8 APPENDIX

Appendix A: Meeting Notes with Camden Energy officer

RAMBOLL	BUILDINGS	RAN	мвост	E
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1/2				



BUILDINGS

en hierarchy would nts for CHP and

ith the applications y had reduced

it would expect to see

issues.

uildings to meet rinciple this would be need to agree to the

e approach to test the

d instead focus on the d fabric efficiency

evelopment by others as this would burden by planning policy a Farr.

community centre ility and low running

n the Grafton road ne funding back into

a central heating sing departments is would be acceptable should advise on the followed.

DEVELOPMENT OF CAMDEN SITES KILN PLACE STAGE D DESIGN REPORT

Appendix B: DER Worksheet from NHER 5.4.2 SAP Calculation:

Synopsis of the Modeling Input Data

Unit No	Element		Air tightness (m ³ /hm ² @5 0 Pa)	Code level	DER	TER	Improveme nt over TER	ENE 01	FEE	ENE 02	Renewab s
Unit 1.7	Element				Kg CC	₂ /m²/year		Credit	kWh/m²/ year	Credits	
Site 1	Roof	0.10									
3 stories Detache d Dwelling	Floor	0.10	2.5	4				3.1	46.4	6.8	N/A
Dwennig	Wall	0.15			13.98	18.93	-26.15% Passed	5.1	40.4	0.0	IN/A
	Glazing	1.00									
	Glazing	1.00	-								
	Total Glazing Area	25 m²	-								
Unit 2.2	Total Glazing Area 25 m² U Value (w/m²K)		Air tightness (m ³ /hm ² @5 0 Pa)	Code level DER		DER TER		ENE 01	FEE	ENE 02	Renewab s
	U Value						nt over TER		kWh/m²/		
	Roof	w/m ² 0.10	-					Credit	year	Credits	
	Floor	0.10						3	55.9	3.8	N/A
	Wall	0.10	1.5	4	16.05	21.68	-25.97%	5	55.9	3.0	
		0.15					Passed				
	Glazing	1.0									
	Total Glazing Area	39.61 m ²									



	Conclusion
ble	
ible	
	No renewable technology is required to achieve Code level 4.
	Air tightness: 2.5 m ³ /hm ² @50 Pa
	U Value: See Column 2 Recommended Solution.
ble	
	Conclusion
	No renewable technology is required to
	achieve Code level 4.
	Air tightness: 1.5 m ³ /hm ² @50 Pa
	U Value: See Column 2 Recommended Solution.

DEVELOPMENT OF CAMDEN SITES KILN PLACE STAGE D DESIGN REPORT

Unit 3.1	U Value (w/m²K)	Air tightness (m ³ /hm ² @50 Pa)	Code level	DER	TER	Improvement over TER	ENE 01	FEE	ENE 02	2 Renewables	Conclusion			
	U Value w/m ²						Credit	kWh/m²/yea	r Credits		In order to achieve Code level 4, 0.4kWpeak of PV is required. This			
	Roof 0.10										equates to 2 no of South facing PV – Panels. Each panel size is approximately			
	Floor 0.10	2	4	14.06	19.25	-26.96% Passed Code	3.1	43.5	4.7	PV	(990 x 1640)mm Ref: Ecolution			
	Wall 0.15	2		11.00	19.25	4					Renewables. Air tightness of 2 m ³ /hm ² @50 Pa is			
	Glazing 1.0										recommended.			
	Total opening Area 24 m ²	2									U Value : Please see column 2. Recommended Solution.			
		Air												
Unit No	U Value (w/m ² K)	tightness (m ³ /hm ² @5 0 Pa)	Code level	DER	TER	Improvemen t over TER	ENE 01	FEE	ENE 02	Renewables	Conclusion			
Unit 5.3	U Value w/m ²										In order to achieve Code level 4,			
	Roof 0.10						3.3	63.3	0	PV	0.4kWpeak of PV is required. This equates to 2 no of South facing PV Panels. Each			
	Floor 0.10					-29.14%					panel size is approximately (990 x			
	Wall 0.15	2	3	19.04	26.87	Code level 4 achieved					1640)mm Ref: Ecolution Renewables.			
	Glazing 1.0										Air tightness of 2 m ³ /hm ² @50 Pa is			
	Total opening Area 13.72										recommended. U Value : Please see column 2. Recommended Solution.			

Unit 3.1	U Value (w/m	²K)	Air tightness (m ³ /hm ² @50 Pa)	Code level	DER	TER	Improvement over TER	ENE 01	FEE	ENE 02	Renewables	Conclusion
	U Value	w/m²						Credit	kWh/m²/year	Credits		In order to achieve Code level 4, 0.4kWpeak of PV is required. This
	Roof	0.10										equates to 2 no of South facing PV Panels. Each panel size is approximately
	Floor	0.10	2	4	14.06	19.25	-26.96% Passed Code	3.1	43.5	4.7	PV	(990 x 1640)mm Ref: Ecolution
	Wall	0.15	_		1100	19.25	4					Renewables. Air tightness of 2 m³/hm²@50 Pa is
	Glazing	1.0	-									recommended.
	Total opening Area	24 m²										U Value : Please see column 2. Recommended Solution.
Unit No	No U Value (w/m ² K)		Air tightness (m ³ /hm ² @5 0 Pa)	Code level	DER	TER	Improvemen t over TER	ENE 01	FEE	ENE 02	Renewables	Conclusion
Unit 5.3	U Value	w/m²										In order to achieve Code level 4,
	Roof	0.10						3.3	63.3	0	PV	0.4kWpeak of PV is required. This equates to 2 no of South facing PV Panels. Each
	Floor	0.10					-29.14%					panel size is approximately (990 x
	Wall	0.15	2	3	19.04	26.87	Code level 4 achieved					1640)mm Ref: Ecolution Renewables.
	Glazing	1.0										Air tightness of 2 m ³ /hm ² @50 Pa is
	Total opening Area	13.72										recommended. U Value : Please see column 2. Recommended Solution.

RAMBOLL

TER 2009 Worksheet Design - Draft



Assessor name	Mrs Farah Naz	Assessor number	1					
Client		Last modified	21/02/2014					
Address	1.7 Ste 01 1.7 Kiln Place, Camden, Camden, Gospel Oak London, UK, NW5							

1. Overall dwe	lling dimensi	ons											
					A	rea (m²)			rage storey eight (m)		Vo	olume (m³)	
Lowest occupied	d					44.87	(1a) x		2.66] (2a) =		119.35	(3a)
+1						38.00	(1b) x		3.00	(2b) =		114.00	(3b)
+2						36.15	(1c) x		3.00	(2c) =		108.45	(3c)
Total floor area		(1a)	+ (1b) + (1c) + (1d)(1n) = 🔤	119.02	(4)						
Dwelling volume	е							(3a) + (3b) + (3	c) + (3d)(3n) =	341.80	(5)
2. Ventilation	rate												
											m	³ per hour	
Number of chim	neys								0	x 40 =	-	0	(6a)
Number of oper	n flues								0	x 20 =	-	0	(6b)
Number of inter	rmittent fans								3	x 10 =	-	30	(7a)
Number of pass	ive vents								0	x 10 =	-	0	(7b)
Number of fluel	ess gas fires								0	x 40 =	-	0	(7c)
											Air	changes pe hour	er
Infiltration due	to chimneys, t	flues, fans,	PSVs		(6a)	+ (6b) + (7a	a) + (7b) + (7c) =	30] ÷ (5) :	-	0.09	(8)
If a pressurisatio	on test has be	en carried	out or is inte	ended, pro	ceed to (17), otherwise	e continue j	rom (9) to	o (16)				
Air permeability	value, q50, e	xpressed ir	n cubic metr	es per hou	ir per squa	re metre of	envelope a	irea				10.00	(17)
If based on air p	ermeability v	alue, then	(18) = [(17) -	÷ 20] + (8),	otherwise	(18) = (16)						0.59	(18)
Air permeability	value applies	if a pressu	risation tes	t has been	done, or a	design or s	pecified air	permeabi	lity is being	used			
Number of sides	s on which dw	velling is sh	eltered									2	(19)
Shelter factor									1 -	[0.075 x (1	9)] =	0.85	(20)
Adjusted infiltra	tion rate									(18) x (20) =	0.50	(21)
Infiltration rate	modified for I	monthly wi	nd speed:										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Monthly averag	-				-					-			
(22)m	5.40	5.10	5.10	4.50	4.10	3.90	3.70	3.70	4.20	4.50	4.80	5.10	
										∑(22)1	.12 =	54.10	(22)
Wind Factor (22			4 27	4.42	1.02	0.00	0.02	0.02	4.05	1.12	1.20	4.27	7
(22a)m	1.35	1.27	1.27	1.12	1.02	0.98	0.92	0.92	1.05	1.12	1.20	1.27	
م مانین مهم ما : مطالب	tion rots /-!!-			المعمد مامما) _ (21) (2	20)				∑(22a)1	.12 =	13.52	(22a
Adjusted infiltra (22b)m	0.67	0.64	0.64	0.56) = (21) × (2 0.51	2a)m 0.49	0.46	0.46	0.52	0.56	0.60	0.64	7
(220)111	0.07	0.04	0.04	0.30	0.51	0.49	0.40	0.40	0.52		·		 (
										∑(22b)1	.12	6.76	(22k

