area, m²	m²	A, m²	W/m²K	W/K	kJ/m²K	kJ/K	
Window - Dou	•		0.200	1.15 (1.20)	0.23			(27)
argon filled, le	ow-E, En=0.2,							
hard coat (Ea	,							
Specified U	I-Value = 1.20							
Window - Dou	uble-glazed,		2.520	1.15 (1.20)	2.89			(27)
argon filled, le	ow-E, En=0.2,							
hard coat (W	est)							
Specified U	I-Value = 1.20							
Window - Dou	uble-glazed,		4.330	1.15 (1.20)	4.96			(27)
argon filled, le	ow-E, En=0.2,							
hard coat (Ea	ast)							
Specified U	I-Value = 1.20							
Window - Dou	uble-glazed,		0.550	1.15 (1.20)	0.63			(27)
argon filled, le	ow-E, En=0.2,							
hard coat (No	orth)							
Specified U	I-Value = 1.20							
Full glazed de	oor -		6.680	1.20	8.02			(26)
Double-glaze	ed, argon filled,							
low-E, En=0.	2, hard coat							
(West)								
Specified U	I-Value = 1.20							
Full glazed de	oor -		3.780	1.20	4.54			(26)
Double-glaze	ed, argon filled,							
low-E, En=0.	2, hard coat							
(East)								
Specified U	I-Value = 1.20							
Full glazed de	oor -		2.630	1.20	3.16			(26)
Double-glaze	ed, argon filled,							
low-E, En=0.	2, hard coat							
(North)								
Specified U	I-Value = 1.20							
Rooflight at 7	'0° or less -		4.670	1.15 (1.20)	5.35			(27)
-	ed, argon filled,			. ,				. ,
low-E, En=0.	•							
(n/a)								
, ,	ified U-Value =	1.20						
Walls			4.15	0.21	0.87	9.00	37.35	(29)
<b>D</b> 0:								` '

Beam/Medium Dense Block/150 Kingspan TF70/Screed

46.23

96.74

JPA Designer Version 6.03x , SAP Version 9.92

Licensed to Thermcalc Limited

Dormer Cheeks -

Studs/12.5 P'bd

Walls

P'bd Ground floors

Weatherboard/Battens/9 OSB/51 Cavity/140 Timber Frame Insulated With 120 Celotex XR4000 Between

Brick or (Weatherboard/Battens/100 Medium Dense Block)/51 Cavity/140 Timber Frame Insulated With 120 Celotex XR4000 Between Studs/12.5

Page 4 of 84

0.20

0.12

19.35

5.55

9.00

75.00

870.66

3467.25

(29)

(28)

C:\Users\marka\Dropbox\OneDrive\THERMCALCLIMITEDFOLDER\SAPCALCULATIONS\Jobs J4701 - J5200\J5067-3. JDP J5067-3

Approval of JPA Designer by BRE applies only to the software, data is not subject to quality control procedures, users are themselves responsible for the accuracy of the data. The results of the calculation should not be accepted without first checking the input data.

3. Heat	losses a	and heat	loss pa	rameter	•								
Element		Gross	•	enings	Netare		/alue	A x U		appa-valu			
		area, m <sup>2</sup>	m <sup>2</sup>		A, m²		m²K	W/K	k	J/m²K	kJ/K		
Flat roof	s				3.36	6	0.15	0.5	0	9.00	30.24	(:	(30)
150 Ki	ngspan T	R27 Ove	er Joists										
Pitched	roofs ins	ulated be	etween ra	afters	51.06	6	0.12	6.1	3	9.00	459.54	· (:	(30)
150 Ki	ngspan k	<7 Between	en										
Rafter	s/52.5 Ki	ngspan k	(118 Und	der									
Rafter	s With Br	eather M	embrane	Э									
Total an		مامامه	t C:	a A	?						220	20 (	24\
	ea of exte		ments Si	gma A, r	[] <del>^</del>						226.9 62.1	•	(31)
	eat loss,	VV/N									4865.0	•	(33)
Heat ca	pacity I mass pa	romotor	k 1/m2k/								4003.0 52.6	,	(34) (35)
	thermal		, KJ/111-K								34.0	,	36)
	oric heat	-									96.1		37)
	on heat l		ulated m	onthly							30.1	15 (.	31)
		,			14444	44.44	40.00	14.50	40.05	40.00	10.45		'OO'
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 tra	nsfer coe	efficient,	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		
											138.8	31 (	(39)
Heat los	s param	eter (HLF	P), W/m²	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 (ave	erage)			-					-		1.5	50 (4	40)
Number	of days i	n month	(Table 1	a)									
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 Assumed occupancy, N Annual average hot water usage in litres per day Vd,average	<b>kWh/year</b> 2.66 97.33	(42) (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) Distribution loss	1531.31	(45)
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) Hot water cylinder loss factor (kWh/day) Volume factor Temperature factor Energy lost from store (kWh/day)	0.00 0.0000 0.0000 0.0000 0.000	(50) (51) (52) (53) (55)
Total storage loss	0.00	(EC)
0.00         0.00         0.00         0.00         0.00         0.00         0.00         0.00         0.00         0.00         0.00         0.00         0.00         0.00         0.00         0.00         0.00         0.00         0.00         0.00         0.00         0.00         0.00         0.00         0.00         0.00         0.00         0.00         0.00         0.00         0.00         0.00         0.00         0.00         0.00         0.00         0.00         0.00         0.00         0.00         0.00         0.00         0.00         0.00         0.00         0.00         0.00         0.00         0.00         0.00         0.00         0.00         0.00         0.00         0.00         0.00         0.00         0.00         0.00         0.00         0.00         0.00         0.00         0.00         0.00         0.00         0.00         0.00         0.00         0.00         0.00         0.00         0.00         0.00         0.00         0.00         0.00         0.00         0.00         0.00         0.00         0.00         0.00         0.00         0.00         0.00         0.00         0.00         0.00         0.00         0.00         0.00 <td< td=""><td>0.00</td><td>(56)</td></td<>	0.00	(56)
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	(37)
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	(00)
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	17.71	(01)
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		(32)
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)
1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5	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)

#### 5. Internal gains

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Metabol	ic 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
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
Appliand	ces 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
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
Pumps a	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
Losses	e.g. evap	oration (r	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
Water he	eating ga	ins									
76.82	74.56	69.86	63.47	59.32	53.48	48.52	54.88	57.15	63.76	71.22	74.56
Total inte	ernal gaiı	าร									
608.02	603.05	579.23	542.44	504.74	471.20	451.82	460.89	482.27	519.29	560.30	591.34

# 6. Solar gains (calculation for January)

	Area & Flux	g & FF	Shading	Gains
Window - Double-glazed, argon filled, low-E,	0.9 x 0.200 19.64	0.72 x 0.70	0.77	1.3720
En=0.2, hard coat (East)				
Specified U-Value = 1.20				
Window - Double-glazed, argon filled, low-E,	0.9 x 2.520 19.64	0.72 x 0.70	0.77	17.2867
En=0.2, hard coat (West)				
Specified U-Value = 1.20				
Window - Double-glazed, argon filled, low-E,	0.9 x 4.330 19.64	0.72 x 0.70	0.77	29.7029
En=0.2, hard coat (East)				
Specified U-Value = 1.20				
Window - Double-glazed, argon filled, low-E,	0.9 x 0.550 10.63	0.72 x 0.70	0.77	2.0427
En=0.2, hard coat (North)				
Specified U-Value = 1.20				
Full glazed door - Double-glazed, argon filled,	0.9 x 6.680 19.64	0.72 x 0.70	0.77	45.8234
low-E, En=0.2, hard coat (West)				
Specified U-Value = 1.20				
Full glazed door - Double-glazed, argon filled,	0.9 x 3.780 19.64	0.72 x 0.70	0.77	25.9300
low-E, En=0.2, hard coat (East)				
Specified U-Value = 1.20				
Full glazed door - Double-glazed, argon filled,	0.9 x 2.630 10.63	0.72 x 0.70	0.77	9.7677
low-E, En=0.2, hard coat (North)				
Specified U-Value = 1.20				
Rooflight at 70° or less - Double-glazed,	0.9 x 4.670 26.00	0.72 x 0.70	1.00	55.0761
argon filled, low-E, En=0.2, hard coat (n/a)				
Velux Specified U-Value = 1.20				

ı ı <del>c</del> alıılç	g system i	esponsiv	veness								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
Utilisati	on factor	for gains	for living	area							
0.88	0.84	0.77	0.66	0.54	0.42	0.33	0.37	0.54	0.74	0.85	0.89
Mean ir	nternal tei	nperatur	e in living	garea T1							
17.33	17.78	18.54	19.43	20.14	20.61	20.82	20.77	20.35	19.36	18.18	17.24
Tempe	rature du	ring heat	ing perio	ds in rest	of dwelli	ng 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
Utilisati	on factor	for gains	for rest	of dwellir	ng						
0.87	0.82	0.74	0.62	0.49	0.35	0.24	0.28	0.48	0.70	0.83	0.88
Mean ir	nternal te	mperatui	e in the r	est of dw	elling T2	2					
15.05	15.67	16.69	17.88	18.79	19.36	19.58	19.55	19.09	17.84	16.23	14.92
	rea fracti										0.50
Mean ir	nternal ter	mperatur		whole d	welling)						
16.19	16.73	17.61	18.66	19.47	19.99	20.20	20.16	19.72	18.60	17.20	16.08
Apply a	djustmer	it to the n	nean inte	rnal tem	perature	, where a	ppropria	ite			
16.19	16.73	17.61	18.66	19.47	19.99	20.20	20.16	19.72	18.60	17.20	16.08
8. Spac	ce heatin	a reauii	rement								
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	on factor		•		1		<u> </u>	1			
0.82	0.77	0.70	0.59	0.48	0.37	0.28	0.31	0.48	0.67	0.78	0.83
Useful (					1				1		
	752.69	843.06	881.78	809.34	620.50	443.74	450.66	584.59	641.78	621.33	619.63
	/average								1 2		
4.30	4.90	6.50	8.90	11.70	14.60	16.60	16.40	14.10	10.60	7.10	4.20
	ss rate fo		JL						1		
	3 1662.13					494.48	515.19	774.83	1108 7	1405 29	1658.86
	n of mont		JL	1	1 . 00.00	10 11 10	3.3.10	1	1.30.7		1 .000.00
	1.00	1.00	1.00	1.00	1-	-	-	1-	1.00	1.00	1.00
1.00		∥∪	1.00	∥ 1.55	I			I.			1.50
1.00 Space l		guireme	nt for ea	ch month	i. kWh/m	onth					·
Space I	neating re			ch month	n, kWh/m	onth	-	I-	347.40	564.45	773.18

# 8c. Space cooling requirement - not applicable

Space heating requirement per m<sup>2</sup> (kWh/m<sup>2</sup>/year)

44.64

(99)

# 9a. Energy requirements

I	kWh/year	
No secondary heating system selected  Fraction of space heat from main system(s)  Efficiency of main heating system  1.0000  92.80%		(202) (206)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov D	ec ec	
Space heating requirement		
760.65 611.14 532.35 340.21 198.30 347.40 564.45 77	73.18	(98)
Appendix Q - monthly energy saved (main heating system 1)		
0.00 0.00 0.00 0.00 0.00 0.00 0	.00	(210)
Space heating fuel (main heating system 1)		
819.67   658.56   573.66   366.60   213.69   -   -   -   -   374.35   608.24   83	33.17	(211)
Appendix Q - monthly energy saved (main heating system 2)		
0.00 0.00 0.00 0.00 0.00 0.00 0	.00	(212)
Space heating fuel (main heating system 2)		
	.00	(213)
Appendix Q - monthly energy saved (secondary heating system)		
	.00	(214)
Space heating fuel (secondary)		
	.00	(215)
Water heating Water heating		
Water heating requirement	74.47	(C4)
	71.17	(64)
Efficiency of water heater	87.10	(216)
	9.30	(217)
Water heating fuel	04.00	(210)
197.37   173.22   180.15   159.08   154.46   137.63   129.47   145.84   146.79   165.14   177.57   19	91.68	(219)
	kWh/year	
	4447.93	(211)
Space heating fuel (secondary) Water heating fuel	0.00 1958.39	(215) (219)
Electricity for pumps, fans and electric keep-hot	1000.00	(210)
central heating pump	30.00	(230c)
boiler with a fan-assisted flue	45.00	(230e)
Total electricity for the above, kWh/year Electricity for lighting (100.00% fixed LEL)	75.00 409.43	(231) (232)
Energy saving/generation technologies	403.43	(232)
Appendix Q -		
Energy saved or generated ():	0.000	(236a)
Energy used ():	0.000	(237a)
Total delivered energy for all uses	6890.75	(238)

#### 10a. Fuel costs using Table 12 prices

,	kWh/year	Fuel price p/kWh	£/year	
Space heating - main system 1	4447.933	3.480	154.79	(240)
Space heating - main system 2	0.000	0.000	0.00	(241)
Waterheating				
Water heating cost	1958.39	3.480	68.15	(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			406.84	(255)
11a. SAP rating				
Energy cost deflator			0.42	(256)
Energy cost factor (ECF)			1.24	(257)
SAPvalue			82.66	
SAP rating			83	(258)
SAP band			В	

#### 12a. Carbon dioxide emissions

	Energy	<b>Emission factor</b>	<b>Emission</b>	S
	kWh/year	kg CO2/kWh	kg CO2/y	ear
Space heating, main system 1	4447.93	0.216	960.75	(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	1958.39	0.216	423.01	(264)
Space and water heating			1383.77	(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			1635.18	(272)
			kg/m²/yea	ır
CO2 emissions per m <sup>2</sup>			17.69	(273)
El value			84.06	(273a)
El rating			84	(274)
El band			В	

# Calculation of stars for heating and DHW

Main heating energy efficiency
Main heating environmental impact
Water heating energy efficiency
Water heating environmental impact

 $(3.48 / 0.8980) \times (1 + (0.29 \times 0.00)) = 3.8753$ , stars = 4  $(0.2160 / 0.8980) \times (1 + (0.29 \times 0.00)) = 0.2405$ , stars = 4 3.48 / 0.8843 = 3.9351, stars = 4 0.2160 / 0.8843 = 0.2442, stars = 4

Page 10 of 84

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Building type Detached house

Reference J5067-3

Date 7 October 2019

Client DCM Architectural Consultants Ltd Project Unit 3

25 Pigeon Lane 66 Borstal Hill
Herne Bay Whitstable
Kent Kent
CT6 7EH CT5 4NB

# SAP 2012 worksheet for notional dwelling - calculation of target emissions

#### 1. Overall dwelling dimensions

	Area	Av. Storey	Volume	
	(m²)	height (m)	(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 (m³)			222.37	(5)

#### 2. Ventilation rate

											m³ per ho	our
							main + s heating	eondar	y + othe	r		
Numbe	er of chim	nevs					0 + 0 + 0	,	x 40		0.00	(6a)
	er of oper						0 + 0 + 0		x 20		0.00	(6b)
	er of inter		ans				3		x 10		30.00	(7a)
	er of pass		_				0		x 10		0.00	(7b)
	er of fluel						0		x 40		0.00	(7c)
											Air chanc	jes per hour
Infiltrat	ion due t	o chimne	eys, fans	and flues	3						0.13	(8)
Pressu	ıre test, r	esult q50	)						5.00			(17)
Air per	meability										0.38	(18)
Numbe	er of side	s on whic	ch shelte	red							2.00	(19)
Shelte	Shelterfactor										0.85	(20)
Infiltration rate incorporating shelter factor											0.33	(21)
Infiltrat	tion rate r	nodified <sup>1</sup>	for montl	nly wind s	peed							
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	
Wind F	actor										52.50	(22)
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)
Adjuste	ed infiltra	tion rate	(allowing	g for shelt	er and w	ind spee	ed)					
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)
	ition : nat ve air cha			ntermitter	nt extrac	t fans						
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)
	л			л			л					

3. Heat losses and heat loss parameter Gross Openings		Hayalua	AxU	
Element Gross Openings area, m <sup>2</sup> m <sup>2</sup>	Netarea A, m²	U-value W/m²K	W/K	
Window - Double-glazed,	2.300	1.33 (1.40)	3.05	(27)
air-filled, low-E, En=0.1, soft	2.300	1.33 (1.40)	3.03	(21)
coat (West)				
Specified U-Value = 1.20				
Window - Double-glazed,	3.950	1.33 (1.40)	5.24	(27)
air-filled, low-E, En=0.1, soft	0.000	1100 (11-10)	0.2 .	( /
coat (East)				
Specified U-Value = 1.20				
Window - Double-glazed,	0.500	1.33 (1.40)	0.66	(27)
air-filled, low-E, En=0.1, soft		, ,		` ,
coat (North)				
Specified U-Value = 1.20				
Window - Double-glazed,	0.180	1.33 (1.40)	0.24	(27)
air-filled, low-E, En=0.1, soft				
coat (East)				
Specified U-Value = 1.20				
Full glazed door -	6.090	1.40	8.53	(26)
Double-glazed, air-filled,				
low-E, En=0.1, soft coat				
(West)				
Specified U-Value = 1.20				
Full glazed door -	3.450	1.40	4.83	(26)
Double-glazed, air-filled,				
low-E, En=0.1, soft coat				
(East)				
Specified U-Value = 1.20 Full glazed door -	2.400	1.40	3.36	(26)
Double-glazed, air-filled,	2.400	1.40	3.30	(20)
low-E, En=0.1, soft coat				
(North)				
Specified U-Value = 1.20				
Rooflight at 70° or less -	4.260	1.59 (1.70)	6.78	(27)
Double-glazed, air-filled,	55		00	( /
low-E, En=0.1, soft coat				
(n/a)				
Velux Specified U-Value = 1.20				
Walls	98.54	0.18	17.74	(29)
Brick or (Weatherboard/Battens/100				
Medium Dense Block)/51 Cavity/140				
Timber Frame Insulated With 120				
Celotex XR4000 Between Studs/12.5				
P'bd				(= =\
Walls	4.17	0.18	0.75	(29)
Dormer Cheeks -				
Weatherboard/Battens/9 OSB/51				
Cavity/140 Timber Frame Insulated With 120 Celotex XR4000 Between				
Studs/12.5 P'bd				
Ground floors	46.23	0.13	6.01	(28)
Beam/Medium Dense Block/150	70.20	0.10	0.01	(20)
Kingspan TF70/Screed				
955	_	40 404		

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Page 13 of 84

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3. Heat losses and heat loss parameter												
Element		Gross	Ope	enings	Netare	a U-\	/alue	AxU				
		area, m²	m <sup>2</sup>		A, m²	W/	m²K	W/K				
Flat roof	s				3.36	6	0.13	0.4	<b>!</b> 4			(30)
150 Kii	ngspan T	R27 Ove	er Joists									
Pitched	roofs ins	ulated be	etween ra	afters	51.47	7	0.13	6.6	69			(30)
150 Ki	ngspan k	<7 Between	en									
Rafters	s/52.5 Ki	ngspan k	<118 Und	der								
Rafters With Breather Membrane												
Total area of external elements Sigma A, m <sup>2</sup> 226.90 (31)												
	eat loss,			giria / t, i							64.	, ,
	l mass pa		. kJ/m²K	(user-sp	ecified T	MP)					250.0	- ()
	thermal		,	(		,					11.	, ,
	oric heat	_									75.0	, ,
Ventilati	on heat l	oss calc	ulated m	onthly								, ,
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 tra	nsfer coe	efficient,	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 los	s param	eter (HLF	<sup>2</sup> ), W/m <sup>2</sup>	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	
HLP (ave	0 /										1.3	27 (40)
Number	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 Assumed occupancy, N Annual average hot water usage in litres per day Vd, average 9												(42) (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	97.33 Dec	(43)
	er usage		•		J	Juli	Aug	Госр	000	1400	DCC	
107.06			95.38	91.49	87.59	87.59	91.49	95.38	99.27	103.17	107.06	(44)
	content c			[011.0	07.00	07.00	01110	00.00	00.27	100111	107.00	( /
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)	
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 cylinder loss factor (kWh/day)  Volume factor  Temperature factor  0.0000  (5) 0.0000  (5) 0.0000  (5) 0.0000  (5)											(50) (51) (52) (53) (55)	
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 stor	age loss	JI.	J.		Л	J	IL		J.			
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 lo	oss calcu	ılated for	each mo	onth								
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 he	at require	ed for wa	ter heati	ng calcul	ated for	each mo	nth					
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)
	rom wate				kWh/mor	· ·						
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)
Heat gains from water heating, kWh/month											(64)	
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)

# 5. Internal gains

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Metabol	ic 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
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
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
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
Pumps a	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
Losses	e.g. evap	oration (r	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
Water he	eating ga	ins									
88.08	85.83	81.03	74.02	69.23	62.77	57.83	64.82	67.73	74.97	82.51	85.84
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