(23a) If mechanical ventilation: air change rate through system N/A If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)), otherwise (23b) = (23a) N/A (23b) If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = N/A (23c)d) If natural ventilation or whole house positive input ventilation from loft if $(22b)m \ge 1$, then (24d)m = (22b)m; otherwise $(24d)m = 0.5 + [(22b)m2 \times 0.5]$ 0.61 0.61 0.64 0.66 0.68 0.70 (24d)m 0.73 0.70 0.70 0.66 0.63 0.62 (24d)Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25) 0.70 (25)m 0.73 0.70 0.66 0.63 0.62 0.61 0.61 0.64 0.66 0.68 0.70 (25)3. Heat losses and heat loss parameter The κ -value is the heat capacity per unit area, see Table 1e. Element Gross Openings, Net area U-value, A x U, к-value, Ахк. Area, m² m² W/m²K W/K kJ/m².K A. m² kJ/K Doors 1.85 х 2.00 = 3.70 N/A N/A (26)Window* 27.90 1.85 = 51.68 N/A N/A (27)х Ground floor 0.25 42.69 10.67 N/A N/A (28a) х = Party Wall 29.34 0.00 0.00 N/A N/A х = (32)External wall 154.16 х 0.35 ÷ 53.95 N/A N/A (29a) 7.79 N/A N/A Roof 48.69 0.16 (30)x _ 275.29 Total area of external elements ∑A, m² (31)* for windows and roof windows, effective window U-value is calculated using formula 1/[(1/UValue)+0.04] paragraph 3.2 127.79 Fabric heat loss, $W/K = \Sigma(A \times U)$ (26)...(30) + (32) =(33)Heat capacity $Cm = \sum (A \times \kappa)$ (28)...(30) + (32) + (32a)...(32e) = N/A (34)Thermal mass parameter (TMP) in kJ/m²K Calculated separately = 250.00 (35)Thermal bridges: $\Sigma(L \times \Psi)$ calculated using Appendix K 30.28 (36)if details of thermal bridging are not known then $(36) = 0.15 \times (31)$ Total fabric heat loss (33) + (36) =158.07 (37)Ventilation heat loss calculated monthly 0.33 x (25)m x (5) (38)m 82.05 79.28 79.28 74.21 71.19 69.78 68.44 68.44 71.92 74.21 76.67 79.28 (38) Heat transfer coefficient, W/K (37)m + (38)m 229.99 232.29 (39)m 240.13 237.36 237.36 232.29 229.26 227.85 226.52 226.52 234.74 237.36 Average = $\Sigma(39)1...12/12 =$ 232.64 (39) Heat loss parameter (HLP), W/m^2K (39)m ÷ (4) (40)m 2.02 1.99 1.99 1.95 1.93 1.91 1.90 1.90 1.93 1.95 1.97 1.99 Average = $\sum (40)1...12/12 =$ 1.95 (40)4. Water heating energy requirement kWh/year 2.86 (42)Assumed occupancy, N If TFA > 13.9, N = 1 + 1.76 x $[1 - exp(-0.000349 x (TFA - 13.9)^2)] + 0.0013 x (TFA - 13.9)$ If TFA ≤ 13.9, N = 1 Annual average hot water usage in litres per day Vd, average = (25 x N) + 36 107.49 (43) Annual average hot water usage has been reduced by 5% if the dwelling is designed to achieve a water use target of not more than 125 litres per person per day (all water use, hot and cold) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Hot water usage in litres per day for each month Vd, m = factor from Table 1c x (43)109.64 (44)m 118.23 113.94 109.64 105.34 101.04 96.74 96.74 101.04 105.34 113.94 118.23 ∑(44)1...12 = 1289.83 (44)Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x Tm/3600 kWh/month (see Tables 1b, 1c 1d) (45)m 175.76 153.72 158.62 138.29 132.70 114.51 106.11 121.76 123.21 143.59 156.74 170.21

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

For community heating include distribution loss whether or not hot water tank is present

(70)m	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00 (70)
Losses e.g. evapor	ration (nega	ative values) (Table 5)									
(71)m	-114.38	-114.38	-114.38	-114.38	-114.38	-114.38	-114.38	-114.38	-114.38	-114.38	-114.38	-114.38 (71)
Water heating gai	ns (Table 5))										
(72)m	182.14	179.65	174.48	167.45	162.89	156.47	151.01	158.00	160.49	167.76	175.97	179.66 (72)
Total internal gair	ıs (66)m + ((67)m + (68	s)m + (69)m	+ (70)m +	(71)m + (72	!)m						
(73)m	584.99	580.64	560.91	530.52	500.07	472.15	455.36	464.22	481.27	511.90	546.00	571.18 (73)
6. Solar gains			<u> </u>									
Solar gains are ca		• •	•			•				ition.		
Rows (74) to (82)					-	eded if ther	e is more ti	nan one wii	ndow type.			
Details for month						1	2 -	Cura elfica de		Current fin de		
	F	Access facto Table 6d	Dr	Area m ²	50	lar flux W/	-	Specific da or Table 6b		Specific da or Table 6c		Gains (W)
East		0.77	x	27.90	x	19.87	x 0.9 x	0.72	x	0.70	=	193.69 (76)
Solar gains in wat	ts calculate		1		1				1		1	
(83)m	193.69	375.42	600.04	890.92	1084.00	1131.09	1097.85	955.49	717.37	457.19	240.80	159.77 (83)
Total gains - inter												
(84)m	778.68	956.06	1160.95	1421.44	1584.06	1603.25	1553.21	1419.71	1198.64	969.09	786.81	730.95 (84)
(0))			1100.00		100.000	1000.20	1000.21	1.10.7.1	1150.01	505105	100.01	
7. Mean internal	temperatu	ure (heating	g season)									
Temperature duri	ng heating	periods in t	he living ar	ea from Ta	ble 9, Th1(°	C)						21.00 (85)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation factor f	or gains for	r living area	ι, η1,m (see	Table 9a)								
(86)m	1.00	0.99	0.98	0.95	0.87	0.74	0.55	0.59	0.86	0.97	0.99	1.00 (86)
Mean internal ten	np of living	area T1 (ste	eps 3 to 7 ir	n Table 9c)								
(87)m	18.83	19.05	19.47	19.96	20.48	20.81	20.95	20.94	20.65	20.02	19.28	18.88 (87)
Temperature duri	ng heating	periods in t	he living ar	ea from Ta	ble 9, Th2(°	C)						
(88)m	19.33	19.34	19.34	19.37	19.39	19.40	19.40	19.40	19.39	19.37	19.36	19.34 (88)
Utilisation factor f	or gains for	r rest of dw	elling η2,m	(see Table	9a)							
(89)m	0.99	0.99	0.97	0.93	0.81	0.61	0.36	0.39	0.76	0.95	0.99	1.00 (89)
Mean internal ten	nperature i	n the rest o	f dwelling T	Γ2 (follow s	teps 3 to 7	in Table 9c)					
(90)m	17.43	17.66	18.08	18.57	19.06	19.32	19.40	19.39	19.21	18.64	17.90	17.50 <mark>(90)</mark>
Living area fractio	n							fLA	30.00	÷ (4) =	-	0.25 (91)
Mean internal ten	nperature f	or the who	le dwelling	fLA x T1 +(:	1 - fLA) x T2							
(92)m	17.78	18.01	18.43	18.92	19.42	19.69	19.79	19.78	19.57	18.98	18.25	17.85 (92)
Apply adjustment	to the mea	in internal t	emperatur	e from Tab	le 4e, wher	e appropria	ate					
(93)m	17.78	18.01	18.43	18.92	19.42	19.69	19.79	19.78	19.57	18.98	18.25	17.85 <mark>(93)</mark>
8. Space heating	requireme											
	Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Set Ti to the mean			obtained a	it step 11 o	f Table 9b,	so that tim	= (93)m an	d recalcula	te the utilis	ation facto	r for gains	using Table 9a)
Utilisation factor f			0.07	0.02	0.01	0.04	0.41	0.44	0.70	0.05	0.00	
(94)m	0.99	0.99	0.97	0.92	0.81	0.64	0.41	0.44	0.78	0.95	0.99	0.99 (94)
Useful gains, ηmG		1		1209.27	1200.07	1020 70	C24.27	c27.02	021.20	017.40	777 4 6	
(95)m	773.01	942.54	1122.16	1308.37	1288.87	1020.78	634.37	627.83	931.20	917.40	777.16	726.22 <mark>(95)</mark>
Monthly average				-	11 70	14.00	10.00	10.00	14.20	10.00	7.00	4.00 (00)
(96)m	4.50	5.00	6.80	8.70	11.70	14.60	16.90	16.90	14.30	10.80	7.00	4.90 (96)
Heat loss rate for		· · ·			1700.40	1100.40	654.27	652.20	1212 24	1001.10	2640.04	
(97)m	3189.51	3088.59	2760.75		1769.48	1160.43	654.27	653.20	1212.34	1901.16	2640.84	3072.95 (97)
Space heating req								0.00	0.00	724.04	1244.05	1745 07
(98)m	1797.88	1442.14	1219.11	767.88	357.57	0.00	0.00	0.00	0.00	731.91	1341.85	1745.97

							Total ner v	/ear (kWh/	vear) = 5(9)	8)15, 10	12 = 9	404.32	(98
Space heating req	uirement ir	n kWh/m²/y	ear				fotul per ;					79.01] (99] (99
9a. Energy Requi	irements - I	Individual h	eating syst	ems incluc	ling micro-	СНР							
Space heating:													
Fraction of space	heating from	m secondar	y/suppleme	entary syst	em (Table 1	L1)			0.10	(201)			
Fraction of space	heating from	m main syst	:em(s) 1 - (0.90	(202)						
Fraction of main h	neating fron	n main syste	em 2			0.00	(203)						
Fraction of total s	pace heat f	rom main sy	ystem 1 (20			0.90	(204)						
Fraction of total s	pace heat f	rom main s	ystem 2 (20	02) x (203)					0.00	(205)			
Efficiency of main	space heat	ing system	1 (%)						78.90	(206)			
(from database or	· • Table 4a/4	ıb, adjusted	where app	ropriate by	y the amou	nt shown in	the 'space	efficiency	adjustmen		Table 4c)		
Efficiency of secor		-							100.00	(208)			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating req	uirement, k	wh/month	(as calcula	ted above))								
(98)m	1797.88	1442.14	1219.11	767.88	357.57	0.00	0.00	0.00	0.00	731.91	1341.85	1745.97]
Space heating fue	l (main hea	ting system	1), kWh/m	onth = (98)m x (204) x	x 100 ÷ (20	6)						
(211)m	2050.81	1645.03	1390.62	875.91	407.88	0.00	0.00	0.00	0.00	834.88	1530.62	1991.60]
						1	Total per ye	ear (kWh/ye	ear) = ∑(21	1)15, 10	12 = 10	0727.37	(21:
Space heating fue	l (secondar	y), kWh/mc	onth = (98)n	n x (201) x	100 ÷ (208)	1							-
	,	,,, ,	(= =).	1 - 7	- (,								-

(215)m	179.79	144.21	121.91	76.79	35.76	0.00	0.00	0.00	0.00	73.19	134.18	174.60	
						1	Fotal per ye	ar (kWh/ye	ear) = ∑(215	5)15, 10	.12 = 9	940.43	(215)

Water heating:

Output from wate	Output from water heater, kWh/month (calculated above)														
(64)m	272.09	240.73	254.96	231.52	229.03	207.73	202.44	218.10	216.44	239.93	249.97	266.55]		
										∑(64)1	.12 = 2	829.51	(64)		

Efficiency of water heater per month 77.27 77.13 76.77 76.10 74.36 68.80 68.80 68.80 68.80 75.92 76.96 77.26 (217)m Fuel for water heating, kWh/month = $(64)m \times 100 \div (217)m$ (219)m 352.15 312.12 332.09 304.25 308.00 301.94 294.25 317.00 314.60 316.01 324.80 345.02