# 6. Solar gains (calculation for January)

o. Colar gams (calculation for bandary)	Area & Flux	g & FF	Shading	Gains
Window - Double-glazed, air-filled, low-E,	0.9 x 2.300 19.64	•	0.77	13.8053
En=0.1, soft coat (West)				
Specified U-Value = 1.20	0.0 0.050.40.04	0.00 0.70	0.77	00.7000
Window - Double-glazed, air-filled, low-E,	0.9 x 3.950 19.64	0.63 x 0.70	0.77	23.7092
En=0.1, soft coat (East)				
Specified U-Value = 1.20	0.0 v.0 500 10 62	0.63 x 0.70	0.77	1 6240
Window - Double-glazed, air-filled, low-E, En=0.1, soft coat (North)	0.9 x 0.500 10.63	0.03 X 0.70	0.77	1.6249
Specified U-Value = 1.20				
Window - Double-glazed, air-filled, low-E,	0.9 x 0.180 19.64	0.63 x 0.70	0.77	1.0804
En=0.1, soft coat (East)	0.0 X 0.100 10.04	0.00 X 0.7 0	0.77	1.000-
Specified U-Value = 1.20				
Full glazed door - Double-glazed, air-filled,	0.9 x 6.090 19.64	0.63 x 0.70	0.77	36.5541
low-E, En=0.1, soft coat (West)				
Specified U-Value = 1.20				
Full glazed door - Double-glazed, air-filled,	0.9 x 3.450 19.64	0.63 x 0.70	0.77	20.7080
low-E, En=0.1, soft coat (East)				
Specified U-Value = 1.20				
Full glazed door - Double-glazed, air-filled,	0.9 x 2.400 10.63	0.63 x 0.70	0.77	7.7993
low-E, En=0.1, soft coat (North)				
Specified U-Value = 1.20				
Rooflight at 70° or less - Double-glazed,	0.9 x 4.260 26.00	0.63 x 0.70	1.00	43.9606
air-filled, low-E, En=0.1, soft coat (n/a)				
Velux Specified U-Value = 1.20				

	rature dui 3 system r	ring heati esponsiv		ds in the I	iving are	a, Th1 (°	C)				21.00 1.00
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
au						J			Л	Л	
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		JI	JI			JI	IL		JL	JL	
4.61	4.61	4.62	4.66	4.66	4.69	4.69	4.70	4.68	4.66	4.65	4.63
Jtilisati	on factor	for gains	for living	area	,	JI.	IL		J.		
1.00	0.99	0.97	0.90	0.74	0.55	0.41	0.47	0.76	0.96	0.99	1.00
Mean ir	nternal ter	nperatur	e in living	area T1		JI.	IL		J.	II.	
19.60	19.81	20.17	20.61	20.88	20.98	21.00	20.99	20.90	20.48	19.95	19.56
Гетре	rature du	ring heati	ng perio	ds in rest	of dwelli	ng Th2	Л		И	Л	
19.85	19.86	19.86	19.87	19.87	19.88	19.88	19.88	19.87	19.87	19.87	19.86
Jtilisati	on factor	for gains	for rest	of dwellir	ng		Л		И	Л	
1.00	0.99	0.97	0.87	0.68	0.46	0.31	0.36	0.67	0.95	0.99	1.00
Mean ir	nternal te	mperatur	e in the r	est of dw	elling T2	2	Л		Л	Л	
18.00	18.31	18.83	19.43	19.76	19.86	19.88	19.88	19.80	19.28	18.52	17.95
_	rea fracti nternal ter	,	,		welling)	JI.	IL.		JI.	11	0.50
18.80	19.06	19.50	20.02	20.32	20.42	20.44	20.43	20.35	19.88	19.23	18.76
Apply a	djustmen	t to the m	nean inte	rnal tem	erature	, where a	ppropria	ite	,	ĮI.	
18.80	19.06	19.50	20.02	20.32	20.42	20.44	20.43	20.35	19.88	19.23	18.76
		·									
	ce heatin			May	luo	Lut	Λυα	Son	Oct	Nov	Doc
Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Jan Jtilisati	Feb on factor	Mar for gains	Apr		JL				JL		
Jan Jtilisati 1.00	Feb on factor 0.99	Mar	Apr	May 0.71	Jun 0.51	Jul 0.36	Aug 0.42	Sep   0.71	Oct 0.95	Nov 0.99	Dec 1.00
Jan Jtilisati 1.00 Jseful g	Feb on factor 0.99 gains	Mar for gains 0.96	Apr 0.88	0.71	0.51	0.36	0.42	0.71	0.95	0.99	1.00
Jan Jtilisati 1.00 Jseful ç 568.01	Feb on factor 0.99 gains 707.47	Mar for gains 0.96	Apr 0.88	916.40	JL				JL	0.99	
Jan Jtilisati 1.00 Jseful ç 568.01 Monthly	Feb on factor 0.99 gains 707.47	Mar for gains 0.96 871.45 external	0.88 991.15 tempera	0.71 916.40 ture	0.51	0.36	0.42	0.71	0.95	0.99	1.00
Jan Jtilisati 1.00 Jseful of 568.01 Monthly 4.30	Feb on factor 0.99 gains 707.47 average 4.90	Mar for gains 0.96 871.45 external 6.50	991.15 tempera	0.71 916.40 ture 11.70	0.51 659.38 14.60	0.36	0.42	0.71	0.95	0.99	1.00
Jan Jtilisati 1.00 Jseful g 568.01 Monthly 4.30 Heat los	Feb on factor 0.99 gains 707.47 vaverage 4.90 ss rate for	Mar for gains 0.96 871.45 external 6.50 r mean in	991.15 tempera 8.90 ternal te	0.71 916.40 ture 11.70 mperatu	0.51 659.38 14.60	0.36 442.18 16.60	0.42 461.90 16.40	0.71 659.49 14.10	0.95 676.78 10.60	0.99 569.74 7.10	1.00       529.39       4.20
Jan Jtilisati 1.00 Jseful of 568.01 Monthly 4.30 Heat los	Feb on factor 0.99 gains 707.47 average 4.90 ss rate for	Mar for gains 0.96 871.45 external 6.50 r mean in 1537.53	991.15 tempera 8.90 ternal te	0.71 916.40 ture 11.70 mperatu	0.51 659.38 14.60	0.36	0.42 461.90 16.40	0.71	0.95 676.78 10.60	0.99 569.74 7.10	1.00
Jan Jtilisati 1.00 Jseful g 568.01 Monthly 4.30 Heat los 1721.3	Feb on factor 0.99 gains 707.47 vaverage 4.90 ss rate for 2 1677.93 n of month	Mar for gains 0.96 871.45 external 6.50 r mean in 1537.53 h for heaf	991.15 tempera 8.90 ternal te	0.71 916.40 ture 11.70 mperatu 1007.56	0.51 659.38 14.60	0.36 442.18 16.60	0.42 461.90 16.40 466.68	0.71 659.49 14.10 726.98	0.95 676.78 10.60	0.99 569.74 7.10 1423.22	1.00 529.39 4.20 1714.11
Jan Jtilisati 1.00 Jseful of 568.01 Monthly 4.30 Heat los 1721.3 Fraction	Feb on factor 0.99 gains 707.47 average 4.90 ss rate for 2 1677.93 n of month	Mar for gains 0.96 871.45 external 6.50 mean in 1537.53 for heat 1.00	991.15 tempera 8.90 ternal te 1302.04 ting	0.71 916.40 ture 11.70 mperatu 1007.56	0.51 659.38 14.60 re 674.49	0.36 442.18 16.60 444.52	0.42 461.90 16.40	0.71 659.49 14.10	0.95 676.78 10.60	0.99 569.74 7.10	1.00       529.39       4.20
Jan Jtilisati 1.00 Jseful g 568.01 Monthly 4.30 Heat los 1721.3 Fraction 1.00 Space I	Feb on factor 0.99 gains 707.47 vaverage 4.90 ss rate for 2 1677.93 n of month 1.00 neating re	Mar for gains 0.96 871.45 external 6.50 r mean in 1537.53 h for head 1.00 equireme	991.15 tempera 8.90 ternal te 1302.04 ting 1.00 ent for ea	0.71 916.40 ture 11.70 mperatu 1007.56 1.00 ch month	0.51 659.38 14.60 re 674.49	0.36 442.18 16.60 444.52	0.42 461.90 16.40 466.68	0.71 659.49 14.10 726.98	0.95 676.78 10.60 1084.25	0.99 569.74 7.10 1423.22	1.00 529.39 4.20 1714.11 1.00
Jan Jtilisati 1.00 Jseful g 568.01 Monthly 4.30 Heat los 1721.3 Fractior 1.00 Space h	Feb on factor 0.99 gains 707.47 vaverage 4.90 ss rate for 2 1677.93 n of month 1.00 neating re	Mar for gains 0.96 871.45 external 6.50 mean in 1537.53 h for head 1.00 equireme 495.56	991.15 tempera 8.90 ternal te 1302.04 ting 1.00 ent for ea 223.84	0.71 916.40 ture 11.70 mperatu 1007.56 1.00 ch month	0.51 659.38 14.60 re 674.49 - n, kWh/m	0.36 442.18 16.60 444.52 	0.42 461.90 16.40 466.68	0.71 659.49 14.10 726.98	0.95 676.78 10.60	0.99 569.74 7.10 1423.22	1.00 529.39 4.20 1714.11

# 9a. Energy requirements

kWh/year										
No secondary heating system selected Fraction of space heat from main system(s)  Efficiency of main heating system  1.0000  93.40%		(202) (206)								
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov	Dec									
Space heating requirement										
858.06   652.15   495.56   223.84   67.82   -   -   -   303.16   614.50	881.43	(98)								
Appendix Q - monthly energy saved (main heating system 1)										
0.00   0.00   0.00   0.00   -   -   -   -   0.00   0.00	0.00	(210)								
Space heating fuel (main heating system 1)										
918.69   698.23   530.58   239.66   72.61   -   -   -   -   324.58   657.93	943.72	(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	(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	(215)								
Waterheating										
Water heating requirement		(0.1)								
	204.71	(64)								
Efficiency of water heater	80.30	(216)								
	88.31	(217)								
Water heating fuel		(0.4.0)								
237.73 210.20 222.05 200.61 200.62 182.60 174.95 195.03 197.18 208.80 217.47	231.82	(219)								
Annual totals	kWh/year									
Space heating fuel used, main system 1	4386.01	(211)								
Space heating fuel (secondary)	0.00 2479.06	(215)								
Water heating fuel Electricity for pumps, fans and electric keep-hot	2479.00	(219)								
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) Energy saving/generation technologies	417.77	(232)								
Appendix Q -										
Energy saved or generated ():	0.000	(236a)								
Energy used ():	0.000	(237a)								
Total delivered energy for all uses	7357.84	(238)								

10a. Does not apply

11a. Does not apply

#### 12a. Carbon dioxide emissions

iza. Carbon dioxide emissions				
	Energy	<b>Emission factor</b>	<b>Emission</b>	_
	kWh/year	kg CO2/kWh	kg CO2/y	ear
Space heating, main system 1	4386.01	0.216	947.38	(261)
Space heating, main system 2	0.00	0.000	0.00	(262)
Space heating, secondary	0.00	0.519	0.00	(263)
Waterheating	2479.06	0.216	535.48	(264)
Space and water heating			1482.85	(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			1738.60	(272)
			kg/m²/yea	ır
Emissions per m <sup>2</sup> for space and water heating			16.04	(272a)
Emissions per m <sup>2</sup> for lighting			2.35	(272b)
Emissions per m <sup>2</sup> for pumps and fans			0.42	(272c)
<b>Target Carbon Dioxide Emission Rate (TER)</b> = (16.0378 x 1.00) + 2.3450 + 0.4210			18.80	(273)

Building type Detached house

Reference J5067-3

Date 7 October 2019

Client DCM Architectural Consultants Ltd Project Unit 3

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 dwelling emissions

#### 1. Overall dwelling dimensions

	Area	Av. Storey	Volume	
	(m²)	height (m)	(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 (m³)			222.37	(5)

#### 2. Ventilation rate

											m³ per ho	our
							main + s	eondar	y + othe	r		
							heating					
	er of chim						0 + 0 + 0		x 40		0.00	(6a)
	er of oper						0 + 0 + 0		x 20		0.00	(6b)
Numbe	er of inter	mittent fa	ans				4	,	x 10		40.00	(7a)
Numbe	er of pass	ive vents	;				0		x 10		0.00	(7b)
Numbe	er of fluel	ess gas f	ires				0	:	x 40		0.00	(7c)
											Air chang	jes per hour
Infiltrat	ion due t	o chimne	eys, fans	and flues	3						0.18	(8)
Pressu	ıre test, r	esult q50	)						5.00			(17)
Air per	meability										0.43	(18)
Numbe	er of side	s on whic	ch shelte	red							2.00	(19)
Shelterfactor											0.85	(20)
Infiltrat	ion rate i	ncorpora	ting shel	ter factor							0.37	(21)
Infiltrat	tion rate r	nodified	for mont	hly wind s	peed							
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	
Wind F	actor										52.50	(22)
1.27	1.25	1.23	1.10	1.07	0.95	0.95	0.93	1.00	1.07	1.13	1.18	
					10.00	0.00	0.00	1			13.13	(22a)
Adjuste	ed infiltra	tion rate	(allowing	g for shelt	er and w	ind spee	ed)				10.10	(224)
0.47	0.46	0.45	0.40	0.39	0.35	0.35	0.34	0.37	0.39	0.41	0.43	
	, l		- И		*						4.80	(22b)
	ition : nat ve air cha			ntermitter	nt extrac	t fans						` '
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)
0.01	0.00	0.00	0.50	0.50	0.00	0.00	0.50	0.07	0.50	0.50	0.00	(-0)

A, m²   W/m²K   W/K   M/m²K	3. Heat losses and heat loss	s paramete	r					
Window - Double-glazed, argon filled, low-E, En=0.2, hard coat (East)   Specified U-Value = 1.20   Window - Double-glazed, argon filled, low-E, En=0.2, hard coat (West)   Specified U-Value = 1.20   Window - Double-glazed, argon filled, low-E, En=0.2, hard coat (North)   Specified U-Value = 1.20   Window - Double-glazed, argon filled, low-E, En=0.2, hard coat (West)   Specified U-Value = 1.20   Window - Double-glazed, argon filled, low-E, En=0.2, hard coat (West)   Specified U-Value = 1.20   Window - Double-glazed, argon filled, low-E, En=0.2, hard coat (West)   Specified U-Value = 1.20   Window - Double-glazed, argon filled, low-E, En=0.2, hard coat (West)   Specified U-Value = 1.20	Element Gross	Openings	Netarea	U-value	AxU		AxK	
argon filled, low-E, En=0.2, hard coat (East) Specified U-Value = 1.20 Window - Double-glazed, argon filled, low-E, En=0.2, hard coat (North) Specified U-Value = 1.20 Window - Double-glazed, argon filled, low-E, En=0.2, hard coat (North) Specified U-Value = 1.20 Window - Double-glazed, argon filled, low-E, En=0.2, hard coat (East) Specified U-Value = 1.20 Window - Double-glazed, argon filled, low-E, En=0.2, hard coat (West) Specified U-Value = 1.20 Full glazed door -	area, m²	m²	A, m²	W/m²K	W/K	kJ/m²K	kJ/K	
hard coat (East) Specified U-Value = 1.20 Window -Double-glazed, argon filled, low-E, En=0.2, hard coat (North) Specified U-Value = 1.20 Window -Double-glazed, argon filled, low-E, En=0.2, hard coat (Cast) Specified U-Value = 1.20 Window -Double-glazed, argon filled, low-E, En=0.2, hard coat (Cast) Specified U-Value = 1.20 Window -Double-glazed, argon filled, low-E, En=0.2, hard coat (West) Specified U-Value = 1.20 Window -Double-glazed, argon filled, low-E, En=0.2, hard coat (West) Specified U-Value = 1.20 Full glazed door - Casto	Window - Double-glazed,		0.200	1.15 (1.20)	0.23			(27)
Specified U-Value = 1.20   Vindow - Pouble-glazed, agon filled, low-E, En-0.2, hard coat (North)   Specified U-Value = 1.20   Vindow - Pouble-glazed, agon filled, low-E, En-0.2, hard coat (East)   Specified U-Value = 1.20   Vindow - Pouble-glazed, agon filled, low-E, En-0.2, hard coat (East)   Specified U-Value = 1.20   Vindow - Pouble-glazed, agon filled, low-E, En-0.2, hard coat (West)   Specified U-Value = 1.20   Vindow - Pouble-glazed, agon filled, low-E, En-0.2, hard coat (West)   Specified U-Value = 1.20   Vindow - Pouble-glazed, agon filled, low-E, En-0.2, hard coat (North)   Specified U-Value = 1.20   Vindow - Pouble-glazed, agon filled, low-E, En-0.2, hard coat (North)   Specified U-Value = 1.20   Vindow - Pouble-glazed, agon filled, low-E, En-0.2, hard coat (East)   Specified U-Value = 1.20   Vindow - Pouble-glazed, agon filled, low-E, En-0.2, hard coat (East)   Specified U-Value = 1.20   Vindow - Pouble-glazed, agon filled, low-E, En-0.2, hard coat (West)   Specified U-Value = 1.20   Vindow - Pouble-glazed, agon filled, low-E, En-0.2, hard coat (West)   Specified U-Value = 1.20   Vindow - Pouble-glazed, agon filled, low-E, En-0.2, hard coat (West)   Vindow - Pouble-glazed, agon filled, low-E, En-0.2, hard coat (West)   Vindow - Pouble-glazed, agon filled, low-E, En-0.2, hard coat (West)   Vindow - Pouble-glazed, agon filled, low-E, En-0.2, hard coat (West)   Vindow - Pouble-glazed, agon filled, low-E, En-0.2, hard coat (West)   Vindow - Pouble-glazed, agon filled, low-E, En-0.2, hard coat (West)   Vindow - Pouble-glazed, agon filled, low-E, En-0.2, hard coat (West)   Vindow - Pouble-glazed, agon filled, low-E, En-0.2, hard coat (West)   Vindow - Pouble-glazed, agon filled, low-E, En-0.2, hard coat (West)   Vindow - Pouble-glazed, agon filled, low-E, En-0.2, hard coat (West)   Vindow - Pouble-glazed, agon filled, low-E, En-0.2, hard coat (West)   Vindow - Pouble-glazed, agon filled, low-E, En-0.2, hard coat (West)   Vindow - Pouble-glazed, agon filled, low-E, En-0.2, hard coat (West)   Vindow - Poub	argon filled, low-E, En=0.2,							
Window - Double-glazed, argon filled, low-E, En=0.2, hard coat (North)   Specified U-Value = 1.20   Window - Double-glazed, argon filled, low-E, En=0.2, hard coat (North)   Specified U-Value = 1.20   Window - Double-glazed, argon filled, low-E, En=0.2, hard coat (East)   Specified U-Value = 1.20   Window - Double-glazed, argon filled, low-E, En=0.2, hard coat (West)   Specified U-Value = 1.20   Window - Double-glazed, argon filled, low-E, En=0.2, hard coat (West)   Specified U-Value = 1.20   Full glazed door   Casto	hard coat (East)							
argon filled, low-E, En=0.2, hard coat (North) Specified U-Value = 1.20 Window - Double-glazed, argon filled, low-E, En=0.2, hard coat (East) Specified U-Value = 1.20 Window - Double-glazed, argon filled, low-E, En=0.2, hard coat (West) Specified U-Value = 1.20 Full glazed door - 2.630 1.20 3.16 (26) Couble-glazed, argon filled, low-E, En=0.2, hard coat (North) Specified U-Value = 1.20 Full glazed door - 2.630 1.20 3.16 (26) Couble-glazed, argon filled, low-E, En=0.2, hard coat (North) Specified U-Value = 1.20 Full glazed door - 3.780 1.20 4.54 (26) Couble-glazed, argon filled, low-E, En=0.2, hard coat (North) Specified U-Value = 1.20 Full glazed door - 3.780 1.20 4.54 (26) Couble-glazed, argon filled, low-E, En=0.2, hard coat (West) Specified U-Value = 1.20 Full glazed door - 6.680 1.20 8.02 (26) Cuble-glazed, argon filled, low-E, En=0.2, hard coat (West) Specified U-Value = 1.20 Rooflight at 70° or less - 4.670 1.15 (1.20) 5.35 (27) Couble-glazed, argon filled, low-E, En=0.2, hard coat (V/a) Valux Specified U-Value = 1.20 Rooflight at 70° or less - 4.670 1.15 (1.20) 5.35 (27) Couble-glazed, argon filled, low-E, En=0.2, hard coat (V/a) Valux Specified U-Value = 1.20 Walls	Specified U-Value = 1.20							
argon filled, low-E, En=0.2, hard coat (North) Specified U-Value = 1.20 Window - Double-glazed, argon filled, low-E, En=0.2, hard coat (East) Specified U-Value = 1.20 Window - Double-glazed, argon filled, low-E, En=0.2, hard coat (Warth) Specified U-Value = 1.20 Full glazed door -	Window - Double-glazed,		0.550	1.15 (1.20)	0.63			(27)
hard coat (North) Specified U-Value = 1.20 Window - Double-glazed, Argon filled, low-E, En=0.2, hard coat (East) Specified U-Value = 1.20 Window - Double-glazed, Argon filled, low-E, En=0.2, hard coat (West) Specified U-Value = 1.20 Window - Double-glazed, Argon filled, low-E, En=0.2, hard coat (West) Specified U-Value = 1.20 Full glazed door - Couble-glazed, argon filled, low-E, En=0.2, hard coat (North) Specified U-Value = 1.20 Full glazed door - Specified U-Value = 1.20 Full glazed door - Couble-glazed, argon filled, low-E, En=0.2, hard coat (North) Specified U-Value = 1.20 Full glazed door - Couble-glazed, argon filled, low-E, En=0.2, hard coat (Nest) Specified U-Value = 1.20 Full glazed door - Couble-glazed, argon filled, low-E, En=0.2, hard coat (Nest) Specified U-Value = 1.20 Roflight at 70° or less - Couble-glazed, argon filled, low-E, En=0.2, hard coat (Nest) Specified U-Value = 1.20 Roflight at 70° or less - Couble-glazed, argon filled, low-E, En=0.2, hard coat (Nest) Specified U-Value = 1.20 Walls A.15 O.21 O.87 O.87 O.87 O.87 O.87 O.87 O.87 O.87	argon filled, low-E, En=0.2,			. ,				, ,
Specified U-Value = 1.20   Window-Double-glazed, argon filled, low-E, En=0.2, hard coat (East)   Specified U-Value = 1.20   Window-Double-glazed, argon filled, low-E, En=0.2, hard coat (West)   Specified U-Value = 1.20   Specified U-Va	hard coat (North)							
argon filled, low-E, En=0.2, hard coat (East) Specified U-Value = 1.20   Window - Double-glazed, argon filled, low-E, En=0.2, hard coat (West) Specified U-Value = 1.20   Full glazed door - 2.630  1.20  3.16  (26)   Specified U-Value = 1.20   Full glazed door - 3.780  1.20  4.54  (26)   Specified U-Value = 1.20   Full glazed door - 3.780  1.20  4.54  (26)   Specified U-Value = 1.20   Full glazed door - 3.780  1.20  4.54  (26)   Specified U-Value = 1.20   Full glazed door - 6.680  1.20  8.02  (26)   Specified U-Value = 1.20   Full glazed door - 6.680  1.20  8.02  (26)   Specified U-Value = 1.20   Full glazed door - 6.680  1.20  8.02  (26)   Specified U-Value = 1.20   Full glazed, argon filled, low-E, En=0.2, hard coat (West) Specified U-Value = 1.20   Specified U-Value								
argon filled, low-E, En=0.2, hard coat (East) Specified U-Value = 1.20   Window - Double-glazed, argon filled, low-E, En=0.2, hard coat (West) Specified U-Value = 1.20   Full glazed door - 2.630  1.20  3.16  (26)   Specified U-Value = 1.20   Full glazed door - 2.630  1.20  4.54  (26)   Specified U-Value = 1.20   Full glazed door - 3.780  1.20  4.54  (26)   Specified U-Value = 1.20   Full glazed door - 3.780  1.20  4.54  (26)   Specified U-Value = 1.20   Full glazed door - 3.780  1.20  4.54  (26)   Specified U-Value = 1.20   Full glazed door - 6.680  1.20  8.02  (26)   Specified U-Value = 1.20   Full glazed door - 6.680  1.20  8.02  (26)   Specified U-Value = 1.20   Full glazed, argon filled, low-E, En=0.2, hard coat (West) Specified U-Value = 1.20   Specified U-Value	Window - Double-glazed,		4.330	1.15 (1.20)	4.96			(27)
Specified U-Value = 1.20   Window- Double-glazed, argon filled, low-E, En=0.2, hard coat (West)   Specified U-Value = 1.20   Sp	argon filled, low-E, En=0.2,			. ,				
Specified U-Value = 1.20   Window- Double-glazed, argon filled, low-E, En=0.2, hard coat (West)   Specified U-Value = 1.20   Sp	_							
Window-Double-glazed, argon filled, low-E, En=0.2, hard coat (West) Specified U-Value = 1.20 Full glazed door- Double-glazed, argon filled, low-E, En=0.2, hard coat (North) Specified U-Value = 1.20 Full glazed door- Specified U-Value = 1.20	, ,							
argon filled, low-E, En=0.2, hard coat (West) Specified U-Value = 1.20 Full glazed door - 2.630 1.20 3.16 (26) Double-glazed, argon filled, low-E, En=0.2, hard coat (North) Specified U-Value = 1.20 Full glazed door - 3.780 1.20 4.54 (26) Double-glazed, argon filled, low-E, En=0.2, hard coat (East) Specified U-Value = 1.20 Full glazed door - 6.680 1.20 8.02 (26) Double-glazed, argon filled, low-E, En=0.2, hard coat (East) Specified U-Value = 1.20 Full glazed door - 6.680 1.20 8.02 (26) Double-glazed, argon filled, low-E, En=0.2, hard coat (West) Specified U-Value = 1.20 Rooflight at 70° or less - 4.670 1.15 (1.20) 5.35 (27) Double-glazed, argon filled, low-E, En=0.2, hard coat (r/a) Velux Specified U-Value = 1.20 Walls Dormer Cheeks - Weatherboard/Battens/9 OSB/51 Cavity/140 Timber Frame Insulated With 120 Celotex XR4000 Between Studs/12.5 Pbd Walls Brick or (Weatherboard/Battens/100 Medium Dense Block/)51 Cavity/140 Timber Frame Insulated With 120 Celotex XR4000 Between Studs/12.5 Pbd Ground floors 46.23 0.12 5.55 75.00 3467.25 (28)	•		2.520	1.15 (1.20)	2.89			(27)
Narrd coat (West)   Specified U-Value = 1.20	•			, ,				` ,
Specified U-Value = 1.20 Full glazed door - 2.630 1.20 3.16 (26) Double-glazed, argon filled, low-E, En=0.2, hard coat (North) Specified U-Value = 1.20 Full glazed door - 3.780 1.20 4.54 (26) Double-glazed, argon filled, low-E, En=0.2, hard coat (East) Specified U-Value = 1.20 Full glazed door - 6.680 1.20 8.02 (26) Double-glazed, argon filled, low-E, En=0.2, hard coat (West) Specified U-Value = 1.20 Full glazed door - 6.680 1.20 8.02 (26) Double-glazed, argon filled, low-E, En=0.2, hard coat (West) Specified U-Value = 1.20 Rooflight at 70° or less - 4.670 1.15 (1.20) 5.35 (27) Double-glazed, argon filled, low-E, En=0.2, hard coat (n/a) Velux Specified U-Value = 1.20 Walls 4.15 0.21 0.87 9.00 37.35 (29) Dormer Cheeks - Weatherboard/Battens/9 OSB/51 Cavity/140 Timber Frame Insulated With 120 Celotex XR4000 Between Studs/12.5 P'bd Walls 96.74 0.20 19.35 9.00 870.66 (29) 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 46.23 0.12 5.55 75.00 3467.25 (28)								
Full glazed door- Double-glazed, argon filled, low-E, En=0.2, hard coat (North) Specified U-Value = 1.20 Full glazed door- Double-glazed, argon filled, low-E, En=0.2, hard coat (East) Specified U-Value = 1.20 Full glazed door- Double-glazed, argon filled, low-E, En=0.2, hard coat (East) Specified U-Value = 1.20 Full glazed door- Double-glazed, argon filled, low-E, En=0.2, hard coat (West) Specified U-Value = 1.20 Rooflight at 70° or less- Double-glazed, argon filled, low-E, En=0.2, hard coat (IValue = 1.20 Walls	, ,							
Double-glazed, argon filled,   low-E, En=0.2, hard coat (North)   Specified U-Value = 1.20   Full glazed door -	•		2.630	1.20	3.16			(26)
Iow-E, En=0.2, hard coat (North)   Specified U-Value = 1.20								( )
(North) Specified U-Value = 1.20 Full glazed door - 3.780 1.20 4.54 (26) Double-glazed, argon filled, low-E, En=0.2, hard coat (East) Specified U-Value = 1.20 Full glazed door - 6.680 1.20 8.02 (26) Double-glazed, argon filled, low-E, En=0.2, hard coat (West) Specified U-Value = 1.20 Rooflight at 70° or less - 4.670 1.15 (1.20) 5.35 (27) Double-glazed, argon filled, low-E, En=0.2, hard coat (In/a) Velux Specified U-Value = 1.20 Walls 4.15 0.21 0.87 9.00 37.35 (29) Dormer Cheeks - Weatherboard/Battens/9 OSB/51 Cavity/140 Timber Frame Insulated With 120 Celotex XR4000 Between Studs/12.5 P'bd Walls 96.74 0.20 19.35 9.00 870.66 (29) Brick or (Weatherboard/Battens/100 Medium Dense Block)/51 Cavity/140 Timber Frame Insulated With 120 Celotex XR4000 Between Studs/12.5 P'bd Groundfloors 46.23 0.12 5.55 75.00 3467.25 (28)								
Specified U-Value = 1.20 Full glazed door -								
Full glazed door -	` ,							
Double-glazed, argon filled,   low-E, En=0.2, hard coat (East)   Specified U-Value = 1.20   Full glazed door -   6.680   1.20   8.02   (26)			3.780	1.20	4.54			(26)
Iow-E, En=0.2, hard coat (East)   Specified U-Value = 1.20								( - /
CEast   Specified U-Value = 1.20								
Specified U-Value = 1.20 Full glazed door - 6.680 1.20 8.02 (26) Double-glazed, argon filled, low-E, En=0.2, hard coat (West) Specified U-Value = 1.20 Rooflight at 70° or less - 4.670 1.15 (1.20) 5.35 (27) Double-glazed, argon filled, low-E, En=0.2, hard coat (n/a) Velux Specified U-Value = 1.20 Walls 4.15 0.21 0.87 9.00 37.35 (29) Dormer Cheeks - Weatherboard/Battens/9 OSB/51 Cavity/140 Timber Frame Insulated With 120 Celotex XR4000 Between Studs/12.5 P'bd  Walls 96.74 0.20 19.35 9.00 870.66 (29) 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 46.23 0.12 5.55 75.00 3467.25 (28) Beam/Medium Dense Block/150								
Full glazed door -	· ·							
Double-glazed, argon filled,   low-E, En=0.2, hard coat ((West)   Specified U-Value = 1.20   Rooflight at 70° or less -   4.670   1.15 (1.20)   5.35   (27)   Double-glazed, argon filled,   low-E, En=0.2, hard coat ((n/a)   Velux Specified U-Value = 1.20   Walls   4.15   0.21   0.87   9.00   37.35   (29)   Dormer Cheeks -   Weatherboard/Battens/9 OSB/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)   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   46.23   0.12   5.55   75.00   3467.25   (28)   Beam/Medium Dense Block/150     46.23   0.12   5.55   75.00   3467.25   (28)   Cavity/Medium Dense Block/150     Cavity/150	•		6.680	1.20	8.02			(26)
low-E, En=0.2, hard coat (West)								( )
West   Specified U-Value = 1.20   Rooflight at 70° or less -   4.670   1.15 (1.20)   5.35   (27)								
Specified U-Value = 1.20								
Rooflight at 70° or less -   4.670   1.15 (1.20)   5.35   (27)	` ,							
Double-glazed, argon filled, low-E, En=0.2, hard coat (n/a)  Velux Specified U-Value = 1.20  Walls	•		4.670	1.15 (1.20)	5.35			(27)
low-E, En=0.2, hard coat (n/a)  Velux Specified U-Value = 1.20  Walls 4.15 0.21 0.87 9.00 37.35 (29)  Dormer Cheeks -  Weatherboard/Battens/9 OSB/51  Cavity/140 Timber Frame Insulated  With 120 Celotex XR4000 Between  Studs/12.5 P'bd  Walls 96.74 0.20 19.35 9.00 870.66 (29)  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 46.23 0.12 5.55 75.00 3467.25 (28)  Beam/Medium Dense Block/150	•			, ,				` ,
\( \text{Velux Specified U-Value} = 1.20 \) \( \text{Valls} & 4.15 & 0.21 & 0.87 & 9.00 & 37.35 & (29) \) \( \text{Dormer Cheeks-} \) \( \text{Weatherboard/Battens/9 OSB/51} \) \( \text{Cavity/140 Timber Frame Insulated} \) \( \text{With 120 Celotex XR4000 Between} \) \( \text{Studs/12.5 P'bd} \) \( \text{Walls} & 96.74 & 0.20 & 19.35 & 9.00 & 870.66 & (29) \) \( \text{Brick or (Weatherboard/Battens/100} \) \( \text{Medium Dense Block)/51 Cavity/140} \) \( \text{Timber Frame Insulated With 120} \) \( \text{Celotex XR4000 Between Studs/12.5} \) \( \text{P'bd} \) \( \text{Ground floors} & 46.23 & 0.12 & 5.55 & 75.00 & 3467.25 & (28) \) \( \text{Beam/Medium Dense Block/150} \)								
Velux Specified U-Value = 1.20         Walls       4.15       0.21       0.87       9.00       37.35       (29)         Dormer Cheeks - Weatherboard/Battens/9 OSB/51       Weatherboard/Battens/9 OSB/51       Very Cavity/140 Timber Frame Insulated       Vith 120 Celotex XR4000 Between Studs/12.5 P'bd       96.74       0.20       19.35       9.00       870.66       (29)         Brick or (Weatherboard/Battens/100 Medium Dense Block)/51 Cavity/140 Timber Frame Insulated With 120 Celotex XR4000 Between Studs/12.5 P'bd       75.00       3467.25       (28)         Ground floors       46.23       0.12       5.55       75.00       3467.25       (28)         Beam/Medium Dense Block/150       46.23       0.12       5.55       75.00       3467.25       (28)								
Walls 4.15 0.21 0.87 9.00 37.35 (29)  Dormer Cheeks - Weatherboard/Battens/9 OSB/51 Cavity/140 Timber Frame Insulated With 120 Celotex XR4000 Between Studs/12.5 P'bd  Walls 96.74 0.20 19.35 9.00 870.66 (29)  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 46.23 0.12 5.55 75.00 3467.25 (28) Beam/Medium Dense Block/150	` ,	.20						
Dormer Cheeks - Weatherboard/Battens/9 OSB/51 Cavity/140 Timber Frame Insulated With 120 Celotex XR4000 Between Studs/12.5 P'bd Walls 96.74 0.20 19.35 9.00 870.66 (29) 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 46.23 0.12 5.55 75.00 3467.25 (28) Beam/Medium Dense Block/150	•		4.15	0.21	0.87	9.00	37.35	(29)
Cavity/140 Timber Frame Insulated With 120 Celotex XR4000 Between Studs/12.5 P'bd  Walls 96.74 0.20 19.35 9.00 870.66 (29) 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 46.23 0.12 5.55 75.00 3467.25 (28) Beam/Medium Dense Block/150	Dormer Cheeks -							( - /
With 120 Celotex XR4000 Between Studs/12.5 P'bd  Walls 96.74 0.20 19.35 9.00 870.66 (29)  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 46.23 0.12 5.55 75.00 3467.25 (28)  Beam/Medium Dense Block/150	Weatherboard/Battens/9OS	B/51						
With 120 Celotex XR4000 Between Studs/12.5 P'bd  Walls 96.74 0.20 19.35 9.00 870.66 (29)  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 46.23 0.12 5.55 75.00 3467.25 (28)  Beam/Medium Dense Block/150	Cavity/140 Timber Frame Ins	ulated						
Walls       96.74       0.20       19.35       9.00       870.66       (29)         Brick or (Weatherboard/Battens/100       Medium Dense Block)/51 Cavity/140       10.20       19.35       9.00       870.66       (29)         Medium Dense Block/51 Cavity/140       10.20       19.35       19.00       870.66       (29)         Celotex XR4000 Between Studs/12.5 P'bd       10.20       19.35       19.35       19.00       870.66       (29)         Ground floors       46.23       0.12       5.55       75.00       3467.25       (28)         Beam/Medium Dense Block/150       10.12       5.55       75.00       3467.25       (28)	With 120 Celotex XR4000 Be	etween						
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 46.23 0.12 5.55 75.00 3467.25 (28) Beam/Medium Dense Block/150	Studs/12.5 P'bd							
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 46.23 0.12 5.55 75.00 3467.25 (28) Beam/Medium Dense Block/150	Walls		96.74	0.20	19.35	9.00	870.66	(29)
Timber Frame Insulated With 120 Celotex XR4000 Between Studs/12.5 P'bd Ground floors 46.23 0.12 5.55 75.00 3467.25 (28) Beam/Medium Dense Block/150	Brick or (Weatherboard/Batte	ens/100						` ,
Celotex XR4000 Between Studs/12.5         P'bd         Ground floors       46.23       0.12       5.55       75.00       3467.25       (28)         Beam/Medium Dense Block/150	Medium Dense Block)/51 Ca	vity/140						
P'bd         Ground floors       46.23       0.12       5.55       75.00       3467.25       (28)         Beam/Medium Dense Block/150	Timber Frame Insulated With	120						
Ground floors 46.23 0.12 5.55 75.00 3467.25 (28) Beam/Medium Dense Block/150	Celotex XR4000 Between Stu	uds/12.5						
Beam/Medium Dense Block/150	P'bd							
Beam/Medium Dense Block/150	Ground floors		46.23	0.12	5.55	75.00	3467.25	(28)
Kinggpon TE70/Serood	Beam/Medium Dense Block/	150						, ,
Kingspan 1770/30leed	Kingspan TF70/Screed							

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Page 22 of 84

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Approval of JPA Designer by BRE applies only to the software, data is not subject to quality control procedures, users are themselves responsible for the accuracy of the data. The results of the calculation should not be accepted without first checking the input data.

3. Heat	losses a	and hear	loss pa	rametei	•								
Element	t	Gross	•	enings	Netarea		alue/	AxU		appa-valu			
		area, m <sup>2</sup>	m <sup>2</sup>		A, m²	W/	m²K	W/K	k	J/m²K	kJ/K		
Flat roof	s				3.36	6	0.15	0.5	0	9.00	30.24	(30	))
150 Kir	ngspan 1	TR27 Ove	er Joists										
Pitched	roofs ins	ulated be	etween ra	afters	51.06	6	0.12	6.1	3	9.00	459.54	(30	))
150 Kir	ngspan ł	<7 Between	en										
Rafters/52.5 Kingspan K118 Under													
		eather M											
Total are	ea of exte	ernal ele	ments Si	gma A, r	n²						226.9	0 (31	)
	eat loss.										62.1	•	•
Heat cap	pacity	•									0.0	•	•
		arameter	, kJ/m²K								52.6	•	,
	thermal		,								34.0	,	,
	oric heat	-									96.1		
Ventilati	on heat	loss calc	ulated m	onthly								•	,
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	3)
Heat tra	nsfer coe	efficient,	W/K	JL	JL	JL	Л		JL				
140.85	1	,	138.81	138.54	137.30	137.30	137.07	137.78	138.54	139.08	139.64		
140.03	140.54	140.23	130.01	130.54	137.30	137.30	137.07	137.70	130.34	133.00		4 (20	٠,
Heatles	o norom	otor/ULI	) \///m2	V							138.8	31 (39	"
		eter (HLI	, .		·	1	nr.	1	1	10			
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 (ave	erage)										1.5	0 (40	))
Number	of days i	in month	(Table 1	a)									
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. Wate Assume			y require	ements							kWh/year 2.66	(42)
Annuala	average l	not water	usage ir	n litres pe	er day Vd	,average	)				97.33	(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot wate	er usage	in litres p	oer day fo	or each r	nonth							
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 c	of hot wat	ter 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 of Distribut		annual)									1531.31	(45)
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)  Hot water cylinder loss factor (kWh/day)  Volume factor  Temperature factor  Energy lost from store (kWh/day)  Total storage loss  0.00  0.00  0.00  0.00  0.00  0.00  0.00											(50) (51) (52) (53) (55)	
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 stora	age loss	И	Л		,	П	И			Л		
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 lo	oss calcu	lated for	each mo	onth	,							
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 hea	at require	ed for wa	ter heatii	ng calcul	ated for e	each mo	nth					
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 fi	rom wate	er heater	for each	month, l	kWh/mor	nth						
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)
			ating, kW	,	,			V			1733.95	(64)
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)

# 5. Internal gains

	_										
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Metabol	ic 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
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
Appliand	ces gains	3				,					
243.53	246.06	239.69	226.13	209.02	192.94	182.19	179.66	186.03	199.59	216.70	232.79
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
Pumps a	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
Losses	e.g. evap	oration (r	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
Water he	eating ga	ins	,	,		,	,		,	,	
76.82	74.56	69.86	63.47	59.32	53.48	48.52	54.88	57.15	63.76	71.22	74.56
Total inte	ernal gaiı	ns					,				
409.40	407.07	392.16	368.15	343.68	320.28	305.23	311.65	324.13	348.37	376.14	397.05