3822.22 Total per year (kWh/year) = $\Sigma(219)1...12 =$ (219)

Annual Totals Summary:	kWh/year kWh/year	
Space heating fuel used, main system 1	10727.37 (211)	.)
Space heating fuel used, secondary	940.43 (215))
Water heating fuel used	3822.22 (219)	ı)
Electricity for pumps, fans and electric keep-hot (Table 4f):		
mechanical ventilation fans - balanced, extract or positive input from outside	0.00 (230;	ia)
warm air heating system fans	0.00 (230)	ıb)
central heating pump	130.00 (230)	ic)
oil boiler pump	0.00 (230)	id)
boiler flue fan	45.00 (230)	ie)
maintaining electric keep-hot facility for gas combi boiler	0.00 (230)	if)
pump for solar water heating	0.00 (230)	ig)
Total electricity for the above	Σ(230a)(230g) 175.00 (231)	.)
Electricity for lighting (calculated in Appendix L):	759.95 (232)	.)
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP		

12a. Carbon dioxide emissions - Individual heating systems includin	ng micro-CHP		
	Energy	Emissions	Emissions
	kWh/year	Factor	(kgCO2/year)

Space heating - main system 1	10727.37	х	0.194] = [2081.11	(261)
Space heating - secondary	940.43	х	0.422] = [396.86	(263)
Water heating	3822.22	х	0.194] = [741.51	(264)
Space and water heating			(261) + (262) +	- (263) + (264) =	3219.48	(265)
Pumps, fans and electric keep-hot	175.00	x	0.422] =	73.85	(267)
Lighting	759.95	x	0.422] =	320.70	(268)
Total carbon dioxide emissions				∑(261)(271) =	3614.03	(272)
Emissions per m ² for space and water heating					27.67	(272a)
Emissions per m ² for lighting					2.69	(272b)
Target Carbon Dioxide Emissions Rate (TER)		[(27.67 ×	< FF × EFA) + (2.6	9 × EFA)] × (0.6)	18.93	(273)

DER 2009 Worksheet Design - Draft



This design submission has been carried out using Approved SAP software. It has been prepared from plans and specifications and may not reflect the property as constructed.

Assessor name	Mrs Farah Naz	Assessor number	1
Client		Last modified	21/02/2014
Address	1.7 Ste 01 1.7 Kiln Place, Camden, Camden, Gospel Oak London, UK, N	W5	

1. Overall dwelling dimension	ons											
				A	rea (m²)		¢	verage storey height (m)		Vo	lume (m³)	
Lowest occupied					44.87	(1a) x		2.66	(2a) =		119.35	(3a)
+1					38.00	(1b) x		3.00	(2b) =		114.00	(3b)
+2					36.15	(1c) x		3.00	(2c) =		108.45	(3c)
Total floor area	(1a) ·	+ (1b) + (1c) + (1d)(1	Ln) = 🔤	119.02	(4)						
Dwelling volume								(3a) + (3b) + (3	c) + (3d)(3n) =	341.80	(5)
2. Ventilation rate												
										m	³ per hour	
Number of chimneys								0	x 40 :	=	0	(6a)
Number of open flues								0	x 20 :	=	0	(6b)
Number of intermittent fans								0) x 10 :	=	0	(7a)
Number of passive vents								0) x 10 :	=	0	(7b)
Number of flueless gas fires								0	x 40 ×	=	0	(7c)
										Airo	changes pe hour	er
Infiltration due to chimneys,	flues, fans, F	PSVs		(6a)	+ (6b) + (7	a) + (7b) +	(7c) =	0	÷ (5)	=	0.00	(8)
If a pressurisation test has be	en carried o	ut or is inte	ended, pro	ceed to (17), otherwis	e continue	e from (9) to (16)				
Air permeability value, q50, e	expressed in	cubic metr	es per hou	ir per squa	re metre o	f envelope	area				2.50	(17)
If based on air permeability v	alue, then (18) = [(17)	÷ 20] + (8),	otherwise	(18) = (16))					0.12	(18)
Air permeability value applies	s if a pressui	isation tes	t has been	done, or a	design or s	specified a	ir perme	ability is being	used			
Number of sides on which dw	elling is she	ltered									1	(19)
Shelter factor								1 -	[0.075 x (1	.9)] =	0.92	(20)
Adjusted infiltration rate									(18) x (20) =	0.12	(21)
Infiltration rate modified for	monthly wir	d speed:										
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	g Sep	Oct	Nov	Dec	
Monthly average wind speed			4.50	4.10	2.00	2 70	270	4.20	4.50	4.80	F 10	7
(22)m 5.40	5.10	5.10	4.50	4.10	3.90	3.70	3.70	9 4.20	4.50	4.80	5.10	
Wind Easter (22a) $m = (22)m$	• •								∑(22)1	.12 =	54.10	(22)
Wind Factor (22a)m = (22)m - (22a)m 1.35	. 4 1.27	1.27	1.12	1.02	0.98	0.92	0.92	2 1.05	1.12	1.20	1.27	7
(220)	1.27	1.27	1.12	1.02	0.50	0.52	0.52	1.05	Σ(22a)1	·	13.52	 (22a)
Adjusted infiltration rate (allo	wing for sh	elter and w	vind speed) = (21) × (2	2a)m				21-20/1	·	10.02	_ (=20)
(22b)m 0.16	0.15	0.15	0.13	0.12	0.11	0.11	0.12	L 0.12	0.13	0.14	0.15	
	·	I							∑(22b)1	.12 =	1.56	(22b)
Calculate effective air change	rate for the	applicable	e case:									

Calculate effective air change rate for the applicable case:

If mechanica	al ventilation:	air change	rate throug	gh system									0.50	(23a)
lf exhaust ai	ir heat pump (using Apper	idix N, (23t	o) = (23a) ×	Fmv (equa	tion (N5)), d	otherv	vise (23	b) = (23	a)			0.50	(23b)
If balanced v	with heat reco	overy: efficie	ency in % a	llowing for	in-use fact	or (from Ta	ble 4h	ı) =					77.35	(23c)
a) If balance	d mechanical	ventilation	with heat	recovery (N	1VHR) (22	b)m + (23b) x [1 -	(23c) ÷	- 100] =	_				_
(24a)m	0.27	0.26	0.26	0.24	0.23	0.23	0.3	22	0.22	0.23	0.24	0.25	0.26	(24a)
Effective air cha	ange rate - en	ter (24a) or	(24b) or (2	4c) or (24d)) in box (25	5)								_
(25)m	0.27	0.26	0.26	0.24	0.23	0.23	0.3	22	0.22	0.23	0.24	0.25	0.26	(25)
3. Heat losses	and heat loss	s parameter												
The κ-value is ti	he heat capac	ity per unit	area, see T	able 1e.										
	Element		Gross Area, m ²	Open m	•	Net area A, m²		U-valu W/m ²		А x U, W/К		alue, m².K	Ахк, kJ/K	
Doors						4.40] x	1.00) =	4.40	N	/A	N/A	(26)
Window*						20.52	x	0.96	5 =	19.73	N	/A	N/A	(27)
Ground floor						42.69	x	0.10) =	4.27	N	/A	N/A	(28a)
External wall						158.99	x	0.15	; =	23.85		/A	N/A	(29a)
Party Wall						29.34	x	0.00) =	0.00		/A	N/A	(32)
Roof						48.69	x	0.10) =	4.87		/A	N/A	(30)
Total area of ex	ternal elemer	nts ΣA. m²				275.29	(31)					<i>.</i>		
* for windows a		_	ve window	U-value is a	calculated (using formu		(1/UVa	lue)+0.0	4] paragra	ph 3.2			
Fabric heat loss	-					3,	, ,	. /	,		, 26)(30) + (32) =	57.12	(33)
Heat capacity C		-							(28)		+ (32a)(3		N/A	(34)
Thermal mass p		/P) in kI/m²	к						(20)		ated separat		285.00] (35)] (35)
Thermal bridge	•			vK						Calcula			27.53	(35) (36)
-	thermal bridg				5 v (31)								27.55	
Total fabric hea	-	ing are not		(50) = 0.11) X (31)						(33) + (36) =	84.64	(37)
Ventilation hea		ed monthly	0.33 x (25	5)m x (5)							()			
(38)m	30.38	29.40	29.40	27.45	26.14	25.49	24.	84	24.84	26.47	27.45	28.42	29.40	(38)
Heat transfer co	oefficient. W/	K (37)m+	(38)m					I		1	1	1		
(39)m	115.03	114.05	114.05	112.09	110.79	110.13	109	.48	109.48	111.11	112.09	113.07	114.05	7
		•								Average =	Σ(39)112	/12 =	112.12	(39)
Heat loss paran	neter (HLP), V	//m²K (39)	m ÷ (4)							-				
(40)m	0.97	0.96	0.96	0.94	0.93	0.93	0.9	92	0.92	0.93	0.94	0.95	0.96	
						•		·		Average =	Σ(40)112,	/12 =	0.94	(40)
			_											_
4. Water heat	ing energy re	quirement			-									
												k	Wh/year	
Assumed occup	oancy, N										2.86	(42	2)	
If TFA > 13.9	9, N = 1 + 1.76	x [1 - exp(-	0.000349 x	(TFA - 13.9)²)] + 0.001	l3 x (TFA - 1	.3.9)							
If TFA ≤ 13.9	9, N = 1													
Annual average	e hot water us	age in litres	per day Vo	d,average =	(25 x N) +	36					102.1	1 (43	3)	
Annual average	e hot water us	age has bee	en reduced	by 5% if the	e dwelling i	is designed	to acl	nieve a	water us	se target of	not more tl	han 125 lit	res	
per person per	day (all water	use, hot an	d cold)											
	Jan	Feb	Mar	Apr	Мау	Jun	Ju	ıl	Aug	Sep	Oct	Nov	Dec	
Hot water usag	e in litres per	day for eac	h month Vo	d,m = factor	r from Tabl	e 1c x (43)								_
(44)m	112.32	108.24	104.15	100.07	95.99	91.90	91.	90	95.99	100.07	104.15	108.24	112.32	
											∑(44)1	.12 =	1225.34	(44)
Energy content	of hot water	used - calcu	lated mon	thly = 4.190) x Vd,m x r	nm x Tm/36	600 k	Wh/mo	onth (see	e Tables 1b	, 1c 1d)			
(45)m	166.97	146.03	150.69	131.38	126.06	108.78	100	.80	115.67	117.05	136.41	148.91	161.70	

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

For community heating include distribution loss whether or not hot water tank is present