6. Solar gains (calculation for January)

	Area & Flux	g & FF	Shading	Gains
Window - Double-glazed, argon filled, low-E,	0.9 x 0.200 19.64	0.72 x 0.70	0.77	1.3720
En=0.2, hard coat (East)				
Specified U-Value = 1.20				
Window - Double-glazed, argon filled, low-E,	0.9 x 0.550 10.63	0.72 x 0.70	0.77	2.0427
En=0.2, hard coat (North)				
Specified U-Value = 1.20				
Window - Double-glazed, argon filled, low-E,	0.9 x 4.330 19.64	0.72 x 0.70	0.77	29.7029
En=0.2, hard coat (East)				
Specified U-Value = 1.20				
Window - Double-glazed, argon filled, low-E,	0.9 x 2.520 19.64	0.72 x 0.70	0.77	17.2867
En=0.2, hard coat (West)				
Specified U-Value = 1.20				
Full glazed door - Double-glazed, argon filled,	0.9 x 2.630 10.63	0.72 x 0.70	0.77	9.7677
low-E, En=0.2, hard coat (North)				
Specified U-Value = 1.20				
Full glazed door - Double-glazed, argon filled,	0.9 x 3.780 19.64	0.72 x 0.70	0.77	25.9300
low-E, En=0.2, hard coat (East)				
Specified U-Value = 1.20				
Full glazed door - Double-glazed, argon filled,	0.9 x 6.680 19.64	0.72 x 0.70	0.77	45.8234
low-E, En=0.2, hard coat (West)				
Specified U-Value = 1.20				
Rooflight at 70° or less - Double-glazed,	0.9 x 4.670 26.00	0.72 x 0.70	1.00	55.0761
argon filled, low-E, En=0.2, hard coat (n/a)				
Value Charified II Value - 1 20				

Velux Specified U-Value = 1.20

	n <i>interna</i> ature dui			ds in the	living are	a, Th1 (°	C)				21.00	(85
	system r	•	<b>.</b>		Ü	, ,	,				1.00	`
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau		<u></u>	Щ			JI.	Л.		JI.	JI.		
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		JI.	JI.			Л	Л		Л	Л		
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	on factor	for gains	for living	area					,		,	
0.92	0.88	0.81	0.70	0.57	0.45	0.35	0.40	0.59	0.79	0.89	0.93	(86
Mean in	ternal ter	mperatur	e in living	area T1							,	
16.99	17.49	18.31	19.28	20.05	20.56	20.79	20.74	20.27	19.17	17.88	16.89	(87
Temper	ature du	ring heati	ng perio	ds in rest	of dwelli	ng 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)
Utilisatio	on factor	for gains	for rest	of dwellir	ng				,		,	
0.91	0.86	0.79	0.66	0.52	0.38	0.26	0.31	0.52	0.76	0.88	0.92	(89
Mean in	ternal te	mperatur	e in the r	est of dw	elling T2	2	JI.		JI.	JI.		
14.58	15.27	16.39	17.70	18.70	19.32	19.57	19.52	19.00	17.59	15.84	14.45	(90
_	rea fracti	,	,			JI.	J.		JI.	JI.	0.50	(91
Mean in	iternal ter	mperatur	e (for the	whole d	welling)							
15.79	16.38	17.35	18.49	19.38	19.94	20.18	20.13	19.63	18.38	16.86	15.67	(92
Apply a	djustmen	nt to the m	nean inte	rnal tem	perature	, where a	appropria	ite				
15.79	16.38	17.35	18.49	19.38	19.94	20.18	20.13	19.63	18.38	16.86	15.67	(93
8. Space	e heatin	ng requii	rement									
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisatio	on factor	for gains				Я			Я	Я	,	
0.87	0.82	0.74	0.63	0.51	0.39	0.30	0.34	0.52	0.71	0.83	0.88	(94
Usefulg	gains	JI.	Л		,	Л			,	Л		
517.41	636.09	753.12	822.52	774.90	602.98	434.97	438.47	550.33	566.50	508.07	484.00	(95
Monthly	average	external	tempera	ture	J				JL			
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 los	ss rate fo	r mean in	ternal te	mperatu	re	JI.			JI			
1617.69	9 1612.84	1521.07	1330.91	1063.40	733.63	491.80	511.37	762.50	1077.89	1357.64	1602.14	(97
	of mont					JI	JL		J			`
1.00	1.00	1.00	1.00	1.00	-	-	-	-	1.00	1.00	1.00	
	neating re			JL	n, kWh/m	onth	JL		JL			
818.61	, -		il.		·  -	-	<b>-</b>	1-	380.47	611.69	831.90	
	ace heat	_		ļ	kWh/vea	ar) (Octo	ber to Ma	ay)	1		4451.09	(98
	neating re	•		•	` •	, ,		- /			48.14	(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)  Efficiency of main heating system  92.80%		(202) (206)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov	Dec	
Space heating requirement		
818.61   656.38   571.35   366.04   214.65   -   -   -   -   380.47   611.69	831.90	(98)
Appendix Q - monthly energy saved (main heating system 1)		
0.00   0.00   0.00   0.00   -   -   -   -   0.00   0.00	0.00	(210)
Space heating fuel (main heating system 1)		
882.13 707.30 615.68 394.44 231.30 409.99 659.15	896.44	(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)
Waterheating		
Water heating requirement		(0.4)
176.21   154.58   160.62   141.56   136.97   119.88   112.77   127.02   127.85   146.94   158.39		(64)
Efficiency of water heater	87.10	(216)
89.31   89.27   89.19   89.03   88.73   87.10   87.10   87.10   87.10   89.03   89.23	89.33	(217)
Water heating fuel	104.00	(040)
197.30   173.16   180.08   159.01   154.37   137.63   129.47   145.84   146.79   165.05   177.50	191.62	(219)
Annual totals	kWh/year	
Space heating fuel used, main system 1	4796.44	(211)
Space heating fuel (secondary) Water heating fuel	0.00 1957.80	(215) (219)
Electricity for pumps, fans and electric keep-hot	1937.00	(213)
central heating pump	30.00	(230c)
boiler with a fan-assisted flue	45.00	(230e)
Total electricity for the above, kWh/year	75.00 409.43	(231)
Electricity for lighting (100.00% fixed LEL) Energy saving/generation technologies	409.43	(232)
Appendix Q -		
Energy saved or generated ():	0.000	(236a)
Energy used ():	0.000	(237a)
Total delivered energy for all uses	7238.66	(238)

10a. Does not apply

11a. Does not apply

#### 12a. Carbon dioxide emissions

	Energy	Emission factor	<b>Emission</b>	S
	kWh/year	kg CO2/kWh	kg CO2/y	ear
Space heating, main system 1	4796.44	0.216	1036.03	(261)
Space heating, main system 2	0.00	0.000	0.00	(262)
Space heating, secondary	0.00	0.519	0.00	(263)
Waterheating	1957.80	0.216	422.88	(264)
Space and water heating			1458.91	(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			1710.33	(272)
			kg/m²/yea	ar
Dwelling Carbon Dioxide Emission Rate (DER)			18.50	(273)

Building type Detached house

Reference J5067-3

Date 7 October 2019

Client DCM Architectural Consultants Ltd Project Unit 3

25 Pigeon Lane 66 Borstal Hill
Herne Bay Whitstable
Kent Kent
CT67EH CT54NB

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

assessed by program JPA Designer version 6.04a1, printed on 7/10/2019 at 16:24:08

#### 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 = 18.80

Dwelling Carbon Dioxide Emission Rate

DER = 18.50

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) TFEE = 58.3

Dwelling Fabric Energy Efficiency (DFEE) DFEE = 57.1 OK

2a Thermal bridging

Thermal bridging calculated using default y-value of 0.15

2b Fabric U-values

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

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 40GS

Source of efficiency: from boiler database

Alpha InTec 40GS

Efficiency: 88.9% SEDBUK2009

Minimum: 88.0% OK

Secondary heating system:

None -

Page 29 of 84

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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):

OK
Slight
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/m<sup>2</sup>K

Building type Detached house

Reference J5067-3

Date 7 October 2019

Client DCM Architectural Consultants Ltd Project Unit 3

25 Pigeon Lane 66 Borstal Hill
Herne Bay Whitstable
Kent Kent
CT67EH CT54NB

#### SAP 2012 input data Printed on 7 Oct 2019 at 04:24 PM

#### Unit 3, 66 Borstal Hill, Whitstable, Kent, CT5 4NB

Unit 3

66 Borstal Hill Whitstable Kent

Located in: England

Region: South East England

Postcode: CT54NB

UPRN:

CT54NB

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 (North)

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 = 0.55 U = 1.20 - Double-glazed, argon filled, low-E, En=0.2,

hard coat (North)

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Page 31 of 84

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Building type Detached house

Reference J5067-3

Date 7 October 2019

Client DCM Architectural Consultants Ltd Project Unit 3

25 Pigeon Lane 66 Borstal Hill
Herne Bay Whitstable
Kent Kent
CT67EH CT54NB

#### SAP 2012 input data Printed on 7 Oct 2019 at 04:24 PM

#### Unit 3, 66 Borstal Hill, Whitstable, Kent, CT5 4NB

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)

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)

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 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

JPA Designer Version 6.03x , SAP Version 9.92 Page 32 of 84

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Building type Detached house

Reference J5067-3

Date 7 October 2019

Client DCM Architectural Consultants Ltd Project Unit 3

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Unit 3, 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 No

compensator:

Boiler has weather Yes

compensator:

Boiler has emhanced 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

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Page 33 of 84

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Building type Detached house

Reference J5067-3

Date 7 October 2019

Client DCM Architectural Consultants Ltd Project Unit 3

25 Pigeon Lane 66 Borstal Hill
Herne Bay Whitstable
Kent Kent
CT6 7EH CT5 4NB

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#### Unit 3, 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/m<sup>2</sup>/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
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
North	0.9 x 0.55	74.68	0.72 x 0.70	0.90	17
n/a	0.9 x 4.67	189.00	0.72 x 0.70	1.00	400
Total					1285

	Jun	Jul	Aug	
Solar gains Solar gains	1355	1285	1086	(P3)
Internal gains	468	449	458	
Total summer gains	1823	1734	1544	(P5)
Summer gain/loss ratio	2.67	2.54	2.26	(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	19.50	21.77	21.69	(P7)
Likelihood of high internal temperature	Not sia.	Sliaht	Sliaht	

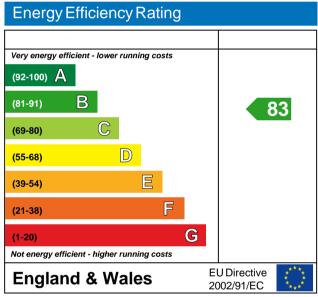
Assessment of likelihood of high internal temperature Slight

# **Predicted Energy Assessment**

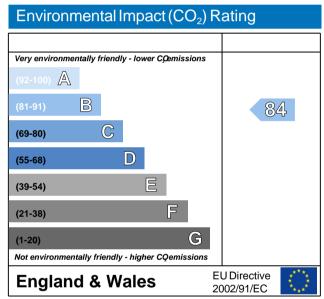
Unit 3 66 Borstal Hill Whitstable Kent CT5 4NB Ref: J5067-3 Dwelling type:
Date of assessment:
Produced by
Total floor area:
Detached house
7 October 2019
Thermcalc Limited
92 m²

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 (CO<sub>2</sub>) 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 (CO<sub>2</sub>) emissions. The higher the rating the less impact it has on the environment.

# **Project Information**

Building type Detached house

Reference J5067-3

Date 7 October 2019

Client DCM Architectural Consultants Ltd Project Unit 3

25 Pigeon Lane 66 Borstal Hill
Herne Bay Whitstable
Kent Kent
CT6 7EH CT5 4NB

# SAP 2012 worksheet for - calculation of fabric energy efficiency

### 1. Overall dwelling dimensions

	Area	Av. Storey	Volume	
	(m²)	height (m)	(m³)	
Groundfloor(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 (m³)			222.37	(5)

### 2. Ventilation rate

											m³ per ho	our
							main + s heating	eondar	y + othe	r		
Numbe	er of chim	nevs					0 + 0 + 0	,	x 40		0.00	(6a)
	er of oper						0 + 0 + 0		x 20		0.00	(6b)
	er of inter		ans				3		x 10		30.00	(7a)
	er of pass		_				0		x 10		0.00	(7b)
	er of fluel						0		x 40		0.00	(7c)
											Air chanc	jes per hour
Infiltrat	ion due t	o chimne	eys, fans	and flues	3						0.13	(8)
Pressu	ıre test, r	esult q50	)						5.00			(17)
Air per	meability										0.38	(18)
Numbe	er of side	s on whic	ch shelte	red							2.00	(19)
Shelte	rfactor										0.85	(20)
Infiltrat	ion rate i	ncorpora	ting shel	ter factor							0.33	(21)
Infiltrat	tion rate r	nodified <sup>1</sup>	for montl	nly wind s	peed							
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	
Wind F	actor										52.50	(22)
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)
Adjuste	ed infiltra	tion rate	(allowing	g for shelt	er and w	ind spee	ed)					
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)
	ition : nat ve air cha			ntermitter	nt extrac	t fans						
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)
	л			л			л					

3. F	leat i	losses	and	heat	loss	parameter
------	--------	--------	-----	------	------	-----------

3. Heat losses and	•						
Element Gro	, ,	Netarea	U-value	AxU	kappa-value		
	a, m² m²	A, m²	W/m²K	W/K	kJ/m²K	kJ/K	
Window - Double-gla		0.200	1.15 (1.20)	0.23			(27)
argon filled, low-E, E	n=0.2,						
hard coat (East)							
Specified U-Value :							
Window - Double-gla	zed,	2.520	1.15 (1.20)	2.89			(27)
argon filled, low-E, E	n=0.2,						
hard coat (West)							
Specified U-Value :	= 1.20						
Window - Double-gla	zed,	4.330	1.15 (1.20)	4.96			(27)
argon filled, low-E, E	n=0.2,						
hard coat (East)							
Specified U-Value :	= 1.20						
Window - Double-gla		0.550	1.15 (1.20)	0.63			(27)
argon filled, low-E, E			- ( /				` ,
hard coat (North)	- ,						
Specified U-Value :	= 1 20						
Full glazed door -	20	6.680	1.20	8.02			(26)
Double-glazed, argor	n filled	0.000	1.20	0.02			(20)
low-E, En=0.2, hard							
(West)	Coat						
Specified U-Value	- 1 20						
Full glazed door -	- 1.20	3.780	1.20	4.54			(26)
Double-glazed, argor	o fillad	3.700	1.20	4.54			(20)
low-E, En=0.2, hard	Coal						
(East)	1.00						
Specified U-Value :	= 1.20	0.000	4.00	0.40			(00)
Full glazed door -	. eu	2.630	1.20	3.16			(26)
Double-glazed, argor							
low-E, En=0.2, hard	coat						
(North)							
Specified U-Value							
Rooflight at 70° or les		4.670	1.15 (1.20)	5.35			(27)
Double-glazed, argor							
low-E, En=0.2, hard	coat						
(n/a)							
Velux Specified U-	Value = 1.20						
Walls		4.15	0.21	0.87	9.00	37.35	(29)
Dormer Cheeks -							
Weatherboard/Batt	tens/9 OSB/51						
Cavity/140 Timber F	Frame Insulated						
With 120 Celotex X	R4000 Between						
Studs/12.5 P'bd							
Walls		96.74	0.20	19.35	9.00	870.66	(29)
Brick or (Weatherbo	oard/Battens/100						
Medium Dense Blo	ck)/51 Cavity/140						
Timber Frame Insu	lated With 120						
Celotex XR4000 Be	etween Studs/12.5						
P'bd							
Ground floors		46.23	0.12	5.55	75.00	3467.25	(28)
Beam/Medium Den	nse Block/150						. ,
Kingspan TF70/Scr	reed						
- ·		Þ	age 39 of 84				

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Page 39 of 84

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3. Heat	losses a	and heat	loss pa	rameter	•								
Elemen		Gross	•	enings	Netare		/alue	ΑxU		appa-valu			
		area, m <sup>2</sup>	m <sup>2</sup>		A, m²		m²K	W/K	k	J/m²K	kJ/K		
Flat roof	s				3.36	6	0.15	0.5	50	9.00	30.24		(30)
150 Ki	ngspan T	R27 Ove	er Joists										
Pitched	roofs ins	ulated be	etween ra	afters	51.06	6	0.12	6.1	3	9.00	459.54		(30)
150 Ki	ngspan k	<7 Between	en										
Rafter	s/52.5 Ki	ngspan k	<118 Unc	der									
Rafter	s With Br	eather M	embrane	Э									
Total ar	ea of exte	ernal elei	ments Si	gma A, r	n²						226.9	90	(31)
	eat loss,	W/K									62.1		(33)
Heat ca											4865.0		(34)
	l mass pa		, kJ/m²K								52.6		(35)
	thermal	-									34.0		(36)
	oric heat										96.1	19	(37)
Ventilat	on heat l	oss calc	ulated m	onthly									
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 tra	nsfer coe	efficient,	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		
		,	П		,						137.6	3	(39)
Heat los	s param	eter (HLF	P), W/m²	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 (av	erage)		!			,			,		1.4	19	(40)
Number	of days i	n month	(Table 1	a)									
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
31	28	31	30	31	30	31	31	30	31	30	31		

	kWh/year
Assumed occupancy, N Annual average hot water usage in litres per day Vd, average	2.66 (42) 97.33 (43)
	ec (43)
Jan     Feb     Mar     Apr     May     Jun     Jul     Aug     Sep     Oct     Nov     Description       Hot water usage in litres per day for each month	ec
	07.00 (44)
	07.06 (44)
Energy content of hot water used	F0 7F
	53.75
Energy content (annual) Distribution loss	1531.31 (45)
0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.0	.00 (46)
store loss determined from EN 13203-2 tests, taken from boiler data record Hot water storage volume (litres) Hot water cylinder loss factor (kWh/day) Volume factor Temperature factor Energy lost from store (kWh/day) Total storage loss	0.00 (50) 0.0000 (51) 0.0000 (52) 0.0000 (53) 0.00 (55)
	.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   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.0	.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   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.0	.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   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.0	.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   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.0	.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   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.0	.00 (64)
Heat gains from water heating, kWh/month	0.00 (64)

### 5. Internal gains

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Metabol	ic 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
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
Appliand	ces gains	5									
243.53	246.06	239.69	226.13	209.02	192.94	182.19	179.66	186.03	199.59	216.70	232.79
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
Pumps a	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
Losses	e.g. evap	oration (r	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
Water he	eating ga	ins	,		,	,	,		,	,	,
45.35	43.91	40.93	36.87	34.24	30.53	27.38	31.41	32.85	37.05	41.79	43.92
Total inte	ernal gai	ns					,				
374.93	373.43	360.23	338.55	315.60	294.33	281.08	285.18	296.83	318.66	343.71	363.40

### 6. Solar gains (calculation for January)

	Area & Flux	g & FF	Shading	Gains
Window - Double-glazed, argon filled, low-E,	0.9 x 0.200 19.64	0.72 x 0.70	0.77	1.3720
En=0.2, hard coat (East)				
Specified U-Value = 1.20				
Window - Double-glazed, argon filled, low-E,	0.9 x 2.520 19.64	0.72 x 0.70	0.77	17.2867
En=0.2, hard coat (West)				
Specified U-Value = 1.20				
Window - Double-glazed, argon filled, low-E,	0.9 x 4.330 19.64	0.72 x 0.70	0.77	29.7029
En=0.2, hard coat (East)				
Specified U-Value = 1.20				
. Window - Double-glazed, argon filled, low-E,	0.9 x 0.550 10.63	0.72 x 0.70	0.77	2.0427
En=0.2, hard coat (North)				
Specified U-Value = 1.20				
Full glazed door - Double-glazed, argon filled,	0.9 x 6.680 19.64	0.72 x 0.70	0.77	45.8234
low-E, En=0.2, hard coat (West)				
Specified U-Value = 1.20				
Full glazed door - Double-glazed, argon filled,	0.9 x 3.780 19.64	0.72 x 0.70	0.77	25.9300
low-E, En=0.2, hard coat (East)				
Specified U-Value = 1.20				
Full glazed door - Double-glazed, argon filled,	0.9 x 2.630 10.63	0.72 x 0.70	0.77	9.7677
low-E, En=0.2, hard coat (North)				
Specified U-Value = 1.20				
Rooflight at 70° or less - Double-glazed,	0.9 x 4.670 26.00	0.72 x 0.70	1.00	55.0761
argon filled, low-E, En=0.2, hard coat (n/a)				
Value Specified II Value - 1 20				

Velux Specified U-Value = 1.20

Heating system responsiveness							21.00
	<b>—</b> 1.	1		r <u>-</u>	1 -	1	1.00
Jan Feb Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau		16	1	,	1	10	
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							
0.93 0.88 0.81 0.70 0.57	0.45	0.35	0.40	0.59	0.80	0.90	0.93
Mean internal temperature in living area	T1						
16.95 17.46 18.29 19.27 20.05	20.56	20.79	20.73	20.26	19.14	17.85	16.85
Temperature during heating periods in re	est of dwelli	ing Th2					
19.68	19.71	19.71	19.71	19.70	19.70	19.69	19.69
Utilisation factor for gains for rest of dwe	elling						
0.92 0.87 0.79 0.67 0.53	0.38	0.27	0.31	0.53	0.76	0.89	0.93
Mean internal temperature in the rest of	dwelling T2	2	Л		,	Д	
16.03   16.53   17.34   18.27   18.99	19.44	19.61	19.58	19.20	18.19	16.93	15.94
Living area fraction (46.23/92.46) Mean internal temperature (for the whole	e dwelling)		, T			,	0.50
16.49   16.99   17.81   18.77   19.52	2 20.00	20.20	20.16	19.73	18.67	17.39	16.40
Apply adjustment to the mean internal te	mperature	, where a	ppropria	ite	,		
16.49   16.99   17.81   18.77   19.52	2 20.00	20.20	20.16	19.73	18.67	17.39	16.40
8. Space heating requirement	γ.		1	1.		T.	
Jan Feb Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation factor for gains		1	1	Υ	n	1	
0.89 0.84 0.76 0.64 0.52	0.40	0.30	0.35	0.53	0.73	0.85	0.90
Useful gains		1	1	γ	1	1	
497.65   622.52   747.01   822.21   775.4	11 602.59	433.83	437.20	548.74	559.84	492.45	463.45
Monthly average external temperature			7			74	
4.30     4.90     6.50     8.90     11.70		16.60	16.40	14.10	10.60	7.10	4.20
Heat loss rate for mean internal tempera							
1698.13 1681.17 1569.79 1358.69 1074	.64 736.55	491.56	511.88	770.26	1108.47	1418.29	1686.88
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 mo	nth, kWh/m	nonth					
893.16 711.41 612.15 386.27 222.6	62 -	-	-	-	408.17	666.60	910.23
030.10   111.41   012.10   300.21   222.0							
Total space heating requirement per year Space heating requirement per m² (kWh	` ,	ar) (Octo	ber to Ma	ay)	,	Л	4810.62 52.03

# 8c. Space cooling requirement

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Externa	l tempera	aturers			,	<u>u</u>					
-	-	-	-	-	14.60	16.60	16.40	-	-	-	-
Heat lo	ss rate V	V		, and a second	,	<u>u</u>					
-	-	-	-	-	1282.40	1009.55	1035.44	-	-	-	-
Utilisati	on factor	for loss		, c	,						
-	-	-	-	-	0.72	0.77	0.74	-	-	-	-
Useful	loss W										
-	-	-	-	-	929.05	781.31	762.99	-	-	-	-
Interna	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 g	ains W										
0.00	0.00	0.00	0.00	0.00	1355.06	1285.18	1086.26	0.00	0.00	0.00	0.00
Gains \	N										
-	-	_	-	_	1800.32	1712.86	1520.68	-	-	-	-
Fraction	n of mont	h for coo	ling								
0.00	0.00	0.00	0.00	0.00	1.00	1.00	1.00	0.00	0.00	0.00	0.00
Space I	heating k	:Wh									
-	-	-	-	-	72.47	-4.99	-15.90	-	-	-	-
Space	cooling k	Wh									
-	-	-	-	-	627.31	693.07	563.73	-	-	-	-
	fraction ttency fac	etor									1884.11 1.00
_	]_	1_	1_	1_	0.25	0.25	0.25	1_	1_	1_	_
Space	 cooling re	eauireme	nt for mo	nth	0.20	0.20	0.20				
-	1-	-	_	1-	156.83	173.27	140.93	_	1-		-
Space o	cooling (	June to A	Juaust)		100.00	170.27	1 10.00		_		471.03
•	• •		ent per m	² (kWh/m	<sup>2</sup> /year)						5.09

kwn/year	
52.03	(99)
5.09	(108)
57.12	(109)
57.1	(109)
	52.03 5.09 57.12

# **Project Information**

Building type Detached house

Reference J5067-3

Date 7 October 2019

Client DCM Architectural Consultants Ltd Project Unit 3

25 Pigeon Lane 66 Borstal Hill
Herne Bay Whitstable
Kent Kent
CT6 7EH CT5 4NB

### 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	<b>`</b> 106.79	(3a)
First floor	46.23	2.50	115.57	(3b)
Total floor area	92.46			(4)
Dwelling volume (m³)			222.37	(5)

### 2. Ventilation rate

											m³ per ho	our
							main + s	eonda	ry + othe	er		
							heating					
	er of chim						0 + 0 + 0		x 40		0.00	(6a)
	er of oper						0 + 0 + 0	)	x 20		0.00	(6b)
Numbe	er of inter	mittent fa	ans				4		x 10		40.00	(7a)
Numbe	er of pass	ive vents	;				0		x 10		0.00	(7b)
Numbe	er of fluel	ess gas f	ires				0		x 40		0.00	(7c)
											Air chang	ges per hour
Infiltrat	ion due t	o chimne	eys, fans	and flue	S						0.18	(8)
Pressu	ire test, r	esult q50	)						5.00			(17)
Air perr	meability										0.43	(18)
Numbe	er of side	s on whic	ch shelte	red							2.00	(19)
Shelter	rfactor										0.85	(20)
Infiltrat	ion rate ii	ncorpora	iting shel	ter factor							0.37	(21)
Infiltrat	ion rate r	nodified	for montl	hly wind s	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	
Wind F	actor										52.50	(22)
1.27	1.25	1.23	1.10	1.07	0.95	0.95	0.93	1.00	1.07	1.13	1.18	
1.21	1.20	1.20	1.10	1.01	0.00	0.00	0.00	1.00	1.07	1.10	13.13	(22a)
Adjuste	ed infiltra	tion rate	(allowing	g for shelf	ter and v	vind spee	ed)				10.10	(ΣΣα)
0.47	0.46	0.45	0.40	0.39	0.35	0.35	0.34	0.37	0.39	0.41	0.43	
	н	н	н	Я		и.	ı.	*	т.	н	4.80	(22b)
Ventila	tion : nat	ural vent	tilation, i	ntermitte	nt extrac	t fans						
Effectiv	ve air cha	inge 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)
						IL						

3. Hea	t losses	and	heat	loss	parameter
--------	----------	-----	------	------	-----------

Element	Gross area, m <sup>2</sup>	Openings m <sup>2</sup>	Netarea A, m²	U-value W/m²K	A x U W/K	kappa-value kJ/m²K	A x K kJ/K	
Window - Dou		111	0.200	1.15 (1.20)	0.23	NO/III IX	NO/IX	(27)
	ow-E, En=0.2,		0.200	1.13 (1.20)	0.20			(21)
hard coat (Ea								
•	-Value = 1.20							
Window - Dou			2.520	1.15 (1.20)	2.89			(27)
	ow-E, En=0.2,		2.520	1.13 (1.20)	2.00			(21)
hard coat (W								
•	-Value = 1.20							
Window - Dou			4.330	1.15 (1.20)	4.96			(27)
	ow-E, En=0.2,		41000	(1120)	1100			(=: )
hard coat (Ea								
•	-Value = 1.20							
Window - Dou			0.550	1.15 (1.20)	0.63			(27)
	ow-E, En=0.2,		0.000	(=0)				( )
hard coat (No								
•	-Value = 1.20							
Full glazed do			6.680	1.20	8.02			(26)
-	d, argon filled,							` ,
low-E, En=0.	-							
(West)								
Specified U	-Value = 1.20							
Full glazed do	oor -		3.780	1.20	4.54			(26)
Double-glaze	d, argon filled,							
low-E, En=0.2	2, hard coat							
(East)								
Specified U	-Value = 1.20							
Full glazed do	oor -		2.630	1.20	3.16			(26)
_	d, argon filled,							
low-E, En=0.2	2, hard coat							
(North)								
•	-Value = 1.20							
Rooflight at 7			4.670	1.15 (1.20)	5.35			(27)
•	d, argon filled,							
low-E, En=0.2	2, hard coat							
(n/a)		4.00						
	ified U-Value =	: 1.20	4.45	0.04	0.07	0.00	07.05	(00)
Walls	a alka		4.15	0.21	0.87	9.00	37.35	(29)
Dormer Che	eeks - ard/Battens/9 C	)CD/E1						
	Timber Frame I							
•	elotex XR4000							
Studs/12.5		Detween						
Walls	ı bu		96.74	0.20	19.35	9.00	870.66	(29)
	eatherboard/Ba	attens/100	30.74	0.20	10.00	0.00	070.00	(23)
•	nse Block)/51 (							
	ne Insulated W	•						
Celotex XR	4000 Between	Studs/12.5						
P'bd		-						
Ground floors			46.23	0.12	5.55	75.00	3467.25	(28)
Beam/Medi	um Dense Bloo	ck/150						, ,
Kingspan TI	70/Screed							
			D.	ago 47 of 84				

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Page 47 of 84

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3.	Heat	losses	and	heat	loss	parameter
----	------	--------	-----	------	------	-----------

Element		Gross area, m <sup>2</sup>		enings	Net area A, m <sup>2</sup>		⁄alue m²K	A x U W/K		ppa-value /m²K	A x K kJ/K	
Flat roof		,			3.36		0.15	0.5	0	9.00	30.24	(30)
150 Kir	ngspan T	R27 Ove	er Joists									, ,
Pitched				afters	51.06	5	0.12	6.1	3	9.00	459.54	(30)
	• .	K7 Between										
			(118 Und Iembrand									
Kaileis	S VVILLI DI	eamenivi	embrane	ð								
Total are	ea of exte	ernal elei	ments Si	gma A, r	n²						226.9	90 (31)
Fabric h				,							62.1	, ,
Heat cap	oacity										4865.0	04 (34)
Thermal	mass pa	arameter	, kJ/m²K								52.6	62 (35)
Effect of	thermal	bridges									34.0	04 (36)
Total fab	ric heat	loss									96.1	19 (37)
Ventilati	on heat l	oss calc	ulated m	onthly								
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 trai	nsfer coe	efficient,	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	
	,	,	,	,		,	,		,	,	138.8	31 (39)
Heat los	s param	eter (HLF	P), W/m²	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 (ave	erage)							,			1.5	50 (40)
Number	of days i	n month	(Table 1	a)								
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
31	28	31	30	31	30	31	31	30	31	30	31	

	<i>r heatin</i> g d occupa	-	/ require	ements							kWh/year 2.66	(42)
Annuala	average l	not water	usage ir	n litres pe	er day Vd	,average	)				97.33	(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water	er usage	in litres p	oer day f	or each r	nonth							
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 c	f hot wat	er 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 (a	annual)			,	J.				J	1531.31	(45)
Distribut	tion 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)
	er storage		` ,								150.00	(50)
	er cylinde	er loss fa	ctor (kW	h/day)							0.0191	(51)
Volume											0.9283	(52)
	ature fact			(1.14/1./							0.5400	(53)
٠,	ost from		r cylinde	er (KVVh/c	lay)						1.44	(55)
	rage los			1	1	1		1	1	1		(==)
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 stor	age 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 he	at require	ed for wa	ter heati	ng calcul	ated for	each mo	nth			,		
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 f	rom wate	r heater	for each	month, l	«Wh/mor	nth				J		
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)
	n.					n.				н	2329.49	(64)
Heat gai	ins from v	water hea	ating, kW	/h/month	1							
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
Metabol	ic 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
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
Appliand	ces gains	3									
243.53	246.06	239.69	226.13	209.02	192.94	182.19	179.66	186.03	199.59	216.70	232.79
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
Pumps a	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
Losses	e.g. evap	oration (r	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
Water h	eating ga	ins									
143.85	141.60	136.93	130.58	126.46	120.66	115.73	122.05	124.29	130.86	138.28	141.61
Total int	ernal gai	ns									
476.43	474.12	459.23	435.26	410.83	387.46	372.43	378.82	391.27	415.47	443.20	464.09

# 6. Solar gains (calculation for January)

	Area & Flux	g & FF	Shading	Gains
Window - Double-glazed, argon filled, low-E,	0.9 x 0.200 19.64	0.72 x 0.70	0.77	1.3720
En=0.2, hard coat (East)				
Specified U-Value = 1.20				
Window - Double-glazed, argon filled, low-E,	0.9 x 2.520 19.64	0.72 x 0.70	0.77	17.2867
En=0.2, hard coat (West)				
Specified U-Value = 1.20				
Window - Double-glazed, argon filled, low-E,	0.9 x 4.330 19.64	0.72 x 0.70	0.77	29.7029
En=0.2, hard coat (East)				
Specified U-Value = 1.20				
. Window - Double-glazed, argon filled, low-E,	0.9 x 0.550 10.63	0.72 x 0.70	0.77	2.0427
En=0.2, hard coat (North)				
Specified U-Value = 1.20				
Full glazed door - Double-glazed, argon filled,	0.9 x 6.680 19.64	0.72 x 0.70	0.77	45.8234
low-E, En=0.2, hard coat (West)				
Specified U-Value = 1.20				
Full glazed door - Double-glazed, argon filled,	0.9 x 3.780 19.64	0.72 x 0.70	0.77	25.9300
low-E, En=0.2, hard coat (East)				
Specified U-Value = 1.20				
Full glazed door - Double-glazed, argon filled,	0.9 x 2.630 10.63	0.72 x 0.70	0.77	9.7677
low-E, En=0.2, hard coat (North)				
Specified U-Value = 1.20				
Rooflight at 70° or less - Double-glazed,	0.9 x 4.670 26.00	0.72 x 0.70	1.00	55.0761
argon filled, low-E, En=0.2, hard coat (n/a)				
Value Specified II Value - 1 20				

Velux Specified U-Value = 1.20

Jan		esponsi	1	1	1.			r_		1	1.00
	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	1	1	1			1	·r		1	1	1
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
Utilisati	ion factor	for gains	for living	area							
0.91	0.87	0.79	0.68	0.56	0.43	0.34	0.38	0.57	0.77	0.88	0.92
Mean ir	nternal tei	mperatur	e in living	garea T1							
17.11	17.59	18.39	19.34	20.09	20.58	20.81	20.75	20.30	19.25	18.00	17.02
Tempe	rature du	ring heat	ing perio	ds in rest	of dwelli	ng 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
Utilisati	ion factor	for gains	for rest	of dwellir	ng						
0.90	0.85	0.77	0.65	0.51	0.37	0.25	0.30	0.50	0.73	0.86	0.91
Mean ir	nternal te	mperatui	e in the r	est of dw	elling T2	2	,		,	,	
16.18	16.65	17.43	18.33	19.02	19.45	19.61	19.58	19.23	18.28	17.07	16.09
_	area fracti	,	,		7	,			,		0.50
Mean ir	nternal ter	nperatur	e (for the	whole d	welling)						
16.64	17.12	17.91	18.83	19.55	20.01	20.21	20.17	19.77	18.76	17.53	16.56
Apply a	adjustmer	t to the n	nean inte	rnal tem <sub>l</sub>	perature,	, where a	appropria	ite			
16.64	17.12	17.91	18.83	19.55	20.01	20.21	20.17	19.77	18.76	17.53	16.56
0 Cno	aa baatir	~ *~~!!	romont								
-	Feb		-ir	Max	1	1	Δ	Con	0-4	Nov	Dan
la.a	reb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Jan	:										
Utilisati	ion factor		10	0.50	10.00	0.00	0.00	0.54	0.70	0.00	0.07
Utilisati 0.86	0.81	0.73	0.62	0.50	0.38	0.29	0.33	0.51	0.70	0.82	0.87
Utilisati 0.86 Useful (	0.81 gains	0.73	0.62		J	]	JL			]	
Utilisati 0.86 Useful ( 571.67	0.81 gains 687.27	0.73	0.62	798.79	0.38	0.29	0.33	0.51	0.70	0.82 558.66	0.87
Utilisati 0.86 Useful ( 571.67 Monthly	0.81 gains 687.27 yaverage	0.73 798.78 external	0.62 858.44 tempera	798.79 ture	615.60	441.01	446.55	571.69	606.33	558.66	538.98
Utilisati 0.86 Useful ( 571.67 Monthly	0.81 gains ( 687.27 yaverage 4.90	0.73 798.78 external 6.50	0.62 858.44 tempera 8.90	798.79 ture 11.70	615.60	]	JL			]	
Utilisati 0.86 Useful ( 571.67 Monthly 4.30 Heat lo	0.81 gains 687.27 yaverage 4.90 ss rate fo	0.73   798.78   external   6.50   mean in	0.62 858.44 tempera 8.90 nternal te	798.79 ture 11.70 mperatu	615.60 14.60	441.01 16.60	446.55	571.69	606.33	558.66	538.98
Utilisati 0.86 Useful ( 571.67 Monthly 4.30 Heat lo	0.81 gains 7 687.27 y average 4.90 ss rate fo	0.73 798.78 external 6.50 r mean in 1599.88	858.44 tempera 8.90 nternal te	798.79 ture 11.70 mperatu	615.60 14.60	441.01	446.55	571.69	606.33	558.66	538.98
Utilisati 0.86 Useful ( 571.67 Monthly 4.30 Heat lo	0.81 gains 687.27 yaverage 4.90 ss rate fo	0.73 798.78 external 6.50 r mean in 1599.88	858.44 tempera 8.90 nternal te	798.79 ture 11.70 mperatu	615.60 14.60	441.01 16.60	446.55	571.69	606.33	558.66	538.98
Utilisati 0.86 Useful ( 571.67 Monthly 4.30 Heat lo	0.81 gains 7 687.27 y average 4.90 ss rate fo	0.73 798.78 external 6.50 r mean in 1599.88	858.44 tempera 8.90 nternal te	798.79 ture 11.70 mperatu	615.60 14.60	441.01 16.60	446.55	571.69	606.33	558.66	538.98
Utilisati 0.86 Useful ( 571.67 Monthly 4.30 Heat lo 1738.4 Fraction	0.81 gains 687.27 yaverage 4.90 ss rate fo 14 1717.57	0.73 798.78 external 6.50 r mean in 1599.88 n for hea 1.00	858.44 tempera 8.90 nternal te 1379.05 ting 1.00	798.79 ture 11.70 mperatu 1088.04	615.60 14.60 re 743.49	441.01   16.60   495.54	446.55 16.40 516.50	571.69 14.10 781.12	10.60 1130.86	558.66 7.10 1450.65	538.98 4.20 1725.33
Utilisati 0.86 Useful of 571.67 Monthly 4.30 Heat local 1738.4 Fraction 1.00	0.81 gains 7 687.27 y average 4.90 ss rate fo 14 1717.55 n of mont 1.00 heating re	0.73 798.78 external 6.50 mean in 1599.88 n for hea 1.00 equireme	858.44 tempera 8.90 nternal te 1379.05 ting 1.00	798.79 ture 11.70 mperatu 1088.04 1.00 ch month	615.60 14.60 re 743.49 -	441.01   16.60   495.54	446.55 16.40 516.50	571.69 14.10 781.12	10.60 1130.86	558.66 7.10 1450.65	538.98 4.20 1725.33
Utilisati 0.86 Useful ( 571.67 Monthly 4.30 Heat lo 1738.4 Fraction 1.00 Space l 868.08 Total sp	0.81 gains 7 687.27 y average 4.90 ss rate fo 14 1717.55 n of mont 1.00 heating re	0.73 798.78 external 6.50 r mean in 1599.88 n for hea 1.00 equireme 596.02 ing requi	0.62   858.44   tempera   8.90   1379.05   ting   1.00   ent for ea   374.84   irement p	798.79 ture 11.70 mperatu 1088.04 1.00 ch month 215.20 per year (	615.60 14.60 re 743.49 - n, kWh/m	441.01 16.60 495.54 - onth	446.55   16.40   516.50   -	571.69 14.10 781.12	10.60 1130.86 1.00	7.10 1450.65	538.98 4.20 1725.33 1.00

# 8c. Space cooling requirement - not applicable

### 9a. Energy requirements

9a. Energy requirements  kWh/yea	r
No secondary heating system selected  Fraction of space heat from main system(s)  Efficiency of main heating system  1.0000  88.80%	(202) (206)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	
Space heating requirement	
868.08   692.36   596.02   374.84   215.20   -   -   -   -   390.25   642.24   882.64	(98)
Appendix Q - monthly energy saved (main heating system 1)	
0.00   0.00   0.00   0.00   -   -   -   -   -   0.00   0.00   0.00	(210)
Space heating fuel (main heating system 1)	
977.56 779.68 671.19 422.12 242.34 439.47 723.24 993.96	(211)
Appendix Q - monthly energy saved (main heating system 2)	
0.00 0.00 0.00 0.00 0.00 0.00 0	(212)
Space heating fuel (main heating system 2)	
0.00 0.00 0.00 0.00 0.00 0.00 0	(213)
Appendix Q - monthly energy saved (secondary heating system)	
0.00 0.00 0.00 0.00 0.00 0.00 0	(214)
Space heating fuel (secondary)	
0.00   0.00   0.00   0.00   -   -   -   -   0.00   0.00   0.00	(215)
Waterheating	
Water heating requirement	
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)
Efficiency of water heater 79.50	(216)
86.70 86.53 86.16 85.43 84.21 79.50 79.50 79.50 79.50 85.44 86.34 86.76	(217)
Water heating fuel	
261.31 231.23 244.97 223.01 222.84 212.63 205.83 223.62 222.52 231.15 239.98 255.34	(219)
Annual totals  Space heating fuel used, main system 1  Space heating fuel (secondary)  Water heating fuel  2774.44	(211) (215) (219)
Electricity for pumps, fans and electric keep-hot central heating pump boiler with a fan-assisted flue  Total electricity for the above, kWh/year Electricity for lighting (100.00% fixed LEL)  30.00 45.00 45.00 409.43	(230c) (230e) (231) (232)
Energy saving/generation technologies  Appendix Q - Energy saved or generated (): Energy used ():  Total delivered energy for all uses  8508.43	(236a) (237a) (238)