Distribution loss 0.15 x (45)m	
(46)m 25.05 21.90 22.60 19.71 18.91 16.32 15.12 17.35 17.56 20.46 22.34 24.2	6 (46)
Water storage loss:	
b) If manufacturer's declared cylinder loss factor is not known:	
Cylinder volume (litres) including any solar storage within same cylinder 250.00 (50)	
If community heating and no tank in dwelling, enter 110 litres in box (50)	
Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in box (50)	
Hot water storage loss factor from Table 2 (kWh/litre/day) 0.01 (51)	
If community heating see SAP 2009 section 4.3	
Volume factor from Table 2a 0.78 (52)	
Temperature factor from Table 2b0.54(53)	
Energy lost from water storage, kWh/day (50) x (51) x (52) x (53) 0.91 (54)	
Enter (49) or (54) in (55) 0.91 (55)	
Water storage loss calculated for each month = (55) x (41)m	
(56)m 28.09 25.37 28.09 27.18 28.09 28.09 28.09 28.09 28.09 28.09 28.09 28.09	9 <mark>(56)</mark>
If cylinder contains dedicated solar storage, = (56)m x [(50) - (H11)] ÷ (50), else = (56)m where (H11) is from Appendix H	
(57)m 28.09 25.37 28.09 27.18 28.09 27.18 28.09 28.09 27.18 28.09 27.18 28.09 27.18 28.09 27.18 28.09 27.18 28.09	9 (57)
Primary circuit loss (annual) from Table 3 360.00 (58)	
Primary circuit loss for each month (58) ÷ 365 × (41)m	
(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)	
(59)m <u>30.58 27.62 30.58 29.59 20.59 20.58 20.59 20.58 200.58 20.58 20.58 20.58 20.58 20.58 20.58 20.58 20.58 20.58 20.5</u>	8 (59)
Combi loss for each month from Table 3a, 3b or 3c (enter '0' if not a combi boiler) (61)m 0.00 <td>(61)</td>	(61)
) (61)
Total heat required for water heating calculated for each month $0.85 \times (45)m + (46)m + (57)m + (59)m + (61)m$ (62)m225.63199.02209.36188.15184.72165.55159.46174.33173.82195.07205.68220.33	36 (62)
Solar DHW input calculated using Appendix H (negative quantity) ('0' entered if no solar contribution to water heating)	
(63)m 0.00 <t< td=""><td>)</td></t<>)
$\Sigma(63)112 = 0.00$	(63)
Output from water heater for each month, kWh/month (62)m + (63)m	
(64)m 225.63 199.02 209.36 188.15 184.72 165.55 159.46 174.33 173.82 195.07 205.68 220.3	36
Σ(64)112 = 2301.16	(64)
if (64)m < 0 then set to 0	
Heat gains from water heating, kWh/month 0.25 × [0.85 × (45)m + (61)m] + 0.8 × [(46)m + (57)m + (59)m]	
(65)m 79.98 70.65 74.57 67.35 66.38 59.84 57.98 62.92 62.59 69.82 73.18 78.2	3 <mark>(65)</mark>
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating	
5. Internal gains (see Table 5 and 5a)	
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Metabolic gains (Table 5), Watts	:
(66)m 142.97 142.97 142.97 142.97 142.97 142.97 142.97 142.97 142.97 142.97 142.97 142.97 142.97 142.97 142.97)7 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	
(67)m 25.55 22.69 18.45 13.97 10.44 8.82 9.53 12.38 16.62 21.10 24.63 26.2	6 (<mark>67</mark>)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	• •
(68)m 283.93 286.88 279.45 263.65 243.69 224.94 212.41 209.47 216.89 232.70 252.65 271.4	10 <mark>(68)</mark>
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	
(69)m 37.30	0 (69)
Pumps and fans gains (Table 5a)	

(70)m	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(70)
Losses e.g. evapor	ration (nega	ative values) (Table 5)										
(71)m	-114.38	-114.38	-114.38	-114.38	-114.38	-114.38	-114.38	-114.38	-114.38	-114.38	-114.38	-114.38	(71)
Water heating gai	ns (Table 5))											
(72)m	107.50	105.13	100.22	93.55	89.21	83.11	77.93	84.57	86.93	93.84	101.64	105.14	(72)
Total internal gain	ıs (66)m + ((67)m + (68)m + (69)m	+ (70)m +	(71)m + (72	.)m							
(73)m	482.87	480.59	464.02	437.06	409.24	382.76	365.76	372.31	386.34	413.54	444.82	468.70	(73)

6. Solar gains

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Rows (74) to (82) are used 12 times, one for each month, repeating as needed if there is more than one window type.

Details for month of January and annual totals are shown below:

	A	Access facto	or	Area m ²	So	lar flux W/	-	Specific da		F Specific da		Gains (W)	I
		Table 6d			1			or Table 6b		or Table 6c			_
West		0.77	x	1.32	x	19.87	x 0.9 x	0.60	x	0.80	=	8.73	(80)
West		0.77	x	0.85	x	19.87	x 0.9 x	0.60	x	0.70	=	4.90	(80)
East		0.77] x	1.82	x	19.87] x 0.9 x	0.60	x	0.80	=	12.03	(76)
South		0.77] x	15.89	x	47.32	x 0.9 x	0.60	x	0.80	=	250.16	(78)
North		0.77] x	0.64	x	10.73	x 0.9 x	0.60	x	0.80	=	2.28	(74)
Solar gains in watt	s, calculate	d for each	month ∑(74	4)m(82)m	1								
(83)m	278.09	462.06	584.76	685.28	733.39	743.36	728.59	688.79	632.32	516.70	331.10	239.22	(83)
Total gains - intern	al and sola	nr (73)m + (83)m										
(84)m	760.96	942.65	1048.78	1122.34	1142.64	1126.12	1094.35	1061.11	1018.66	930.24	775.91	707.91	(84)
7. Mean internal	temperatu	၊re (heatinန	g season)					-					
Temperature durir	ng heating	periods in t	he living ar	ea from Ta	ble 9, Th1(°	°C)						21.00	(85)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	_
Utilisation factor for	or gains for	^r living area	, η1,m (see	Table 9a)									
(86)m	1.00	0.99	0.98	0.94	0.82	0.62	0.41	0.42	0.70	0.94	1.00	1.00	(86)
Mean internal tem	p of living	area T1 (ste	eps 3 to 7 ir	n Table 9c)									
(87)m	20.17	20.35	20.56	20.76	20.93	20.99	21.00	21.00	20.98	20.80	20.40	20.17	(87)
Temperature durir	ng heating	periods in t	he living ar	ea from Ta	ble 9, Th2(°	°C)							
(88)m	20.11	20.12	20.12	20.13	20.14	20.15	20.15	20.15	20.14	20.13	20.13	20.12	(88)
Utilisation factor for	or gains for	rest of dw	elling η2,m	(see Table	9a)								
(89)m	1.00	0.99	0.97	0.92	0.77	0.54	0.33	0.34	0.63	0.91	0.99	1.00	(89)
Mean internal tem	iperature ii	n the rest o	f dwelling 7	r2 (follow s	teps 3 to 7	in Table 9c)		-				_
(90)m	19.00	19.27	19.58	19.86	20.08	20.14	20.15	20.15	20.13	19.92	19.36	19.01	(90)
Living area fraction	ı							fLA	30.00	÷ (4) =	:	0.25	(91)
Mean internal tem	perature f	or the whol	le dwelling	fLA x T1 +(2	L - fLA) x T2	2							
(92)m	19.29	19.54	19.83	20.09	20.30	20.36	20.37	20.37	20.34	20.14	19.62	19.31	(92)
Apply adjustment	to the mea	n internal t	emperatur	e from Tab	le 4e, wher	e appropria	ate						
(93)m	19.29	19.54	19.83	20.09	20.30	20.36	20.37	20.37	20.34	20.14	19.62	19.31	(93)
8. Space heating	requireme	nt											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Set Ti to the mean	internal te	mperature	obtained a	it step 11 o	f Table 9b,	so that tim	= (93)m ar	d recalcula	te the uti	lisation facto	r for gains	using Table	e 9a)
Utilisation factor for	or gains, ηr	n											
(94)m	1.00	0.99	0.97	0.92	0.78	0.56	0.35	0.36	0.64	0.91	0.99	1.00	(94)
Useful gains, ηmGi	m, W = (94)m x (84)m											
(95)m	758.64	932.21	1014.30	1029.58	889.79	628.02	379.22	379.17	656.48	850.23	769.33	706.23	(95)
Monthly average e	external ter	nperature	from Table	8									
(96)m	4.50	5.00	6.80	8.70	11.70	14.60	16.90	16.90	14.30	10.80	7.00	4.90	(96)