10a. Does not apply

11a. Does not apply

Page 52 of 84

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#### 12a. Carbon dioxide emissions

	Energy	Emission factor	<b>Emission</b>	S
	kWh/year	kg CO2/kWh	kg CO2/y	ear
Space heating, main system 1	5249.57	0.216	1133.91	(261)
Space heating, main system 2	0.00	0.000	0.00	(262)
Space heating, secondary	0.00	0.519	0.00	(263)
Waterheating	2774.44	0.216	599.28	(264)
Space and water heating			1733.18	(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			1984.60	(272)
			kg/m²/yea	ar

21.46

(273)

**Dwelling Carbon Dioxide Emission Rate (DER)** 

# **Project Information**

Building type Detached house

Reference J5067-3

Date 7 October 2019

Client DCM Architectural Consultants Ltd Project Unit 3

25 Pigeon Lane 66 Borstal Hill
Herne Bay Whitstable
Kent Kent
CT6 7EH CT5 4NB

### 1. Overall dwelling dimensions

	Area	Av. Storey	Volume	
	(m²)	height (m)	(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 (m³)			222.37	(5)

#### 2. Ventilation rate

	uiauon r										m³ per ho	our
							main + s	eonda	ry + othe	r		
							heating					
	er of chim	,					0 + 0 + 0		x 40		0.00	(6a)
	er of open						0 + 0 + 0		x 20		0.00	(6b)
	er of interr		_				3		x 10		30.00	(7a)
	er of passi						0		x 10		0.00	(7b)
Numbe	er of fluele	ess gas fi	res				0		x 40		0.00	(7c)
											Air chang	ges per hour
Infiltrat	ion due to	chimne	ys, fans	and flues	3						0.13	(8)
Pressu	re test, re	esult q50	)						5.00			(17)
	meability										0.38	(18)
Numbe	er of sides	on whic	h shelter	ed							2.00	(19)
Shelter	factor										0.85	(20)
	ion rate ir										0.33	(21)
Infiltrat	ion rate n	nodified f	or month	lly wind s	peed							
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 F	actor											
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)
Adjuste	ed infiltrat	ion rate (	(allowing	for shelt	er and w	ind spee	d)					
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)
	tion : nat		ilation, in	termitter	nt extract	fans						
Effectiv	e air cha	nge 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								
Element	Gross	Openings	Netarea	U-value	AxU	kappa-value		
Mindon Davida	area, m²	m²	A, m <sup>2</sup>	W/m <sup>2</sup> K	W/K	kJ/m²K	kJ/K	(07)
Window - Double			0.500	1.33 (1.40)	0.66			(27)
air-filled, low-E,	En=0.1, Soit							
coat (North)	alua 1 00							
Specified U-Va			2.050	4 22 (4 40)	E 0.4			(27)
Window - Double	-		3.950	1.33 (1.40)	5.24			(27)
air-filled, low-E,	⊏⊓=0.1, SOIL							
coat (East) Specified U-Va	alua – 1 20							
•			2 200	4 22 (4 40)	3.05			(27)
Window - Double	-		2.300	1.33 (1.40)	3.03			(27)
air-filled, low-E, coat (West)	⊑11=0.1, S01t							
Specified U-Va	aluo – 1 20							
Window - Double			0.180	1 22 (1 40)	0.24			(27)
air-filled, low-E,	-		0.100	1.33 (1.40)	0.24			(27)
coat (East)	⊑11=0.1, SUIT							
Specified U-Va	20 ـ ـ ـ ـ ـ ـ ـ ـ ـ ـ ـ ـ ـ ـ ـ ـ ـ ـ ـ							
Full glazed door			2.400	1.40	3.36			(26)
Double-glazed, a			2.400	1.40	5.50			(20)
low-E, En=0.1,								
(North)	son coat							
Specified U-Va	alue = 1 20							
Full glazed door			3.450	1.40	4.83			(26)
Double-glazed, a			3.430	1.40	4.00			(20)
low-E, En=0.1, s								
(East)	Joir Cour							
Specified U-Va	alue = 1.20							
Full glazed door			6.090	1.40	8.53			(26)
Double-glazed, a			0.000					()
low-E, En=0.1, s								
(West)								
Specified U-Va	alue = 1.20							
Rooflight at 70°			4.260	1.59 (1.70)	6.78			(27)
Double-glazed, a				, ,				` ,
low-E, En=0.1, s								
(n/a)								
Velux Specifie	d U-Value =	1.20						
Walls			98.54	0.18	17.74	9.00	886.86	(29)
Brick or (Weath	nerboard/Bat	ttens/100						
Medium Dense	Block)/51 C	avity/140						
Timber Frame	Insulated Wi	ith 120						
Celotex XR400	00 Between S	Studs/12.5						
P'bd								
Walls			4.17	0.18	0.75	9.00	37.53	(29)
Dormer Cheek								
Weatherboard								
Cavity/140 Tim								
With 120 Celot		Between						
Studs/12.5 P'b	d							
O			40.00	0.40	0.04	75.00	0.407.05	(00)

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Beam/Medium Dense Block/150

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Kingspan TF70/Screed

Ground floors

0.13

6.01

75.00

3467.25

(28)

46.23

Page 56 of 84

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Approval of JPA Designer by BRE applies only to the software, data is not subject to quality control procedures, users are themselves responsible for the accuracy of the data. The results of the calculation should not be accepted without first checking the input data.

3. Heat	losses a	and hear	t loss pa	rameter									
Element	:	Gross	•	enings	Netarea		/alue	A x U		appa-valu			
		area, m <sup>2</sup>	m <sup>2</sup>		A, m²	W/	m²K	W/K	k	J/m²K	kJ/K		
Flat roof	s				3.36	6	0.13	0.4	4	9.00	30.24	(3	30)
150 Kir	ngspan 1	TR27 Ove	er Joists										
Pitched	roofs ins	ulated be	etween ra	afters	51.47	7	0.13	6.6	9	9.00	463.23	3 (3	30)
150 Kii	ngspan k	<7 Between	en										
Rafters	s/52.5 Ki	ngspan k	<118 Und	der									
Rafters	s With Br	eather M	lembran	Э									
Total are	ea of exte	ernal ele	ments Si	gma A. r	n²						226.9	90 (3	31)
Fabric h				<b>J</b> , .							64.3	•	33)
		arameter	, kJ/m²K	(user-sp	ecified TI	MP)					250.0	•	35)
Effect of			,			,					11.3	•	36)
Total fab	oric heat	loss									75.6	•	37)
Ventilati	on heat	loss calc	ulated m	onthly								•	,
43.08	42.83	42.58	41.44	41.23	40.23	40.23	40.05	40.62	41.23	41.66	42.11	(3	38)
Heat tra	nsfer coe	efficient,	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		
			->								117.1	10 (3	39)
Heat los	s param	eter (HLI	<sup>3</sup> ), W/m <sup>2</sup>	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		
HLP (ave	0 /										1.2	27 (4	40)
Number	of days i	in month	(Table 1	a)									
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
31	28	31	30	31	30	31	31	30	31	30	31		

	er heatin		y require	ements							kWh/year	(40)
	ed occupa average	•	rusage ir	n litres pe	er day Vd	l,average	e				2.66 97.33	(42) (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	( )
Hot wat	er usage	in litres រុ	per day f	or each r	nonth	JI.			JL	JL		
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 o	of hot wat	ter 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	
	content (a tion loss	annual)									1531.31	(45)
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 wate Volume Temper Energy	er storag er cylindo factor ature fact lost from orage los	er loss fa or store (k\	ctor (kW	h/day)							0.00 0.0000 0.0000 0.0000 0.00	(50) (51) (52) (53) (55)
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 stor	age loss		А			Л			,	J		
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 I	oss calcı	ılated for	each mo	onth								
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 he	at requir	ed for wa	ter heati	ng calcul	ated for	each mo	nth					
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 f	from water	er heater	for each	month, l	kWh/mor	nth						
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)
lleet a-	ina funcio		-4i	/la /sa a := 41							0.00	(64)
33.74	ins from 29.51	30.45	26.55	vn/montr 25.47	1 21.98	20.37	23.37	23.65	27.56	30.09	32.67	(65)
33.74	29.01	30.45	20.55	20.41	21.90	20.37	20.31	25.05	27.50	30.08	32.01	(00)

### 5. Internal gains

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Metabol	ic 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
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
Appliand	ces 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
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
Pumps a	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
Losses	e.g. evap	oration (r	egative	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
Water he	eating ga	ins									
45.35	43.91	40.93	36.87	34.24	30.53	27.38	31.41	32.85	37.05	41.79	43.92
Total inte	ernal gaiı	าร									
375.40	373.85	360.57	338.81	315.79	294.50	281.26	285.41	297.14	319.05	344.17	363.88

# 6. Solar gains (calculation for January)

o. Colar gams (calculation for samually)	Area & Flux	g & FF	Shading	Gains
Window - Double-glazed, air-filled, low-E,	0.9 x 0.500 10.63	•	0.77	1.6249
En=0.1, soft coat (North)	0.0 % 0.000 .0.00		• • • • • • • • • • • • • • • • • • • •	
Specified U-Value = 1.20				
Window - Double-glazed, air-filled, low-E,	0.9 x 3.950 19.64	0.63 x 0.70	0.77	23.7092
En=0.1, soft coat (East)				
Specified U-Value = 1.20				
Window - Double-glazed, air-filled, low-E,	0.9 x 2.300 19.64	0.63 x 0.70	0.77	13.8053
En=0.1, soft coat (West)				
Specified U-Value = 1.20				
Window - Double-glazed, air-filled, low-E,	0.9 x 0.180 19.64	0.63 x 0.70	0.77	1.0804
En=0.1, soft coat (East)				
Specified U-Value = 1.20				
Full glazed door - Double-glazed, air-filled,	0.9 x 2.400 10.63	0.63 x 0.70	0.77	7.7993
low-E, En=0.1, soft coat (North)				
Specified U-Value = 1.20	0.0 × 0.450.40.04	0.00 × 0.70	0.77	20.7000
Full glazed door - Double-glazed, air-filled,	0.9 x 3.450 19.64	0.63 x 0.70	0.77	20.7080
low-E, En=0.1, soft coat (East)				
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 (West)	0.9 X 0.090 19.04	0.03 X 0.70	0.77	30.3341
Specified U-Value = 1.20				
Rooflight at 70° or less - Double-glazed,	0.9 x 4.260 26.00	0.63 x 0.70	1.00	43.9606
air-filled, low-E, En=0.1, soft coat (n/a)	0.5 X 4.200 20.00	0.00 X 0.70	1.00	40.0000
Velux Specified U-Value = 1.20				
voian oposition o value - 1120				

•	rannre onn	ring heati	<b>rature</b> ing period	ds in the l	living are	a Th1 <i>(</i> º	C)				21.00
ı ıcalııl0	system r	-	• .	30 111 1110 1	iving are	α, ππ (	<b>O</b> )				1.00
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau					1			1 1			
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	_	JI	Л	JL	J	JI.	JL		J	JI	
4.61	4.61	4.62	4.66	4.66	4.69	4.69	4.70	4.68	4.66	4.65	4.63
Utilisati	on factor	for gains	for living	area		JI	JL		JI	II	
1.00	0.99	0.98	0.91	0.76	0.56	0.42	0.49	0.78	0.97	1.00	1.00
Mean in	ternal ter	nperatur	e in living	area T1		.A.	,		,	,	
19.55	19.77	20.14	20.58	20.87	20.97	20.99	20.99	20.89	20.44	19.90	19.52
Temper	rature dui	ring heati	ng perio	ds in rest	of dwelli	ng 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
Utilisati	on factor	for gains	for rest	of dwellir	ng				,		
1.00	0.99	0.97	0.88	0.69	0.47	0.31	0.38	0.69	0.96	0.99	1.00
Mean ir	nternal tei	mperatur	e in the r	est of dw	elling T2	2					
18.54	18.76	19.12	19.55	19.79	19.87	19.88	19.88	19.82	19.43	18.90	18.51
_	rea fracti nternal ter	`	,		welling)						0.50
19.05	19.26	19.63	20.06	20.33	20.42	20.44	20.43	20.35	19.94	19.40	19.01
Apply a	djustmen	t to the m	nean inte	rnal tem	perature	, where a	ppropria	ite			·
19.05	19.26	19.63	20.06	20.33	20.42	00.44	1		ir .		
		10.00	20.00	20.55	20.42	20.44	20.43	20.35	19.94	19.40	19.01
	ce heatin	g requir	rement			J.	J.		J.		
Jan	Feb	g requir Mar	rement Apr	May	Jun	Jul	20.43 Aug	20.35 Sep	19.94 Oct	19.40 Nov	19.01 Dec
Jan Utilisati	Feb on factor	g requir Mar for gains	rement Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Jan Utilisatio	Feb on factor 0.99	g requir Mar	rement Apr			J.	J.		J.		
Jan Utilisation 1.00 Useful g	Feb on factor 0.99 gains	Mar for gains	Apr 0.89	May 0.72	Jun 0.52	Jul 0.37	Aug 0.43	Sep	Oct 0.96	Nov 0.99	Dec 1.00
Jan Utilisatio 1.00 Useful g 523.21	Feb on factor 0.99 gains 665.11	Mar for gains 0.97	Apr 0.89	May 0.72 908.71	Jun	Jul	Aug 0.43	Sep	Oct	Nov	Dec 1.00
Jan Utilisatio 1.00 Useful g 523.21 Monthly	Feb on factor 0.99 gains 665.11 vaverage	Mar for gains 0.97	Apr 0.89 970.15 tempera	0.72 908.71 ture	Jun 0.52 657.79	Jul 0.37 441.89	Aug 0.43 461.18	Sep 0.73 650.94	Oct 0.96 645.32	Nov 0.99 527.88	Dec 1.00 485.14
Jan Utilisation 1.00 Useful gradient 523.21 Monthly 4.30	Feb on factor 0.99 gains 665.11 average 4.90	Mar for gains 0.97 835.99 external 6.50	970.15 tempera	May  0.72  908.71  ture  11.70	Jun 0.52 657.79 14.60	Jul 0.37	Aug 0.43	Sep	Oct 0.96	Nov 0.99	Dec 1.00
Jan Utilisatio 1.00 Useful g 523.21 Monthly 4.30 Heat los	Feb on factor 0.99 gains 665.11 average 4.90 ss rate for	Mar for gains 0.97 835.99 external 6.50 r mean in	970.15 tempera 8.90	0.72 908.71 ture 11.70 mperature	Jun  0.52  657.79  14.60 re	Jul 0.37 441.89 16.60	Aug  0.43  461.18  16.40	Sep 0.73 650.94	Oct 0.96 645.32	Nov 0.99 527.88 7.10	Dec 1.00 485.14 4.20
Jan Utilisation 1.00 Useful of 523.21 Monthly 4.30 Heat los	Feb on factor 0.99 gains 665.11 average 4.90 ss rate for	Mar for gains 0.97 835.99 external 6.50 mean in 1552.32	970.15 tempera 8.90 ternal te	0.72 908.71 ture 11.70 mperature	Jun  0.52  657.79  14.60 re	Jul 0.37 441.89	Aug 0.43 461.18	Sep 0.73 650.94	Oct 0.96 645.32	Nov 0.99 527.88 7.10	Dec 1.00 485.14
Jan Utilisatio 1.00 Useful g 523.21 Monthly 4.30 Heat los 1750.90 Fraction	Feb on factor 0.99 gains 665.11 vaverage 4.90 ss rate for 1701.86	Mar for gains 0.97 835.99 external 6.50 r mean in 1552.32 n for heaf	970.15 tempera 8.90 ternal te	0.72 908.71 ture 11.70 mperature 1008.53	Jun  0.52  657.79  14.60 re	Jul 0.37 441.89 16.60	Aug  0.43  461.18  16.40  466.65	Sep  0.73  650.94  14.10  727.24	Oct 0.96 645.32 10.60	Nov 0.99 527.88 7.10	Dec 1.00 485.14 4.20 1744.63
Jan Utilisation 1.00 Useful of 523.21 Monthly 4.30 Heat los 1750.90 Fraction 1.00	Feb on factor 0.99 gains 665.11 average 4.90 ss rate for 1701.86 n of month	Mar for gains 0.97  835.99 external 6.50 mean in 1552.32 for hear	970.15 tempera 8.90 ternal te 1307.36 ting	May  0.72  908.71  ture  11.70  mperature  1008.53	Jun  0.52  657.79  14.60 re  674.54	Jul 0.37 441.89 16.60 444.50	Aug  0.43  461.18  16.40	Sep 0.73 650.94	Oct 0.96 645.32	Nov 0.99 527.88 7.10	Dec 1.00 485.14 4.20
Jan Utilisatio 1.00 Useful g 523.21 Monthly 4.30 Heat los 1750.96 Fractior 1.00 Space h	Feb on factor 0.99 gains 665.11 vaverage 4.90 ss rate for for for month 1.00 neating re	mg requireme	970.15 tempera 8.90 ternal te 1307.36 ting 1.00 ent for each	0.72 908.71 ture 11.70 mperature 1008.53	Jun  0.52  657.79  14.60 re  674.54	Jul 0.37 441.89 16.60 444.50	Aug  0.43  461.18  16.40  466.65	Sep  0.73  650.94  14.10  727.24	Oct 0.96 645.32 10.60 1091.35	Nov  0.99  527.88  7.10  1443.37	Dec 1.00 485.14 4.20 1.00
Jan Utilisation 1.00 Useful gradient 523.21 Monthly 4.30 Heat los 1750.90 Fraction 1.00 Space h	Feb on factor 0.99 gains 665.11 vaverage 4.90 ss rate for for for month 1.00 neating re	mg requireme	970.15 tempera 8.90 ternal te 1307.36 ting 1.00 ent for eac	0.72  908.71  ture  11.70  mperature  1008.53  1.00  ch month	Jun  0.52  657.79  14.60  re  674.54  -  n, kWh/m  -	Jul 0.37 441.89 16.60 444.50	Aug  0.43  461.18  16.40  466.65	Sep  0.73  650.94  14.10  727.24	Oct 0.96 645.32 10.60	Nov 0.99 527.88 7.10	Dec 1.00 485.14 4.20 1744.63

### 8c. Space cooling requirement

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Externa	Itempera	aturers	JL -		JL		<u>.                                      </u>				
-	-	-	-	-	14.60	16.60	16.40	-	-	-	-
Heat los	ss rate V	Ï	-11				,				
-	_	-	_	-	1089.37	857.59	879.36	[-	-	-	-
Utilisatio	on factor	for loss					J				
-	-	-	-	-	0.93	0.96	0.94	-	-	-	-
Useful I	oss W										
-	-	-	-	-	1014.45	826.52	828.82	-	-	-	-
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 ga	ains W										
0.00	0.00	0.00	0.00	0.00	1081.45	1025.67	866.92	0.00	0.00	0.00	0.00
Gains V	V										
-	-	-	-	-	1527.11	1453.79	1301.92	-	-	-	-
Fraction	of mont	h for coo	ling								
0.00	0.00	0.00	0.00	0.00	1.00	1.00	1.00	0.00	0.00	0.00	0.00
Space h	neating k	Wh									
-	-	-	-	-	1229.25	1434.06	1416.32	-	-	-	-
Space o	cooling k	Wh									
-	-	-	-	-	369.12	466.69	351.98	-	-	-	-
Total											1187.80
Cooled	fraction tency fac	etor									1.00
	Terrey rac			1	0.25	0.25	0.25	1-			
Space o	ooling re	- equireme	nt for mo	nth	0.25	0.25	0.25	]-			
Spacec		quirerne		1	02.20	116.67	00.00	Υ			
- Casas	-	- 	-		92.28	116.67	88.00	<u> </u> -	-	-	- 200.05
•	• •	lune to A equireme	•	2 (k\\/h/m	2/voar)						296.95 3.21

#### 8f. Fabric Energy Efficiency

	kWh/year	
Energy for space heating	47.46	(99)
Energy for space cooling	3.21	(108)
Total	50.67	(109)
Target Fabric Energy Efficiency	58.3	(109)
= 50.6724 x 1.15, rounded to 1 d.p.		

# **Project Information**

Building type Detached house

Reference J5067-3

Date 7 October 2019

Client DCM Architectural Consultants Ltd Project Unit 3

25 Pigeon Lane 66 Borstal Hill
Herne Bay Whitstable
Kent Kent
CT67EH CT54NB

### 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	<b>`</b> 106.79	(3a)
First floor	46.23	2.50	115.57	(3b)
Total floor area	92.46			(4)
Dwelling volume (m³)			222.37	(5)

### 2. Ventilation rate

											m³ per ho	our
							main + s	eondar	y + othe	er		
							heating					
	er of chim						0 + 0 + 0		x 40		0.00	(6a)
	er of oper						0 + 0 + 0		x 20		0.00	(6b)
Numbe	er of inter	mittent fa	ans				4		x 10		40.00	(7a)
Numbe	er of pass	ive vents	3				0		x 10		0.00	(7b)
Numbe	er of fluel	ess gas f	ires				0		x 40		0.00	(7c)
											Air chang	ges per hour
Infiltrat	ion due t	o chimne	eys, fans	and flue	S						0.18	(8)
Pressu	ire test, r	esult q50	0						5.00			(17)
Air peri	meability	,									0.43	(18)
Numbe	er of side	s on whic	ch shelte	red							2.00	(19)
Shelter	rfactor										0.85	(20)
Infiltrat	ion rate i	ncorpora	iting shel	ter factor							0.37	(21)
Infiltrat	ion rate r	nodified	for mont	hly wind s	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	
Wind F	ootor										57.60	(22)
		4.07	4.40	4.45	4.00	4.05	4.07	4.40	4.00	4.05	4.00	
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)
Adjuste	ed infiltra	tion rate	(allowing	g for shel	ter and v	vind spee	ed)					
0.52	0.49	0.47	0.41	0.42	0.37	0.38	0.39	0.41	0.45	0.46	0.48	
						JL					5.26	(22b)
Ventila	tion : nat	tural ven	tilation. i	ntermitte	nt extrac	t fans						-/
	ve air cha			. ,								
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)
												` '

3. I	Heat	losses	and	heat	loss	parameter
------	------	--------	-----	------	------	-----------

	es and neat io	•						
Element	Gross	Openings	Netarea	U-value	AxU	kappa-value		
	area, m²	m²	A, m²	W/m²K	W/K	kJ/m²K	kJ/K	
Window - Dou	-		0.200	1.15 (1.20)	0.23			(27)
argon filled, lo								
hard coat (Ea	,							
Specified U-	Value = 1.20							
Window - Dou	ble-glazed,		2.520	1.15 (1.20)	2.89			(27)
argon filled, lo	w-E, En=0.2,							
hard coat (We	est)							
Specified U-	Value = 1.20							
Window - Dou	ble-glazed,		4.330	1.15 (1.20)	4.96			(27)
argon filled, lo	-			` ,				` ,
hard coat (Eas								
•	Value = 1.20							
Window - Dou			0.550	1.15 (1.20)	0.63			(27)
argon filled, lo	•		0.000	(1120)	0.00			(=, )
hard coat (Nor								
`	Value = 1.20							
Full glazed do			6.680	1.20	8.02			(26)
Double-glazed			0.000	1.20	0.02			(20)
_	-							
low-E, En=0.2	z, naro coat							
(West)	\/-l 4.00							
•	·Value = 1.20				4-4			(00)
Full glazed do			3.780	1.20	4.54			(26)
Double-glazed	-							
low-E, En=0.2	2, hard coat							
(East)								
•	Value = 1.20							
Full glazed do	or -		2.630	1.20	3.16			(26)
Double-glazed	d, argon filled,							
low-E, En=0.2	2, hard coat							
(North)								
Specified U-	Value = 1.20							
Rooflight at 70	O° or less -		4.670	1.15 (1.20)	5.35			(27)
Double-glazed	d, argon filled,			` '				
low-E, En=0.2	-							
(n/a)	,							
, ,	fied U-Value =	1.20						
Walls			4.15	0.21	0.87	9.00	37.35	(29)
Dormer Che	eks-			V. <u> </u>	0.0.	0.00	00	(=0)
	rd/Battens/9O	SB/51						
	imber Frame Ir							
•	lotex XR4000 E							
Studs/12.5 F		Detween						
Walls	bu		96.74	0.20	19.35	9.00	870.66	(20)
	atherboard/Ba	ttone/100	90.74	0.20	19.55	9.00	670.00	(29)
•								
	nse Block)/51 C ne Insulated Wi	•						
	1000 Between S	Stuas/ 12.5						
P'bd			40.00	0.40		75.00	2407.05	(00)
Ground floors	Dans : Di	1-/450	46.23	0.12	5.55	75.00	3467.25	(28)
	um Dense Bloc	rk/15U						
Kingspan TF	70/Screed							
			P	age 64 of 84				

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Page 64 of 84

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3. Heat losses and heat loss parameters
-----------------------------------------

Element		Gross area, m <sup>2</sup>	•	enings	Net area		/alue m²K	A x U W/K		ppa-value /m²K	A x K kJ/K	
Flat roof		aroa, m	•••		3.36		0.15	0.5		9.00	30.24	(30)
150 Kir	- ngspan T	R27 Ove	er Joists			-			-			()
Pitched I 150 Kir Rafters	roofs ins ngspan k s/52.5 Ki		etween ra en (118 Und	ler	51.06	6	0.12	6.1	3	9.00	459.54	(30)
Total are	ea of exte	ernal elei	ments Si	ama A. r	n²						226.9	90 (31)
Fabric h				<b>3</b> , -							62.1	, ,
Heat cap											4865.0	, ,
1 ,												32 (35)
												)4 (36)
Total fab	ric heat	loss									96.′	19 (37)
Ventilati	on heat l	oss calc	ulated m	onthly								
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 trai	nsfer coe	efficient,	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	
					,						140.0	)1 (39)
Heat los	s param	eter (HLF	P), W/m²	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 (ave	erage)	-	•			-	-				1.5	51 (40)
Number	of days i	n month	(Table 1	a)								
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
31	28	31	30	31	30	31	31	30	31	30	31	

	er heating ed occupa		y require	ements							kWh/year 2.66	(42)
Annual	average l	not wateı	usage ir	n litres pe	er day Vd	,average	)				97.33	(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water	er usage	in litres	oer day f	or each r	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 c	of hot wat	ter 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 of Distribut	content (a tion loss	annual)									1531.31	(45)
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 wate Hot wate Volume Tempera Energy	oss dete er storage er cylinde factor ature fact lost from orage los	e volume er loss fa or store (k\	(litres) ctor (kW		tests, tak	en from	boiler da	ita record	d		0.00 0.0000 0.0000 0.0000 0.000	(50) (51) (52) (53) (55)
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 stor	age 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 lo	oss calcu	ılated for	each mo	onth								
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 he	at require	ed for wa			ated for	each mo	nth					
176.21	154.58	<u> </u>			119.88	112.77	127.02	127.85	146.94	158.39	171.17	(62)
	rom wate		for each			· ·						
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)
· · · · · · · · · · · · · · · · · · ·											(64) (64)	
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)

# 5. Internal gains

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Metabol	ic 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
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
Appliand	ces 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
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
Pumps a	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
Losses	e.g. evap	oration (r	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
Water he	eating ga	ins									
76.82	74.56	69.86	63.47	59.32	53.48	48.52	54.88	57.15	63.76	71.22	74.56
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

# 6. Solar gains (calculation for January)

	Area & Flux	g & FF	Shading	Gains
Window - Double-glazed, argon filled, low-E,	0.9 x 0.200 23.77	0.72 x 0.70	0.77	1.6601
En=0.2, hard coat (East)				
Specified U-Value = 1.20				
Window - Double-glazed, argon filled, low-E,	0.9 x 2.520 23.77	0.72 x 0.70	0.77	20.9173
En=0.2, hard coat (West)				
Specified U-Value = 1.20				
Window - Double-glazed, argon filled, low-E,	0.9 x 4.330 23.77	0.72 x 0.70	0.77	35.9413
En=0.2, hard coat (East)				
Specified U-Value = 1.20				
Window - Double-glazed, argon filled, low-E,	0.9 x 0.550 12.74	0.72 x 0.70	0.77	2.4464
En=0.2, hard coat (North)				
Specified U-Value = 1.20				
Full glazed door - Double-glazed, argon filled,	0.9 x 6.680 23.77	0.72 x 0.70	0.77	55.4475
low-E, En=0.2, hard coat (West)				
Specified U-Value = 1.20				
Full glazed door - Double-glazed, argon filled,	0.9 x 3.780 23.77	0.72 x 0.70	0.77	31.3760
low-E, En=0.2, hard coat (East)				
Specified U-Value = 1.20				
Full glazed door - Double-glazed, argon filled,	0.9 x 2.630 12.74	0.72 x 0.70	0.77	11.6982
low-E, En=0.2, hard coat (North)				
Specified U-Value = 1.20				
Rooflight at 70° or less - Double-glazed,	0.9 x 4.670 32.00	0.72 x 0.70	1.00	67.7860
argon filled, low-E, En=0.2, hard coat (n/a)				
Value Specified II Value - 1 20				

Velux Specified U-Value = 1.20

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
au					1		5	1 1		<u> </u>	
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	0.00	10.00					<u> </u>	10=	10.0.	0.02	0.00
1.63	1.64	1.64	1.65	1.65	1.65	1.65	1.65	1.65	1.64	1.64	1.64
	ion factor		l		1.00	1.00	1.00	1.00	1.0.	1.01	1.0.
0.86	0.82	0.74	0.60	0.47	0.33	0.20	0.22	0.42	0.67	0.81	0.87
	nternal tei		l			0.20		10	0.07	0.0.	0.0.
17.71	18.05	18.87	19.78	20.41	20.79	20.94	20.94	20.68	19.83	18.69	17.71
	rature du		J			l			1	1	
19.65	19.66	19.67	19.68	19.68	19.69	19.69	19.69	19.68	19.68	19.67	19.66
Utilisati	ion factor	for gains	for rest	of dwellir	ng	JI	Л		JL	JL	
0.85	0.80	0.71	0.56	0.41	0.26	0.11	0.12	0.33	0.62	0.79	0.86
Mean ir	nternal te	mperatui	e in the r	est of dw	velling T2	<u> </u>	JL		JL	JI	
15.57	16.04	17.14	18.33	19.12	19.54	19.67	19.67	19.45	18.44	16.93	15.58
	rea fracti										0.50
Mean ir	nternal ter	mperatur	e (for the	whole d	welling)						
16.64	17.04	18.00	19.05	19.77	20.16	20.31	20.31	20.07	19.14	17.81	16.65
	djustmer	t to the m	nean inte	rnal tem	perature			ite			
Apply a	djustmer 17.04	18.00	nean inte 19.05	19.77	perature 20.16			ate 20.07	19.14	17.81	16.65
Apply a 16.64		18.00	19.05			, where a	ppropria		J	][	
Apply a 16.64 <b>8. Spac</b> Jan	17.04	18.00	19.05  rement Apr	19.77	20.16	, where a 20.31	ppropria 20.31	20.07	19.14	17.81	16.65
Apply a 16.64 <b>8. Spac</b> Jan	17.04	18.00	19.05  rement Apr	19.77	20.16	, where a 20.31	ppropria 20.31	20.07	19.14	17.81	16.65
Apply a 16.64  8. Spac Jan Utilisati	17.04  ce heating Feb foon factor 0.75	18.00  ng requin  Mar  for gains	19.05 rement	19.77 May	20.16 Jun	where a 20.31	ppropria 20.31 Aug	20.07   Sep	19.14 Oct	17.81 Nov	16.65
Apply at 16.64  8. Space Jan Utilisati 0.80	ce heating Feb ion factor 0.75 gains	18.00  ng requin  Mar  for gains	19.05 rement	19.77 May	20.16 Jun	where a 20.31	ppropria 20.31 Aug	20.07   Sep   0.36	19.14 Oct	17.81 Nov	16.65
Apply a 16.64  8. Space Jan Utilisati 0.80 Useful 665.45	ce heating Feb ion factor 0.75 gains	18.00  ng requii  Mar  for gains  0.67	19.05  rement Apr 0.54  883.96	19.77   May   0.41   745.54	20.16   Jun   0.28	where a 20.31 Jul 0.16	Aug  0.17	20.07   Sep   0.36	19.14 Oct	Nov 0.74	16.65  Dec  0.81
8. Space Jan Utilisati 0.80 Useful (665.45 Monthly)	ce heating Feb ion factor 0.75 gains 753.37 yaverage	18.00  ng requin  Mar  for gains  0.67  838.50  external  7.60	19.05  rement Apr 0.54  883.96 tempera 10.00	19.77  May  0.41  745.54 ture  13.10	Jun  0.28  525.60  15.90	where a 20.31 Jul 0.16	Aug  0.17	20.07   Sep   0.36	19.14 Oct	Nov 0.74	16.65  Dec  0.81
Apply a 16.64  8. Space Jan Utilisati 0.80 Useful (665.45) Monthly 5.50 Heat los	reb foot factor 0.75 gains 753.37 yaverage 5.80 ss rate fo	mg requirements of the second	19.05  rement Apr 0.54  883.96 tempera 10.00 ternal te	19.77   May   0.41   745.54   ture   13.10   mperatu	Jun  0.28  525.60  15.90	Jul 0.16 279.53	Aug	20.07   Sep   0.36   488.18   15.90	19.14 Oct 0.60 618.11	Nov 0.74 628.19 8.70	Dec 0.81 618.39 5.80
8. Space Jan Utilisati 0.80 Useful of 665.45 Monthly 5.50 Heat los	ree heating Feb fon factor 0.75 gains 753.37 yaverage 5.80 ss rate fo	18.00  ng requin  Mar  for gains  0.67  838.50  external  7.60  r mean ir  1465.11	19.05  Tement Apr  0.54  883.96 tempera 10.00 ternal te 1259.32	19.77   May   0.41   745.54   ture   13.10   mperatu	Jun  0.28  525.60  15.90	Jul 0.16 279.53	Aug	20.07   Sep   0.36   488.18	19.14 Oct 0.60 618.11	Nov 0.74 628.19 8.70	Dec 0.81 618.39
Apply a 16.64  8. Space Jan Utilisati 0.80 Useful ( 665.45 Monthly 5.50 Heat lose 1591.6 Fraction	ree heating Feb fon factor 0.75 gains 753.37 yaverage 5.80 ss rate for 1594.48 n of mont	mg requirements of the formula in th	19.05  Tement Apr  0.54  883.96 tempera 10.00 ternal te 1259.32	19.77   May   0.41   745.54   ture   13.10   mperatu	Jun  0.28  525.60  15.90 re	Jul 0.16 279.53	Aug	20.07   Sep   0.36   488.18   15.90	19.14 Oct 0.60 618.11	Nov 0.74 628.19 8.70	Dec 0.81 618.39 5.80
Apply a 16.64  8. Space Jan Utilisati 0.80 Useful c 665.45 Monthly 5.50 Heat lose 1591.6 Fraction	ce heating Feb fon factor 0.75 gains 753.37 yaverage 5.80 ss rate for 1594.48 n of mont 1.00	18.00  ng requin  Mar for gains 0.67  838.50 external 7.60 r mean ir 1465.11 h for hear	19.05  rement Apr  0.54  883.96 tempera 10.00 ternal te 1259.32 ting 1.00	19.77  May  0.41  745.54 ture  13.10 mperatu  928.90  1.00	20.16   Jun   0.28   525.60   15.90   re   588.46   -	where a 20.31  Jul  0.16  279.53  18.20  291.74	Aug	20.07   Sep   0.36   488.18   15.90	19.14 Oct 0.60 618.11	Nov 0.74 628.19 8.70	Dec 0.81 618.39 5.80
Apply a 16.64  8. Space Jan Utilisati 0.80 Useful c 665.45 Monthly 5.50 Heat lose 1591.6 Fraction	reb foot factor 0.75 gains 5.80 ss rate for 1594.48 n of mont 1.00 heating re	mg requireme	19.05  rement Apr  0.54  883.96 tempera 10.00 ternal te 1259.32 ting 1.00 ent for ea	19.77  May  0.41  745.54 ture  13.10 mperatu  928.90  1.00 ch month	20.16   Jun   0.28   525.60   15.90   re   588.46   -	where a 20.31  Jul  0.16  279.53  18.20  291.74	20.31   Aug   0.17   264.74   18.30   277.86	20.07   Sep   0.36   488.18   15.90   579.49	19.14 Oct 0.60 618.11 12.30	Nov 0.74 628.19 8.70	Dec  0.81  618.39  5.80  1534.74
Apply a 16.64  8. Space Jan Utilisati 0.80 Useful ( 665.45 Monthly 5.50 Heat lose 1591.6 Fraction 1.00 Space I 689.13	ree heating Feb Son factor 0.75 Gains 753.37 Vaverage 5.80 Ses rate for 9 1594.48 In of mont 1.00 Sheating ref 5 565.22	mg requireme	19.05  rement Apr 0.54  883.96 tempera 10.00 ternal te 1259.32 ting 1.00 ent for ea 270.26	19.77  May  0.41  745.54  ture  13.10  mperatu  928.90  1.00  ch month  136.41	20.16   Jun   0.28   525.60   15.90   re   588.46   -	Jul 0.16 279.53 18.20 291.74 - nonth -	Aug	20.07   Sep   0.36   488.18   15.90   579.49   -	19.14 Oct 0.60 618.11 12.30	Nov 0.74 628.19 8.70	16.65  Dec  0.81  618.39  5.80  1534.74  1.00  681.77
Apply a 16.64  8. Space Jan Utilisati 0.80 Useful g 665.45 Monthly 5.50 Heat lose 1591.6 Fraction 1.00 Space I 689.13 Total sp	reb foot factor 0.75 gains 5.80 ss rate for 1594.48 n of mont 1.00 heating re	18.00  mg requin  Mar for gains 0.67  838.50 external 7.60 r mean in 1465.11 h for hea 1.00 equireme 466.20 ting requi	19.05  rement Apr  0.54  883.96 tempera 10.00 ternal te 1259.32 ting 1.00 ent for ea 270.26 irement p	19.77  May  0.41  745.54 ture  13.10 mperatu  928.90  1.00 ch month 136.41 per year	Jun  0.28  525.60  15.90  re  588.46	Jul 0.16 279.53 18.20 291.74 - nonth -	Aug	20.07   Sep   0.36   488.18   15.90   579.49   -	19.14 Oct 0.60 618.11 12.30 958.57	Nov 0.74 628.19 8.70 1279.71	16.65  Dec  0.81  618.39  5.80  1534.74  1.00

# 8c. Space cooling requirement - not applicable

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Page 68 of 84

# **Project Information**

Building type Detached house

Reference J5067-3

Date 7 October 2019

Client DCM Architectural Consultants Ltd Project Unit 3

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	Av. Storey	Volume	
	(m²)	height (m)	(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 (m³)			222.37	(5)

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

### 2. Ventilation rate

											m³ per ho	ur
							main + s	eondar	y + othe	r		
							heating					
	er of chim						0 + 0 + 0		x 40		0.00	(6a)
	er of oper						0 + 0 + 0		x 20		0.00	(6b)
Numbe	er of inter	mittent fa	ans				4		x 10		40.00	(7a)
Numbe	er of pass	ive vents	;				0		x 10		0.00	(7b)
Numbe	er of fluel	ess gas f	ires				0		x 40		0.00	(7c)
											Air chang	es per hour
Infiltrat	tion due t	o chimne	eys, fans	and flues	3						0.18	(8)
Pressu	ire test, r	esult q50	)						5.00			(17)
Air per	meability	,									0.43	(18)
Numbe	er of side	s on whic	ch shelte	red							2.00	(19)
Shelte	rfactor										0.85	(20)
Infiltration rate incorporating shelter factor									0.37	(21)		
Infiltrat	tion rate r	nodified	for mont	hly wind s	peed							
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	
Wind F	actor										57.60	(22)
1.43	1.35	1.27	1.13	1.15	1.02	1.05	1.07	1.13	1.23	1.25	1.32	
1.70	1.00	1.21	1.10	1.10	1.02	1.00	1.07	10	1.20	1.20		(220)
Adjuste	ed infiltra	tion rate	(allowing	g for shelt	er and w	ind spee	ed)				14.40	(22a)
0.52	0.49	0.47	0.41	0.42	0.37	0.38	0.39	0.41	0.45	0.46	0.48	
							I				5.26	(22b)
	ation : nat ve air cha			ntermitter	nt extrac	t fans						( -,
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)
0.07	0.02		0.00	0.00	0.07	0.01	0.00	10.00	0.00	0.00	0.02	(-0)

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

2 1/224 /222								
3. Heat losse Element	<b>s and neat io</b> Gross	Openings	e <b>r</b> Netarea	U-value	AxU	kappa-value	ΔxΚ	
Licinoni	area, m <sup>2</sup>	m <sup>2</sup>	A, m <sup>2</sup>	W/m²K	W/K	kJ/m²K	kJ/K	
Window - Doul	•		0.200	1.15 (1.20)	0.23	10/111 10	10/11	(27)
argon filled, lo	-		0.200	1.10 (1.20)	0.20			(21)
hard coat (Eas								
•	Value = 1.20							
Window - Doul			2.520	1.15 (1.20)	2.89			(27)
argon filled, lo	-		2.020	1.10 (1.20)	2.00			(21)
hard coat (We								
,	Value = 1.20							
Window - Doul			4.330	1.15 (1.20)	4.96			(27)
argon filled, lo	-		4.550	1.13 (1.20)	4.50			(21)
hard coat (Eas								
•	Value = 1.20							
Window - Doul			0.550	1.15 (1.20)	0.63			(27)
argon filled, lo	-		0.550	1.13 (1.20)	0.00			(21)
hard coat (Nor								
•	Value = 1.20							
Full glazed do			6.680	1.20	8.02			(26)
Double-glazed			0.000	1.20	0.02			(20)
low-E, En=0.2	-							
(West)	., riaid coat							
, ,	Value = 1.20							
Full glazed do			3.780	1.20	4.54			(26)
Double-glazed			3.700	1.20	4.54			(20)
low-E, En=0.2	-							
(East)	., Haiu Coai							
` '	Value = 1.20							
Full glazed do			2.630	1.20	3.16			(26)
Double-glazed			2.030	1.20	5.10			(20)
low-E, En=0.2	-							
(North)	., riara coat							
` ,	Value = 1.20							
Rooflight at 70			4.670	1.15 (1.20)	5.35			(27)
Double-glazed			4.070	1.13 (1.20)	0.00			(21)
low-E, En=0.2	-							
(n/a)	., riara coat							
, ,	fied U-Value =	1 20						
Walls	ioa o valao –	1.20	4.15	0.21	0.87	9.00	37.35	(29)
Dormer Che	eks -		4.10	0.21	0.07	0.00	07.00	(20)
	rd/Battens/9C	)SB/51						
	imber Frame Ir							
•	lotex XR4000 B							
Studs/12.5 F		Botwoon						
Walls	ы		96.74	0.20	19.35	9.00	870.66	(29)
	atherboard/Ba	ttens/100	30.74	0.20	10.00	0.00	070.00	(20)
•	ise Block)/51 C							
	ne Insulated W	-						
	000 Between S							
P'bd	200 2000000	,						
Ground floors			46.23	0.12	5.55	75.00	3467.25	(28)
	ım Dense Bloc	:k/150	.5.20	J.12	5.00	. 5.55	3.07.20	(20)
Vingenen TE								