leat loss rate fo		· · ·	1		1	1	1	1	1	1	1	-1	_
(97)m	1701.75	1658.53	1485.93	1276.71	952.29	633.98	379.42	379.41	671.38	1047.36	1427.21	1642.96	(97
pace heating r	-		1		24 x [(97)m	ı - (95)m] x	1	1	r	1		- I	_
(98)m	701.68	488.09	350.89	177.93	46.50	0.00	0.00	0.00	0.00	146.67	473.67	696.93	
							Total per y	/ear (kWh/	year) = ∑(9	8)15, 10	.12 =	3082.35	(98
bace heating r	equirement in	n kWh/m²/y	/ear							(98)	÷ (4)	25.90	(99
9a. Energy Rec	quirements -	Individual h	eating syst	ems incluc	ling micro-	СНР							
bace heating:													
action of space	e heating fro	m secondar	y/supplem	entary syst	em (Table 1	11)			0.00	(201)			
action of spac	ce heating fro	m main syst	tem(s) 1 -	(201)					1.00	(202)			
action of mair	n heating fror	n main syste	em 2						0.00	(203)			
action of tota	l space heat f	rom main sy	ystem 1 (2	02) x [1 - (2	.03)]				1.00	(204)			
action of tota	l space heat f	rom main sy	vstem 2 (2	02) x (203)					0.00	(205)			
ficiency of ma				- / (/					91.00	(206)			
rom database	•	• •		propriate by	v the amou	nt shown i	n the 'space				f Table 4c)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
bace heating r				•	•			J	•				
(98)m	701.68	488.09	350.89	177.93	46.50	0.00	0.00	0.00	0.00	146.67	473.67	696.93	
ace heating f	uel (main hea	ting system	1), kWh/m	nonth = (98)m x (204) x	x 100 ÷ (20	06)						
211)m	771.07	536.36	385.59	195.53	51.10	0.00	0.00	0.00	0.00	161.17	520.52	765.86	
							Total per ye	ear (kWh/w	ear) = Σ(21	1)1 5 10	12 =	3387.20	 (2:
							rotur per ye		2(21)	1,1		5567.20	
ater heating:													
A													
	ater heater, k	1				-							-
	ater heater, k ^a 225.63	Wh/month 199.02	(calculated) 209.36	188.15	184.72	165.55	159.46	174.33	173.82	195.07	205.68	220.36	
		1			184.72	165.55	159.46	174.33	173.82	195.07 Σ(64)1	·	220.36 2301.16	(64
(64)m	225.63	199.02 r month			184.72						.12 =	2301.16	(64
(64)m ficiency of wa	225.63	199.02			184.72 82.24	165.55 80.30	80.30	80.30	80.30		·		(64
(64)m ficiency of wa (217)m	225.63 Iter heater pe 88.14	199.02 r month 87.62	209.36 86.68	188.15 85.17						∑(64)1	.12 =	2301.16	(64
(64)m ficiency of wa (217)m iel for water h	225.63 Iter heater pe 88.14	199.02 r month 87.62	209.36 86.68	188.15 85.17						∑(64)1	.12 =	2301.16	(64
(64)m ficiency of wa (217)m uel for water h	225.63 Iter heater pe 88.14 neating, kWh/	199.02 r month 87.62 'month = (64	209.36 86.68 4)m x 100 ÷	188.15 85.17 - (217)m	82.24	80.30	80.30	80.30	80.30	∑(64)1 84.57	.12 =	2301.16	
(64)m ficiency of wa (217)m uel for water h	225.63 Iter heater pe 88.14 neating, kWh/	199.02 r month 87.62 'month = (64	209.36 86.68 4)m x 100 ÷	188.15 85.17 - (217)m	82.24	80.30	80.30	80.30	80.30	∑(64)1 84.57 230.67	.12 =	2301.16 888.18 249.91	
(64)m ficiency of wa (217)m uel for water h (219)m	225.63 Iter heater pe 88.14 heating, kWh/ 255.99	199.02 r month 87.62 'month = (64	209.36 86.68 4)m x 100 ÷	188.15 85.17 - (217)m	82.24	80.30	80.30	80.30	80.30	∑(64)1 84.57 230.67	.12 = 87.47 235.13 .12 =	2301.16 888.18 249.91	
(64)m fficiency of wa (217)m uel for water h (219)m nnual Totals S	225.63 Iter heater pe 88.14 heating, kWh/ 255.99	199.02 r month 87.62 month = (64 227.14	209.36 86.68 4)m x 100 ÷ 241.52	188.15 85.17 - (217)m	82.24	80.30	80.30	80.30	80.30	∑(64)1 84.57 230.67 = ∑(219)1	.12 = 87.47 235.13 .12 =	2301.16 88.18 249.91 2724.19	 (21
(64)m ficiency of wa (217)m uel for water h (219)m nnual Totals S pace heating f	225.63 Iter heater pe 88.14 heating, kWh/ 255.99	199.02 r month 87.62 month = (64 227.14	209.36 86.68 4)m x 100 ÷ 241.52	188.15 85.17 - (217)m	82.24	80.30	80.30	80.30	80.30	∑(64)1 84.57 230.67 = ∑(219)1	.12 = 87.47 235.13 .12 =	2301.16 88.18 249.91 2724.19	(21 (21
(64)m ficiency of wa (217)m uel for water h (219)m nnual Totals S pace heating f	225.63 Iter heater pe 88.14 heating, kWh/ 255.99	199.02 r month 87.62 'month = (64 227.14 in system 1	209.36 86.68 4)m x 100 ÷ 241.52	188.15 85.17 (217)m 220.92	82.24	80.30	80.30	80.30	80.30	∑(64)1 84.57 230.67 = ∑(219)1	.12 = 87.47 235.13 .12 =	2301.16 88.18 249.91 2724.19 wh/year 3387.20	(21 (21
(64)m ficiency of wa (217)m uel for water h (219)m nnual Totals S pace heating f /ater heating f ectricity for p	225.63 Iter heater pe 88.14 heating, kWh/ 255.99 Summary: fuel used, main fuel used umps, fans an	199.02 r month 87.62 month = (64 227.14 in system 1 nd electric k	209.36 86.68 4)m x 100 : 241.52	188.15 85.17 (217)m 220.92	82.24	80.30	80.30	80.30	80.30	Σ(64)1 84.57 230.67 = Σ(219)1 kWh/ye	.12 = 87.47 235.13 .12 =	2301.16 88.18 249.91 2724.19 wh/year 3387.20	(21 (21 (21
(64)m ficiency of wa (217)m uel for water h (219)m nnual Totals S pace heating f /ater heating f ectricity for p mechanical y	225.63 Iter heater pe 88.14 heating, kWh/ 255.99 Gummary: fuel used, mai fuel used umps, fans an ventilation fan	199.02 r month 87.62 'month = (64 227.14 in system 1 nd electric k ns - balance	209.36 86.68 4)m x 100 ; 241.52	188.15 85.17 (217)m 220.92	82.24	80.30	80.30	80.30	80.30	Σ(64)1 84.57 230.67 = Σ(219)1 kWh/γe	.12 = 87.47 235.13 .12 = ear	2301.16 88.18 249.91 2724.19 wh/year 3387.20	(2: (2: (2: (2:
(64)m ficiency of wa (217)m uel for water h (219)m nnual Totals S pace heating f /ater heating f /ater heating f mechanical warm air heat	225.63 Iter heater pe 88.14 heating, kWh/ 255.99 Gummary: fuel used, main fuel used, main fuel used and the second the second se	199.02 r month 87.62 'month = (64 227.14 in system 1 nd electric k ns - balance	209.36 86.68 4)m x 100 ; 241.52	188.15 85.17 (217)m 220.92	82.24	80.30	80.30	80.30	80.30	∑(64)1 84.57 230.67 = ∑(219)1 kWh/ye 297.74 0.00	.12 = 87.47 235.13 .12 = ear 	2301.16 88.18 249.91 2724.19 wh/year 3387.20) (22) (22) (23) (23) (23)
(64)m ficiency of wa (217)m uel for water h (219)m nnual Totals S pace heating f Vater heating f vater heating f ectricity for p mechanical w warm air heat	225.63 Iter heater pe 88.14 heating, kWh/ 255.99 Gummary: fuel used, main fuel used umps, fans an ventilation fan ating system fan ing pump	199.02 r month 87.62 'month = (64 227.14 in system 1 nd electric k ns - balance	209.36 86.68 4)m x 100 ; 241.52	188.15 85.17 (217)m 220.92	82.24	80.30	80.30	80.30	80.30	Σ(64)1 84.57 230.67 = Σ(219)1 kWh/ye 297.74 0.00 130.00	.12 = 87.47 235.13 .12 = ear 4	2301.16 88.18 249.91 2724.19 wh/year 3387.20) (2: (2: (2: (2: (2: (2: (2: (2:
(64)m ficiency of wa (217)m rel for water h (219)m nual Totals S bace heating f ater heating f ectricity for p mechanical w warm air heat central heat oil boiler pu	225.63 ter heater pe 88.14 heating, kWh/ 255.99 Gummary: fuel used, mai fuel used umps, fans an ventilation fan ating system f ing pump mp	199.02 r month 87.62 'month = (64 227.14 in system 1 nd electric k ns - balance	209.36 86.68 4)m x 100 ; 241.52	188.15 85.17 (217)m 220.92	82.24	80.30	80.30	80.30	80.30	Σ(64)1 84.57 230.67 = Σ(219)1 kWh/ye 297.7 0.00 130.00 0.00	.12 = 87.47 235.13 .12 = ear 4 0	2301.16 88.18 249.91 2724.19 wh/year 3387.20) (22) (22) (23) (23) (23) (23) (23) (23
(64)m ficiency of wa (217)m uel for water h (219)m nnual Totals S pace heating f /ater heating f /ater heating f /ater heating f mechanical w warm air heat central heating oil boiler pur boiler flue fa	225.63 Iter heater pe 88.14 heating, kWh/ 255.99 Gummary: fuel used, main fuel used, main fuel used, main fuel used umps, fans an ventilation fan ating system fan ing pump mp an	199.02 r month 87.62 month = (64 227.14 in system 1 nd electric k ns - balance fans	209.36 86.68 4)m x 100 ; 241.52 ceep-hot (T	188.15 85.17 (217)m 220.92	82.24	80.30	80.30	80.30	80.30	∑(64)1 84.57 230.67 = ∑(219)1 kWh/ye 297.74 0.00 130.00 0.00	.12 = 87.47 235.13 .12 = ear 4 	2301.16 88.18 249.91 2724.19 wh/year 3387.20] (2:] (2:] (2:] (2: (2: (2: (2: (2: (2: (2: (2: (2: (2:
(64)m ficiency of wa (217)m uel for water h (219)m nnual Totals S pace heating f /ater heating f /ater heating f /ater heating f mechanical warm air heati central heati oil boiler pur boiler flue fa maintaining	225.63 ter heater pe 88.14 heating, kWh/ 255.99 Gummary: fuel used, main fuel	199.02 r month 87.62 'month = (64 '227.14 in system 1 in electric k ns - balance fans	209.36 86.68 4)m x 100 ; 241.52 ceep-hot (T	188.15 85.17 (217)m 220.92	82.24	80.30	80.30	80.30	80.30	$\sum (64)1$ 84.57 230.67 $= \sum (219)1$ kWh/ye 297.74 0.00 130.00 0.00 0.00	.12 = 87.47 235.13 .12 = ear 4	2301.16 88.18 249.91 2724.19 wh/year 3387.20	(21) (21) (21) (22) (23) (23) (23) (23) (23) (23) (23
(64)m ficiency of wa (217)m uel for water h (219)m nual Totals S pace heating f /ater heating f //ater heating f //	225.63 ter heater pe 88.14 heating, kWh/ 255.99 Summary: fuel used, mai fuel used, mai fuel used umps, fans an ventilation fan ating system fan ing pump mp an electric keep- lar water hea	199.02 r month 87.62 'month = (64 '227.14 in system 1 ind electric k ns - balance fans -hot facility ting	209.36 86.68 4)m x 100 ; 241.52	188.15 85.17 (217)m 220.92	82.24	80.30	80.30	80.30	80.30 216.47 kWh/year)	$\sum (64)1$ 84.57 230.67 $= \sum (219)1$ kWh/yee 297.7. 0.00 130.00 0.00 0.00 0.00 0.00	.12 = 87.47 235.13 .12 = ear 4 0	2301.16 88.18 249.91 2724.19 wh/year 3387.20) (21) (21) (22) (23) (23) (23) (23) (23) (23) (23
(64)m ficiency of wa (217)m uel for water h (219)m nual Totals S pace heating f /ater heating f //ater heating f //	225.63 ter heater pe 88.14 heating, kWh/ 255.99 Summary: fuel used, mai fuel used, mai fuel used umps, fans an ventilation fan ating system fan ing pump mp an electric keep- lar water hea	199.02 r month 87.62 'month = (64 '227.14 in system 1 ind electric k ns - balance fans -hot facility ting	209.36 86.68 4)m x 100 ; 241.52	188.15 85.17 (217)m 220.92	82.24	80.30	80.30	80.30	80.30 216.47 kWh/year)	$\sum (64)1$ 84.57 230.67 $= \sum (219)1$ kWh/ye 297.74 0.00 130.00 0.00 0.00	.12 = 87.47 235.13 .12 = ear 4 0	2301.16 88.18 249.91 2724.19 Wh/year 3387.20 2724.19) (21) (21) (22) (23) (23) (23) (23) (23) (23) (23
(64)m fficiency of wa (217)m uel for water h (219)m nnual Totals S pace heating f /ater heating f	225.63 ther heater pe 88.14 heating, kWh/ 255.99 Gummary: fuel used, mai fuel used, mai fuel used umps, fans an ventilation fan ating system to ing pump mp an electric keep- lar water hea of of the above	199.02 r month 87.62 'month = (64 '227.14 in system 1 in d electric k ns - balance fans -hot facility ting e	209.36 86.68 4)m x 100 ÷ 241.52	188.15 85.17 (217)m 220.92	82.24	80.30	80.30	80.30	80.30 216.47 kWh/year)	$\sum (64)1$ 84.57 230.67 $= \sum (219)1$ kWh/yee 297.7. 0.00 130.00 0.00 0.00 0.00 0.00	.12 = 87.47 235.13 .12 = ear 4 0	2301.16 88.18 249.91 2724.19 Wh/year 3387.20 2724.19	(21) (21) (21) (22) (23) (23) (23) (23) (23) (23) (23
(64)m fficiency of wa (217)m uel for water h (219)m nnual Totals S pace heating f Vater heatin	225.63 ther heater pe 88.14 heating, kWh/ 255.99 Gummary: fuel used, mai fuel used, mai fuel used, mai fuel used, mai fuel used umps, fans an ventilation fai ating system f ing pump mp an electric keep- lar water hea for the above ghting (calcul	199.02 r month 87.62 'month = (64 '227.14 in system 1 in system 1 in s - balance fans -hot facility ting e lated in App	209.36 86.68 4)m x 100 ÷ 241.52 (ceep-hot (T cd, extract co for gas con pendix L):	188.15 85.17 (217)m 220.92	82.24 224.60	80.30 206.16	80.30	80.30	80.30 216.47 kWh/year)	$\sum (64)1$ 84.57 230.67 $= \sum (219)1$ kWh/yee 297.7. 0.00 130.00 0.00 0.00 0.00 0.00	.12 = 87.47 235.13 .12 = ear 4 0	2301.16 88.18 249.91 2724.19 KWh/year 3387.20 2724.19 2724.19	(21) (21) (21) (22) (23) (23) (23) (23) (23) (23) (23
(64)m fficiency of wa (217)m uel for water h (219)m Annual Totals S pace heating f Vater heating f Vater heating f Iectricity for p mechanical warm air heat central heating oil boiler pur boiler flue fa maintaining	225.63 ther heater pe 88.14 heating, kWh/ 255.99 Gummary: fuel used, mai fuel used, mai fuel used, mai fuel used, mai fuel used umps, fans an ventilation fai ating system f ing pump mp an electric keep- lar water hea for the above ghting (calcul	199.02 r month 87.62 'month = (64 '227.14 in system 1 in system 1 in s - balance fans -hot facility ting e lated in App	209.36 86.68 4)m x 100 ÷ 241.52 (ceep-hot (T cd, extract co for gas con pendix L):	188.15 85.17 (217)m 220.92	82.24 224.60	80.30 206.16	80.30	80.30 217.10 I per year (80.30 216.47 kWh/year)	$\sum (64)1$ 84.57 230.67 $= \sum (219)1$ kWh/yee 297.7. 0.00 130.00 0.00 0.00 0.00 0.00	.12 = 87.47 235.13 .12 = ear 4 4 230g)	2301.16 88.18 249.91 2724.19 KWh/year 3387.20 2724.19 2724.19 451.19	(21) (21) (21) (23) (23) (23) (23) (23) (23) (23) (23
(64)m fficiency of wa (217)m uel for water h (219)m nnual Totals S pace heating f Vater heating f Vater heating f Nater heating f mechanical w warm air heat oil boiler pur boiler flue fa maintaining pump for so otal electricity	225.63 ther heater pe 88.14 heating, kWh/ 255.99 Gummary: fuel used, mai fuel used, mai fuel used, mai fuel used, mai fuel used umps, fans an ventilation fai ating system f ing pump mp an electric keep- lar water hea for the above ghting (calcul	199.02 r month 87.62 'month = (64 '227.14 in system 1 in system 1 in s - balance fans -hot facility ting e lated in App	209.36 86.68 4)m x 100 ÷ 241.52 (ceep-hot (T cd, extract co for gas con pendix L):	188.15 85.17 (217)m 220.92	82.24 224.60	80.30 206.16 outside	80.30	80.30 217.10 I per year (80.30 216.47 kWh/year)	$\sum (64)1$ 84.57 230.67 $= \sum (219)1$ kWh/yee 297.7. 0.00 130.00 0.00 0.00 0.00 0.00	.12 = 87.47 235.13 .12 = ear 4 4 230g)	2301.16 88.18 249.91 2724.19 kWh/year 3387.20 2724.19 2724.19 427.74 451.19) (64) (21) (21) (21) (21) (23) (23)) (23)) (23)) (23)) (23)) (23)) (23)) (23)) (23)) (23

Water heating	2724.19	x	0.198	=	539.39	(264)
Space and water heating			(261) + (262)	+ (263) + (264) =	1210.06	(265)
Pumps, fans and electric keep-hot	427.74	х	0.517	=	221.14	(267)
Lighting	451.19	х	0.517	=	233.26	(268)
Total carbon dioxide emissions				∑(261)(271) =	1664.46	(272)
Dwelling Carbon Dioxide Emissions Rate (DER)					13.98	(273)

TER 2009 Worksheet Design - Draft



Assessor name	Mrs Farah Naz	Assessor number	1
Client		Last modified	21/02/2014
Address	2.2 Site 2 2.2 Kiln Place, Camden, Camden, Gospel Oak London, UK, NV	V5	

1. Overall dwel	lling dimensi	ons											
					Are	a (m²)			age storey eight (m)		Ve	olume (m³)	
Lowest occupied	ł				5	6.25] (1a) x		2.66	(2a) =		149.62	(3a)
+1					4	5.00	(1b) x		3.00	(2b) =		135.00	(3b)
Total floor area		(1a)	+ (1b) + (1c) + (1d)(1n) = 10)1.25	(4)						
Dwelling volume	2							(3a)	+ (3b) + (3	c) + (3d)(3n) =	284.62	(5)
2. Ventilation r	ate												
											m	ı³ per hour	
Number of chim	neys								0] x 40 :	=	0	(6a)
Number of open	flues								0] x 20 :	=	0	(6b)
Number of inter	mittent fans								3) x 10 -	=	30	(7a)
Number of passi	ve vents								0] x 10 :	=	0	(7b)
Number of fluel	ess gas fires								0] x 40 :	=	0	(7c)
											Air	changes pe hour	r
Infiltration due t	o chimneys,	flues, fans,	PSVs		(6a) +	(6b) + (7a	a) + (7b) + (7c) =	30	÷ (5)	=	0.11	(8)
If a pressurisatio	n test has be	en carried d	out or is inte	ended, pro	ceed to (17),	otherwise	e continue	from (9) to	(16)				
Air permeability	value, q50, e	expressed in	cubic metr	es per hou	ur per square	metre of	envelope	area				10.00	(17)
If based on air p	ermeability v	value, then (18) = [(17) ·	÷ 20] + (8),	, otherwise (1	18) = (16)						0.61	(18)
Air permeability	value applie:	s if a pressu	risation test	t has been	done, or a de	esign or s	pecified air	permeabili	ty is being	used			
Number of sides	on which dv	velling is she	eltered									2	(19)
Shelter factor									1 -	[0.075 x (1	.9)] =	0.85	(20)
Adjusted infiltra	tion rate									(18) x (20) =	0.51	(21)
Infiltration rate	modified for	monthly wi	nd speed:										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Monthly average	e wind speed	from Table	7										_
(22)m	5.40	5.10	5.10	4.50	4.10	3.90	3.70	3.70	4.20	4.50	4.80	5.10	
										∑(22)1	.12 =	54.10	(22)
Wind Factor (22										1	1		_
(22a)m	1.35	1.27	1.27	1.12	1.02	0.98	0.92	0.92	1.05	1.12	1.20	1.27	
										∑(22a)1	.12 =	13.52	(22a
Adjusted infiltra				•		-			1 -		1		_
(22b)m	0.69	0.66	0.66	0.58	0.53	0.50	0.48	0.48	0.54	0.58	0.62	0.66	
		-								∑(22b)1	.12 =	6.96	(22)
Calculate effecti	-										·		_
If mechanica	l ventilation:	air change i	ate throug	h system								N/A	(23a