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Page 71 of 84

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

3. Heat losses and heat loss parameter													
Element	t	Gross	Ope	enings	Netare		/alue	A x U		appa-valu			
		area, m <sup>2</sup>	m <sup>2</sup>		A, m²		m²K	W/K	k٠	J/m²K	kJ/K		
Flat roof	s				3.36	6	0.15	0.5	0	9.00	30.24	(30)	
150 Ki	ngspan T	TR27 Ove	er Joists										
Pitched	roofs ins	ulated be	etween ra	afters	51.06	6	0.12	6.1	3	9.00	459.54	(30)	
150 Ki	ngspan k	<7 Between	en										
Rafter	s/52.5 Ki	ngspan k	(118 Und	der									
Rafter	s With Br	eather M	embrane	Э									
Total are	ea of exte	ernal elei	ments Si	gma A, r	n²						226.9	0 (31)	
Fabric h	eat loss,	, W/K									62.1	6 (33)	
Heat capacity 4865.04 (3-											4 (34)		
Thermal mass parameter, kJ/m²K 52.62 (35)												2 (35)	
Effect of	thermal	bridges									34.0	4 (36)	
Total fat	oric heat	loss									96.1	9 (37)	
Ventilati	on heat l	loss calc	ulated m	onthly									
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 tra	nsfer coe	efficient,	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		
	JL	JL	II.			JI	IL				140.0	1 (39)	
Heat los	s param	eter (HLF	P), W/m²	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 (ave	erage)	,	,		,	,	,		,		1.5	1 (40)	
Number	of days i	in month	(Table 1	a)									
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. Wate Assume	<i>r heatin</i> g		require	ements							kWh/year 2.66	(42)
	average l		usage ir	n litres pe	er day Vd	,average	)				97.33	(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water	er usage	in litres p	per day f	or each r	nonth			-			<del></del>	
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 c	of hot wat	er 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 of Distribut	content (a tion loss	annual)									1531.31	(45)
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)  Hot water cylinder loss factor (kWh/day)  Volume factor  Temperature factor  Energy lost from store (kWh/day)  Total storage loss										(50) (51) (52) (53) (55)		
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 stor	age loss	JI.	JI			I.	IL			J		
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 lo	oss calcu	lated for	each mo	onth								
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 he	at require	ed for wa	ter heati		ated for	each moi	nth					
176.21	154.58	160.62	141.56	L	119.88	112.77	127.02	127.85	146.94	158.39	171.17	(62)
	rom wate		,									
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)
Heat gai	ns from	water he	ating, kW	/h/month	1						1733.95	(64)
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)

#### 5. Internal gains

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Metabol	ic 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
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
Appliand	ces gains	3									
363.48	367.25	357.75	337.51	311.97	287.96	271.93	268.15	277.66	297.89	323.44	347.44
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
Pumps a	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
Losses	e.g. evap	oration (r	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
Water he	eating ga	ins									
76.82	74.56	69.86	63.47	59.32	53.48	48.52	54.88	57.15	63.76	71.22	74.56
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

# 6. Solar gains (calculation for January)

	Area & Flux	g & FF	Shading	Gains
Window - Double-glazed, argon filled, low-E,	0.9 x 0.200 23.77	0.72 x 0.70	0.77	1.6601
En=0.2, hard coat (East)				
Specified U-Value = 1.20				
Window - Double-glazed, argon filled, low-E,	0.9 x 2.520 23.77	0.72 x 0.70	0.77	20.9173
En=0.2, hard coat (West)				
Specified U-Value = 1.20				
Window - Double-glazed, argon filled, low-E,	0.9 x 4.330 23.77	0.72 x 0.70	0.77	35.9413
En=0.2, hard coat (East)				
Specified U-Value = 1.20				
Window - Double-glazed, argon filled, low-E,	0.9 x 0.550 12.74	0.72 x 0.70	0.77	2.4464
En=0.2, hard coat (North)				
Specified U-Value = 1.20				
Full glazed door - Double-glazed, argon filled,	0.9 x 6.680 23.77	0.72 x 0.70	0.77	55.4475
low-E, En=0.2, hard coat (West)				
Specified U-Value = 1.20				
Full glazed door - Double-glazed, argon filled,	0.9 x 3.780 23.77	0.72 x 0.70	0.77	31.3760
low-E, En=0.2, hard coat (East)				
Specified U-Value = 1.20				
Full glazed door - Double-glazed, argon filled,	0.9 x 2.630 12.74	0.72 x 0.70	0.77	11.6982
low-E, En=0.2, hard coat (North)				
Specified U-Value = 1.20				
Rooflight at 70° or less - Double-glazed,	0.9 x 4.670 32.00	0.72 x 0.70	1.00	67.7860
argon filled, low-E, En=0.2, hard coat (n/a)				
Value Chasified II Value 1 20				

Velux Specified U-Value = 1.20

Temper	n interna ature du	ring heat	ing perio	ds in the l	living are	a, Th1 (°	C)				21.00 1.00
Jan	system r Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	1 00	IVIGI	7 (5)	Iviay	Joan	Joan	/ lug	ССР		1400	DC0
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	0.00	0.00	0.72	0.70	0.70	0.77	0.70	0.72	0.04	0.02	0.00
1.63	1.64	1.64	1.65	1.65	1.65	1.65	1.65	1.65	1.64	1.64	1.64
	on factor				1	1.00		1	1101		
0.86	0.82	0.74	0.60	0.47	0.33	0.20	0.22	0.42	0.67	0.81	0.87
	ternal ter	nperatur	e in living	area T1		JI.					
17.71	18.05	18.87	19.78	20.41	20.79	20.94	20.94	20.68	19.83	18.69	17.71
Temper	ature du	ring heat	ing perio	ds in rest	of dwelli	ng 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
Utilisati	on factor	for gains	for rest	of dwellin	ng	.H			Л	Л	
0.85	0.80	0.71	0.56	0.41	0.26	0.11	0.12	0.33	0.62	0.79	0.86
Mean in	ternal te	mperatu	e in the r	est of dw	elling T2	2					
15.57	16.04	17.14	18.33	19.12	19.54	19.67	19.67	19.45	18.44	16.93	15.58
	rea fracti ternal ter				welling)						0.50
16.64	17.04	18.00	19.05	19.77	20.16	20.31	20.31	20.07	19.14	17.81	16.65
Apply a	djustmen	nt to the n	nean inte	rnal tem	perature	, where a	ppropria	ite			
16.64	17.04	18.00	19.05	19.77	20.16	20.31	20.31	20.07	19.14	17.81	16.65
Jan Utilisati	Feb	Mar for gains	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0.80	0.75	0.67	0.54	0.41	0.28	0.16	0.17	0.36	0.60	0.74	0.81
Useful g		1	7			7				1	
665.45		838.50	883.96	745.54	525.60	279.53	264.74	488.18	618.11	628.19	618.39
	average	,			,	1	,	,	1	1	
5.50	5.80	7.60	10.00	13.10	15.90	18.20	18.30	15.90	12.30	8.70	5.80
	ss rate fo			•	v	1		γ		-V	
	1594.48			928.90	588.46	291.74	277.86	579.49	958.57	1279.7	1534.74
	of mont			1		ni.	1		nr.	nr.	
1.00	1.00	1.00	1.00	1.00		-	-	<u> </u> -	1.00	1.00	1.00
	neating re	•			n, kWh/m	onth					
689.13		1	270.26		<u></u>	-	-	<u></u>	253.30	469.09	681.77
	ace heat			per year (		ar) (Octo	ber to Ma	ay)			3531.38

## 8c. Space cooling requirement - not applicable

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

38.19

(99)

### 9a. Energy requirements

g,		kWh/year	
No secondary heating system selected Fraction of space heat from main system(s)  Efficiency of main heating system  1.0000  92.80%			(202) (206)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct	Nov	Dec	
Space heating requirement			
689.13   565.22   466.20   270.26   136.41   -   -   -   -   253.3	0 469.09	681.77	(98)
Appendix Q - monthly energy saved (main heating system 1)	,		
0.00   0.00   0.00   0.00   -   -   -   -   0.00	0.00	0.00	(210)
Space heating fuel (main heating system 1)			
742.59   609.08   502.37   291.23   147.00   -   -   -   -   272.9	5 505.49	734.66	(211)
Appendix Q - monthly energy saved (main heating system 2)			
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	(213)
Appendix Q - monthly energy saved (secondary heating system)			
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	(215)
Water heating Water heating requirement			
Water heating requirement	4 450 00	474.47	(64)
176.21   154.58   160.62   141.56   136.97   119.88   112.77   127.02   127.85   146.9	4 158.39		(64)
Efficiency of water heater	00.40	87.10	(216)
89.24 89.21 89.09 88.85 88.43 87.10 87.10 87.10 87.10 88.79	89.10	89.24	(217)
Water heating fuel  197.46   173.29   180.28   159.32   154.89   137.63   129.47   145.84   146.79   165.5	0 177.76	191.79	(219)
197.46   173.29   180.28   159.32   154.89   137.63   129.47   145.84   146.79   165.5	0   177.76	191.79	(219)
Annual totals		kWh/year	(5.4.4)
Space heating fuel used, main system 1		3805.37	(211)
Space heating fuel (secondary) Water heating fuel		0.00 1960.02	(215) (219)
Electricity for pumps, fans and electric keep-hot		1900.02	(219)
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		6249.81	(238)

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

	kWh/year	Fuel price p/kWh	£/year	
Space heating - main system 1	3805.370	4.040	153.74	(240)
Space heating - main system 2	0.000	0.000	0.00	(241)
Waterheating				
Water heating cost	1960.02	4.040	79.18	(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			415.97	(255)

#### 12a. Carbon dioxide emissions

	Energy	Emission factor	<b>Emission</b>	S
	kWh/year	kg CO2/kWh	kg CO2/y	ear
Space heating, main system 1	3805.37	0.216	821.96	(261)
Space heating, main system 2	0.00	0.000	0.00	(262)
Space heating, secondary	0.00	0.519	0.00	(263)
Waterheating	1960.02	0.216	423.36	(264)
Space and water heating			1245.32	(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			1496.74	(272)

### 13a. Primary energy

	Energy	Primary	P. Energy	
	kWh/year	factor	(kWh/yeaı	r)
Space heating, main	3805.37	1.220	4642.55	(261)
Space heating, main system 2	0.00	0.000	0.00	(262)
Space heating, secondary	0.00	3.070	0.00	(263)
Waterheating	1960.02	1.220	2391.22	(264)
Space and water heating			7033.77	(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			8520.96	(272)
Primary energy kWh/m²/year			92.16	(273)

### **Project Information**

Building type Detached house

Reference J5067-3

Date 7 October 2019

Client DCM Architectural Consultants Ltd Project Unit 3

25 Pigeon Lane 66 Borstal Hill
Herne Bay Whitstable
Kent Kent
CT67EH CT54NB

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

#### 1. Overall dwelling dimensions

	Area	Av. Storey	Volume	
	(m²)	height (m)	(m³)	
Groundfloor (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 (m³)			222.37	(5)

#### 2. Ventilation rate

											m³ per ho	our
							main + s	eondar	y + othe	r		
NIl							heating	_	- 40		0.00	(0-)
	er of chim	-					0 + 0 + 0		x 40		0.00	(6a)
	er of oper						0 + 0 + 0		x 20		0.00	(6b)
	er of inter						4		x 10		40.00	(7a)
	erofpass						0		x 10		0.00	(7b)
Numbe	er of fluel	ess gas r	ıres				0	)	x 40		0.00	(7c)
											Air chang	ges per hour
Infiltrat	ion due t	o chimne	eys, fans	and flues	3						0.18	(8)
Pressu	ire test, r	esult q50	)						5.00			(17)
Air per	meability										0.43	(18)
Numbe	er of side	s on whic	ch shelte	red							2.00	(19)
Shelte	rfactor										0.85	(20)
Infiltrat	ion rate ii	ncorpora	ting shel	ter factor							0.37	(21)
Infiltrat	ion rate r	nodified t	for month	nly wind s	peed							
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	
Wind F	actor										52.50	(22)
1.27	1.25	1.23	1.10	1.07	0.95	0.95	0.93	1.00	1.07	1.13	1.18	
		_I	II.			J[	I			_	13.13	(22a)
Adjuste	ed infiltra	tion rate	(allowing	for shelt	er and w	ind spee	ed)					,
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)
	ition : nat ve air cha		ilation, ir	ntermitter	nt extrac	t fans						
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)

3. F	leat i	losses	and	heat	loss	parameter
------	--------	--------	-----	------	------	-----------

3. Heat losse		•					A 16	
Element	Gross	Openings	Netarea	U-value	AxU	kappa-value		
	area, m²	m²	A, m²	W/m²K	W/K	kJ/m²K	kJ/K	
Window - Doul	-		0.200	1.15 (1.20)	0.23			(27)
argon filled, lo								
hard coat (Eas	,							
Specified U-	Value = 1.20							
Window - Doul	ole-glazed,		2.520	1.15 (1.20)	2.89			(27)
argon filled, lo	w-E, En=0.2,							
hard coat (We	st)							
Specified U-	Value = 1.20							
Window - Doul	ole-glazed,		4.330	1.15 (1.20)	4.96			(27)
argon filled, lo	w-E, En=0.2,							
hard coat (Eas								
Specified U-	•							
Window - Doul			0.550	1.15 (1.20)	0.63			(27)
argon filled, lo	-		0.000	()				( /
hard coat (Nor								
Specified U-	,							
Full glazed do			6.680	1.20	8.02			(26)
Double-glazed			0.000	1.20	0.02			(20)
low-E, En=0.2	-							
(West)	, naid coat							
Specified U-	Value – 1 20							
•			2 700	4 20	4.54			(26)
Full glazed do			3.780	1.20	4.54			(26)
Double-glazed	-							
low-E, En=0.2	, nard coat							
(East)	Value 4.00							
Specified U-				4.00	0.40			(00)
Full glazed do			2.630	1.20	3.16			(26)
Double-glazed								
low-E, En=0.2	, hard coat							
(North)								
Specified U-								
Rooflight at 70			4.670	1.15 (1.20)	5.35			(27)
Double-glazed	-							
low-E, En=0.2	, hard coat							
(n/a)								
Velux Specif	ied U-Value =	1.20						
Walls			4.15	0.21	0.87	9.00	37.35	(29)
Dormer Che								
Weatherboa	rd/Battens/9 O	SB/51						
Cavity/140T	imber Frame Ir	nsulated						
With 120 Cel	otex XR4000 E	Between						
Studs/12.5 F	'bd							
Walls			96.74	0.20	19.35	9.00	870.66	(29)
Brick or (Wea	atherboard/Ba	ttens/100						
Medium Den	se Block)/51 C	Cavity/140						
Timber Fram	e Insulated W	ith 120						
Celotex XR4	000 Between S	Studs/12.5						
P'bd								
Ground floors			46.23	0.12	5.55	75.00	3467.25	(28)
	ım Dense Bloc	k/150	_					\ -/
Kingspan TF								
5 1	-		_	04 (04				

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Page 81 of 84

 $C: \label{limitedfolder} C: \label{limitedfolder} Calculations \label{limitedfolder} In the limit of the li$ Approval of JPA Designer by BRE applies only to the software, data is not subject to quality control procedures, users are themselves responsible for the accuracy of the data. The results of the calculation should not be accepted without first checking the input data.

3. Heat	losses a	and heat	t loss pa	rametei	•							
Element		Gross	ross Ópe		nings Netare		a U-value			appa-valu		
		area, m <sup>2</sup>	m <sup>2</sup>		A, m²		m²K	W/K	k	J/m²K	kJ/K	
Flat roof	_				3.36	6	0.15	0.5	0	9.00	30.24	(3
150 Kir	ngspan T	R27 Ove	er Joists									
Pitched roofs insulated between rafters			51.06	6	0.12	6.1	3	9.00	459.54	. (3		
	ngspan k											
	s/52.5 Ki	• .										
Rafters	s With Br	eather M	lembrane	Э								
Total are	ea of exte	ernal elei	ments Si	gma A. r	n²						226.9	90 (3
Fabric heat loss, W/K							62.1	,				
Heat cap	pacity										4865.0	,
Thermal	l mass pa	arameter	, kJ/m <sup>2</sup> K								52.6	62 (3
Effect of	thermal	bridges									34.0	)4 (3
Total fab	oric heat	loss									96.1	19 (3
Ventilati	on heat l	oss calc	ulated m	onthly								
44.65	44.34	44.04	42.62	42.35	41.11	41.11	40.88	41.59	42.35	42.89	43.45	(3
Heat trai	nsfer coe	efficient,	W/K				Л					
140.85	140.54	140.23	138.81	138.54	137.30	137.30	137.07	137.78	138.54	139.08	139.64	
											138.8	31 (3
Heat los	s param	eter (HLF	<sup>2</sup> ), W/m²	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 (ave	erage)										1.5	50 (4
Number	of days i	n month	(Table 1	a)								
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
31	28	31	30	31	30	31	31	30	31	30	31	

Water heating energy requirements kWh/year umed occupancy, N 2.66	(42)
umed occupancy, N 2.66 ual average hot water usage in litres per day Vd,average 97.33	(42) (43)
Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	, ,
water usage in litres per day for each month	
7.06   103.17   99.27   95.38   91.49   87.59   87.59   91.49   95.38   99.27   103.17   107.06	(44)
rgy content of hot water used	( )
3.76   138.86   143.29   124.92   119.86   103.43   95.85     109.99   111.30   129.71   141.59   153.75	
rgy content (annual) 1531.31	(45)
ribution loss	(40)
81 20.83 21.49 18.74 17.98 15.52 14.38 16.50 16.69 19.46 21.24 23.06	(46)
ore loss determined from EN 13203-2 tests, taken from boiler data record	<b>/</b>
water storage volume (litres)  0.00	(50)
water cylinder loss factor (kWh/day) 0.0000 ume factor 0.0000	(51) (52)
perature factor 0.0000	(53)
rgy lost from store (kWh/day) 0.00	(55)
al storage loss	()
0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00	(56)
storage loss	
0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00	(57)
nary loss factor	( )
0 1.00 0.94 0.70 0.45 0.44 0.44 0.48 0.76 0.94 1.00 1.00	
nary loss	
0 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00	(59)
nbi loss calculated for each month	(00)
	(61)
	(01)
al heat required for water heating calculated for each month	(60)
5.21   154.58   160.62   141.56   136.97   119.88   112.77   127.02   127.85   146.94   158.39   171.17	(62)
perture area of solar panel 3.0000 bllector zero-loss efficiency 0.7000	(H1
bllector heat loss coefficient 1.8000	(H2 (H3
ollector 2nd order heat loss coefficient 0.0050	(H3
ollector effective heat loss coefficient 1.8063	(H3
ollector performance ratio 2.5804	(H4
nnual solar radiation per m <sup>2</sup> 1079.5246	(H5
vershading factor 0.8000	(H6
olar energy available 1813.6014	(H7
ljustment factor for showers 1.0000 Dlar/load ratio 1.1843	(H7 (H8
plar utilisation factor 0.5702	(H9
ollector performance factor 0.8793	(H1
edicated solar storage volume 75.0000	(H1
fective solar volume 75.0000	(H1
aily hot water demand 97.3255	(H1
olume ratio Veff/V 0.7706	(H1
	(H1
eff/V factor 0.9479	(H1
plar input -861.8464	
olar input -861.8464 ar DHW input	(63)
olar input -861.8464 ar DHW input .99   -41.70   -71.03   -95.19   -117.60   -115.62   -114.09   -99.68   -78.07   -53.31   -29.64   -20.91	(63)
olar input -861.8464 ar DHW input  99    -41.70   -71.03   -95.19   -117.60   -115.62   -114.09   -99.68   -78.07   -53.31   -29.64   -20.91  out from water heater for each month, kWh/month  Page 83 of 84	
Solution   Solution	(64)
Solar input   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -861.8464   -8	(64)

### 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
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
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
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
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
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
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
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