If exhaust air h If balanced wit								23b) = (23a	a)			N/A N/A	_ (23] (23
				-			DIE 4117 -						_ (23
d) If natural ve			•	•		n loft 2b)m2 x 0.5	1						
(24d)m	0.74	0.72	0.72	0.67	0.64	0.63	0.61	0.61	0.65	0.67	0.69	0.72	(24
Effective air chang	ge rate - en	ter (24a) or	r (24b) or (2	4c) or (24d) in box (2	5)		1	1	1 1		1	
(25)m	0.74	0.72	0.72	0.67	0.64	0.63	0.61	0.61	0.65	0.67	0.69	0.72	(25
								•	•			-	
3. Heat losses ar													
ће к-value is the 		ity per unit										_	
EI	ement		Gross Area, m ²	•	nings, n²	Net area A, m ²		alue, m²K	А x U, W/K	к-val kJ/m	•	Ахк, kJ/K	
oors						1.85	x 2.	= 00	3.70] N/	A	N/A	(26
Vindow*						23.46	x 1	.85 =	43.45	N/	A	N/A	(27
Fround floor						56.25	x 0.	25 =	14.06] N/	A	N/A	(28
arty Wall						12.90	x 0.	= 00	0.00) N/	A	N/A	(32
xternal wall						173.89	x 0.	35 =	60.86	N/	A	N/A	(29
oof						45.00	x 0.	16 =	7.20	N/	A	N/A	(30
otal area of exte	rnal elemer	nts ∑A, m²				300.45	(31)						
for windows and	d roof wind	ows, effecti	ive window	U-value is	calculated	using formu	ıla 1/[(1/U	Value)+0.04	4] paragrap	h 3.2			
abric heat loss, V	V/K = ∑(A ×	U)							(2	5)(30) + (3	2) =	129.27	(3
eat capacity Cm	= ∑(А х к)							(28)	(30) + (32)	+ (32a)(32	e) =	N/A	(3-
hermal mass par	ameter (TN	ЛР) in kJ/m [;]	²K						Calculat	ed separate	ely =	250.00	(3
hermal bridges:	∑(L x Ψ) cal	culated usi	ng Appendi:	×К								33.05	(3
if details of the	ermal bridg	ing are not	known ther	n (36) = 0.1	5 x (31)								
otal fabric heat l	oss									(33) + (3	6) =	162.32	(3
entilation heat lo	oss calculat	ed monthly	/ 0.33 x (25	5)m x (5)									
(38)m	69.63	67.18	67.18	62.70	60.03	58.79	57.60	57.60	60.67	62.70	64.87	67.18	(3
leat transfer coe	fficient, W/	K (37)m +								,,			_
(39)m	231.95	229.50	229.50	225.02	222.35	221.11	219.93	219.93	223.00	225.02	227.19	229.50	
									Average = 2	<u>5</u> (39)112/2	12 =	225.33	(3
leat loss parame		1						1	T	г – г		-1	_
(40)m	2.29	2.27	2.27	2.22	2.20	2.18	2.17	2.17	2.20	2.22	2.24	2.27	
									Average = 2	<u>5(40)112/</u> 2	12 =	2.23	(40
4. Water heating	g energy re	auirement											
	5 67										k	Wh/year	
ssumed occupar	ncv N									2.75	(42	-	
If TFA > 13.9, N	-	x [1 - exn(-	0 000349 v	(TEΔ - 13 C	$(1)^{2}(1) + 0.00$	13 v (TFA - 1	3 9)			2.75	(+2	,	
If TFA ≤ 13.9, N			0.000343 X	(117 15.5	,, ,] + 0.00	13 X (11 X 1	5.57						
Innual average h		age in litre	s per day Vo	l average -	(25 v N) +	36				104.77	(43	<u>۱</u>	
nnual average h		-		7			to achieve	a water us	e target of				
er person per da		-		~y 370 ij til	c awenniy	is acsigned		a water us		St more th	an 123 m		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
ot water usage i					-			- 0					
(44)m	115.25	111.06	106.87	102.67	98.48	94.29	94.29	98.48	102.67	106.87	111.06	115.25	
										<u>Σ(44)1:</u>	12 =	1257.24	(4
	bot wator	usod calcu	ulated ment	hlv – 1 10) v Vd m v	nm v Tm/26	00 kWb/	month (see	Tables 1b.	1c 1d)			-
nergy content of	not water	useu - caici	ulated moni	uny – 4.190	J X VU,III X			1101111 (366	,	10 10)			
nergy content of (45)m	171.32	149.83	154.62	134.80	129.34	111.61	103.43	118.68	120.10	139.96	152.78	165.91	

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61) For community heating include distribution loss whether or not hot water tank is present

Distribution loss 0.15 x (45)m													
(46)m	25.70	22.48	23.19	20.22	19.40	16.74	15.51	17.80	18.01	20.99	22.92	24.89	(46)
Water storage loss	s:												
b) If manufacturer	's declared	cylinder lo	ss factor is	not known	:								
Cylinder volum	e (litres) in	cluding any	solar stora	ge within s	ame cylind	er		1	150.00	(50)			
If community h	eating and	no tank in	dwelling, ei	nter 110 liti	res in box (S	50)							
Otherwise if no	stored hot	water (this	s includes in	istantaneo	us combi bo	oilers) ente	r '0' in box ((50)					
Hot water stor	age loss fac	tor from Ta	ble 2 (kWh	/litre/day)					0.02	(51)			
If community h	eating see	SAP 2009 s	ection 4.3										
Volume factor	from Table	2a							0.93	(52)			
Temperature fa	actor from [·]	Table 2b							0.54	(53)			
Energy lost from	m water sto	orage, kWl	h/day (50)	x (51) x (52	2) x (53)				1.44	(54)			
Enter (49) or (54) i	in (55)								1.44	(55)			
Water storage loss		l for each m	nonth = (55) x (41)m									
(56)m	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)
If cylinder contain	s dedicated	l solar stora	ige, = (56)m	n x [(50) - (H	11)] ÷ (50)	, else = (56)m where (H11) is fror	n Appendi	кн			-
(57)m	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 circuit los	s (annual) f	rom Table 3	3					6	510.00	(58)			-
Primary circuit los)m									
(modified by facto					ng and a cyl	inder therr	nostat)						
(59)m	51.81	46.79	51.81	50.14	51.81	50.14	51.81	51.81	50.14	51.81	50.14	51.81	(59)
Combi loss for eac	h month fr	om Table 3	a, 3b or 3c	(enter '0' if	not a comb	oi boiler)				-	•		-
(61)m	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(61)
Total heat require	d for water	heating ca	lculated for	r each mon	th 0.85 × (4	5)m + (46)	m + (57)m -	+ (59)m + (6	61)m				-
(62)m	267.65	236.85	250.95	228.03	225.68	204.84	199.76	215.02	213.33	236.30	246.01	262.25	(62)
Solar DHW input o	alculated u	ising Appen	dix H (nega	itive quanti	ty) ('0' ente	ered if no s	olar contrib	oution to wa	ater heatin	g)			
(63)m	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00]
										∑(63)1	.12 =	0.00	(63)
Output from wate	r heater foi	r each mon	th, kWh/mo	onth (62)m	n + (63)m								
(64)m	267.65	236.85	250.95	228.03	225.68	204.84	199.76	215.02	213.33	236.30	246.01	262.25]
										∑(64)1	.12 = 2	786.67	(64)
if (64)m < 0 then s	et to 0												
Heat gains from w	ater heatin	g, kWh/mo	onth 0.25 ×	[0.85 × (45)m + (61)m	i] + 0.8 × [(4	46)m + (57)	m + (59)m]					
(65)m	134.03	119.43	128.48	119.40	120.08	111.69	111.46	116.53	114.52	123.61	125.38	132.23	(65)
include (57)	m in calcul	ation of (65)m only if c	ylinder is ir	the dwelli	ng or hot w	vater is from	n communi	ty heating				
5. Internal gains	(see Table	5 and 5a)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (T													-
(66)m	137.54	137.54	137.54	137.54	137.54	137.54	137.54	137.54	137.54	137.54	137.54	137.54	(66)
Lighting gains (cal	r				lso see Tab								-
(67)m	39.15	34.77	28.28	21.41	16.00	13.51	14.60	18.98	25.47	32.34	37.75	40.24	(67)
Appliances gains (1			-
(68)m	258.33	261.01	254.26	239.88	221.72	204.66	193.26	190.58	197.34	211.72	229.87	246.93	(68)
Cooking gains (cal							1			1			٦.
(69)m	36.75	36.75	36.75	36.75	36.75	36.75	36.75	36.75	36.75	36.75	36.75	36.75	(69)
Pumps and fans ga	· · · · · · · · · · · · · · · · · · ·						1			1	1		Т.
(70)m	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	(70)

Losses e.g. evapo	ration (nega	ative values) (Table 5)										
(71)m	-110.03	-110.03	-110.03	-110.03	-110.03	-110.03	-110.03	-110.03	-110.03	-110.03	-110.03	-110.03	(71)
Water heating ga	ins (Table 5)											
(72)m	180.15	177.72	172.69	165.84	161.39	155.13	149.81	156.63	159.05	166.14	174.14	177.73	(72)
Total internal gain	ns (66)m + ((67)m + (68)m + (69)m	+ (70)m +	(71)m + (72	!)m			•	•		•	-
(73)m	551.90	547.77	529.49	501.39	473.38	447.57	431.93	440.45	456.12	484.46	516.03	539.17	(73)
		•	•		•	·	•	•	•	•		•	-
6. Solar gains													
Solar gains are ca	lculated usi	ing solar flu	x from Tabl	e 6a and a	ssociated e	quations to	convert to	the applica	able oriento	ation.			
Rows (74) to (82)	are used 12	times, one	for each m	onth, repe	ating as neo	eded if ther	e is more ti	han one wii	ndow type.				
Details for month	of January	and annual	totals are s	shown belo	ow:								
	ļ	Access facto Table 6d	or	Area m²	So	lar flux W/	-	Specific da or Table 6t		Specific da or Table 60		Gains (W)	1
East		0.77	x	23.46	x	19.87	x 0.9 x	0.72	x	0.70	=	162.85	(76)
Solar gains in wat	ts, calculate	ed for each	month ∑(74	l)m(82)m	ı								_
(83)m	162.85	315.65	504.51	749.08	911.42	951.02	923.08	803.37	603.17	384.41	202.47	134.34	(83)
Total gains - inter	nal and sola	ar (73)m + (83)m										
(84)m	714.75	863.43	1034.00	1250.47	1384.80	1398.59	1355.01	1243.82	1059.29	868.87	718.49	673.51	(84)
										_			
7. Mean interna													,
Temperature dur	ing heating		he living ar	ea from Ta	ble 9, Th1(°	°C)						21.00	(85)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor	_	-											٦
(86)m	0.99	0.99	0.98	0.95	0.88	0.76	0.59	0.63	0.87	0.97	0.99	1.00	(86)
Mean internal ter		1								1	1	I	п
(87)m	18.61	18.83	19.27	19.77	20.34	20.73	20.92	20.90	20.55	19.87	19.09	18.67	(87)
Temperature dur	ing heating	periods in t	he living ar	ea from Ta					2		1	1	-
(88)m	19.16	19.17	19.17	19.20	19.21	19.22	19.23	19.23	19.21	19.20	19.18	19.17	(88)
Utilisation factor	for gains for	1	elling η2,m	(see Table	9a)			1			1	.	-
(89)m	0.99	0.99	0.97	0.93	0.82	0.63	0.37	0.40	0.77	0.95	0.99	0.99	(89)
Mean internal ter		1						1			1	1	-
(90)m	17.09	17.32	17.75	18.27	18.80	19.11	19.22	19.21	18.99	18.37	17.59	17.16	(90)
Living area fraction	on							fLA	30.00	÷ (4) =	=	0.30	(91)
Mean internal ter	nperature f	or the who	e dwelling	fLA x T1 +(1 - fLA) x T2						1		_
(92)m	17.54	17.77	18.20	18.71	19.26	19.59	19.72	19.71	19.45	18.82	18.04	17.61	(92)
Apply adjustment	to the mea	in internal t	emperatur	e from Tab	le 4e, wher	e appropria	ate				r	•	_
(93)m	17.54	17.77	18.20	18.71	19.26	19.59	19.72	19.71	19.45	18.82	18.04	17.61	(93)
8. Space heating	requireme	ent											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Set Ti to the mea	n internal te	emperature									or for gains	using Table	e 9a)
Utilisation factor							. ,				0	Ū	
(94)m	0.99	0.98	0.96	0.92	0.82	0.66	0.44	0.47	0.79	0.94	0.98	0.99	(94)
Useful gains, nm0	5m, W = (94	.)m x (84)m			•	•		•	•	•	•		_
(95)m	707.74	848.53	996.03	1150.88	1141.25	925.00	590.11	581.96	832.73	818.96	707.28	667.50	(95)
Monthly average	external ter	mperature 1	from Table	8								•	_
(96)m	4.50	5.00	6.80	8.70	11.70	14.60	16.90	16.90	14.30	10.80	7.00	4.90	(96)
Heat loss rate for	mean inter	nal temper	ature, Lm. V	N	•	•		Ŧ				•	
(97)m	3024.44	2930.10	2617.08	2253.07	1680.11	1103.18	620.46	619.00	1149.29	1803.67	2507.36	2916.51	(97)
Space heating rec					1	1	(41)m	•				•	
(98)m	1723.63	1398.82	1206.07	793.57	400.92	0.00	0.00	0.00	0.00	732.62	1296.06	1673.27]
							Total per v	/ear (kWh/y	$(ear) = \Sigma(98)$	3)1 5 10	12 = 0)224.94	(98)

(99)

9a. Energy Re		Individual I	neating sys	tems inclue	ding micro-	CHP							
pace heating:										_			
raction of spa	ce heating fro	om seconda	ry/supplem	entary syst	em (Table 1	L1)			0.10	(201)			
raction of spa	ce heating fro	om main sys	tem(s) 1 -	(201)					0.90	(202)			
raction of mai	n heating from	m main syst	em 2						0.00	(203)			
raction of tota	al space heat f	from main s	ystem 1 (2	02) x [1 - (2	203)]				0.90	(204)			
- raction of tota	al space heat f	from main s	ystem 2 (2	02) x (203)					0.00	(205)			
Efficiency of ma				, , ,					78.90	(206)			
from database				nronriate h	v the amou	nt shown i	in the 'space	efficiency			Table 4c)		
Efficiency of se		-							100.00	(208)			
,	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating r				•	•								
(98)m	1723.63	1	1206.07	793.57	400.92	0.00	0.00	0.00	0.00	732.62	1296.06	1673.27	7
Space heating f			1). kWh/n)m x (204) x	(100 ÷ (20)6)	1				1	_
(211)m	1966.11		1375.74	905.21	457.32	0.00	0.00	0.00	0.00	835.69	1478.39	1908.67	7
()		1	1		1		Total per ve	- 	- ear) = Σ(21	.1)15, 101	2 = 1	0522.74	 (21:
Space heating f	fuel (secondar	ry) kWh/m	onth = (98)	m x (201) x	$100 \div (208)$, otal per y	cui (iiiii, y	2(=)	,,			_ (==
(215)m	172.36	139.88	120.61	79.36	40.09	0.00	0.00	0.00	0.00	73.26	129.61	167.33	7
(====),	1/1/00	100.000	120101	75166						.5)15, 101	r	922.49	_] (21
Notor booting							roturper y		2(23			522.15	
Vater heating:			<i>,</i> , , , ,										
Dutput from wa	,	· ·		,	225.68	204.84	199.76	215.02	213.33	236.30	246.01	262.25	7
(64)m	267.65	236.85	250.95	228.03	225.08	204.84	199.76	215.02	213.33	1]] (c.)
										∑(64)11	2 = 2	2786.67	(64)
Efficiency of wa		1	76 70	76.40	74.00	60.00	60.00	60.00	60.00	75.00	76.00	77.22	7
(217)m	77.23	77.11	76.78	76.19	74.68	68.80	68.80	68.80	68.80	75.96	76.93	77.22	
-uel for water l		1	<u> </u>		202.40	207 72	200.25	242 52	240.07	211.00	240 77	220 62	7
(219)m	346.56	307.17	326.83	299.27	302.19	297.73	290.35	312.53	310.07	311.09	319.77	339.62	
							Tota	l per year (kWh/year)	=∑(219)11	.2 = 3	3763.18	(21
Annual Totals S	Summary:									kWh/yea		Wh/year	-
pace heating	fuel used, ma	in system 1									1	0522.74	(21
Space heating	fuel used, sec	condary										922.49	(21
Water heating	fuel used										3	3763.18	(21
Electricity for p	oumps, fans a	nd electric	keep-hot (1	Table 4f):									
mechanical	ventilation fa	ns - balance	ed, extract	or positive	input from o	outside				0.00			(23
warm air he	ating system	fans								0.00			(23
central heat	ting pump									130.00			(230
oil boiler pu	Imp									0.00			(23
boiler flue f	an									45.00			(23
-	electric keep	-	for gas cor	mbi boiler						0.00			(23
	olar water hea	-								0.00			(23)
Fotal electricity	/ for the abov	e								∑(230a)(23	0g)	175.00	(23
Electricity for li	ighting (color)	lated in An	nendiy I \.									691.44	(23
Electricity for li	Burning (calcu	iateu ili Ap	penuix LJ:									071.44	_ (23,
12a. Carbon d	lioxide emissi	ons - Indivi	dual heatir	ng systems	including m	nicro-CHP							
					F	Inergy		F	missions		Er	missions	

	Energy kWh/year		Emissions Factor		Emissions (kgCO2/year)
Space heating - main system 1	10522.74	x	0.194	=	2041.41 (261)

Space heating - secondary	922.49	х	0.422] =	389.29	(263)
Water heating	3763.18	х	0.194] =	730.06	(264)
Space and water heating			(261) + (262) +	+ (263) + (264) =	3160.76	(265)
Pumps, fans and electric keep-hot	175.00	х	0.422] =	73.85	(267)
Lighting	691.44	х	0.422] =	291.79	(268)
Total carbon dioxide emissions				∑(261)(271) =	3526.40	(272)
Emissions per m ² for space and water heating					31.95	(272a)
Emissions per m ² for lighting					2.88	(272b)

Target Carbon Dioxide Emissions Rate (TER)

[(31.95 × FF × EFA) + (2.88 × EFA)] × (0.6)

21.68

(273)

DER 2009 Worksheet Design - Draft



Assessor name	Mrs Farah Naz	Assessor number	1						
Client		Last modified	21/02/2014						
Address	2.2 Site 2 2.2 Kiln Place, Camden, Camden, Gospel Oak London, UK, NW5								

1. Overall dwell	ing dimensi	ons											
					Ar	ea (m²)			Average storey height (m)	,	Vo	olume (m³)	
Lowest occupied						56.25] (1a) x	Γ	2.66	(2a) =		149.62	(3a)
+1						45.00	(1b) x	Ē	3.00	(2b) =		135.00	(3b)
Total floor area		(1a)	+ (1b) + (1c	:) + (1d)(1	Ln) = 1	101.25	(4)	L					_ 1
Dwelling volume									(3a) + (3b) + (3	c) + (3d)(3n) =	284.62	(5)
2. Ventilation ra	ate												
											m	n³ per hour	
Number of chimr	neys							Г	0	x 40 :	=	0	(6a)
Number of open	flues							Ē	0	 x 20 :	=	0	 (6b)
Number of intern	nittent fans							Ī	0	x 10 =	= [0	(7a)
Number of passiv	ve vents							Ī	0	 x 10 :	=	0	 (7b)
Number of fluele	ss gas fires							Ī	0	 x 40 :	=	0	 (7c)
										_	Air	changes pe hour	er
Infiltration due to	o chimneys,	flues, fans,	PSVs		(6a) ·	+ (6b) + (7a	a) + (7b) +	- (7c) = [0	÷ (5)	=	0.00	(8)
If a pressurisation	-			ended, prod)) to (16)				_ • •
Air permeability	value, q50, e	expressed ir	n cubic metr	res per hou	ır per squar	e metre of	envelop	e area				1.50	(17)
If based on air pe	ermeability v	alue, then	(18) = [(17)	÷ 20] + (8),	otherwise	(18) = (16)						0.08	(18)
Air permeability	value applie:	s if a pressu	risation tes	t has been	done, or a d	design or s	pecified a	ir perme	ability is being	used			
Number of sides	on which dv	velling is sh	eltered									1	(19)
Shelter factor									1 -	- [0.075 x (1	.9)] =	0.92	(20)
Adjusted infiltrat	ion rate									(18) x (20) =	0.07	(21)
Infiltration rate m	nodified for	monthly wi	nd speed:										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Au	g Sep	Oct	Nov	Dec	
Monthly average	wind speed	from Table	7								1		_
(22)m	5.40	5.10	5.10	4.50	4.10	3.90	3.70	3.7	0 4.20	4.50	4.80	5.10	
										∑(22)1	.12 =	54.10	(22)
Wind Factor (22a		1								1			-
(22a)m	1.35	1.27	1.27	1.12	1.02	0.98	0.92	0.9	2 1.05	1.12	1.20	1.27	
					() (-					∑(22a)1	.12 =	13.52	(22a
Adjusted infiltrat	ion rate (allo 0.09	owing for sh 0.09	elter and w 0.09	/ind speed) 0.08	= (21) × (2 0.07		0.06	0.0	6 0.07	0.08	0.08	0.09	7
(22b)m	0.09	0.09	0.09	0.08	0.07	0.07	0.06	0.0	6 0.07		·		 (224
Calculate offectiv	o air change	rata far th	o opplicable							∑(22b)1	.12 =	0.94	(22b
Calculate effectiv	-											0.50	_ (224
If mechanical	ventilation:	air change	rate throug	n system								0.50	(23a

If exhaust air he If balanced with									= (23a)			0.50 77.35	(23 (23
a) If balanced n	mechanical	ventilation	with heat	recoverv (N	//VHR) (22	2b)m + (23b) x [1 -	$(23c) \div 1$	001 =					
(24a)m	0.21	0.20	0.20	0.19	0.18	0.18	0.1		.18	0.19	0.19	0.20	0.20	(24
Effective air chang	ge rate - ent	ter (24a) or	(24b) or (2	24c) or (24d	l) in box (2	5)					.	•		_
(25)m	0.21	0.20	0.20	0.19	0.18	0.18	0.1	18 0	.18	0.19	0.19	0.20	0.20	(25
		·		•		•		•			- -	•	•	
3. Heat losses an														
The κ-value is the l	•	ity per unit												
Ele	ement		Gross Area, m ²	•	nings, n²	Net area A, m²		U-value, W/m²K		А x U, W/K		/alue, /m².K	Ахк, kJ/K	
Doors						4.40	_ x [1.00] =	4.40		N/A	N/A	(26
Window*						35.21	x	0.96	=	33.86		N/A	N/A	(2
Ground floor						56.25] x [0.10] =	5.62		N/A	N/A	(28
xternal wall						159.59] × [0.15] =	23.94		N/A	N/A	(29
Party Wall						12.90] x [0.00	=	0.00		N/A	N/A	(32
Roof						45.00] x [0.10] =	4.50		N/A	N/A	(30
otal area of exter	rnal elemen	ıts ∑A, m²				300.45	(31)							
for windows and	l roof windd	ows, effecti	ve window	U-value is	calculated	using form	ula 1/[(1/UValue	e)+0.04] paragra	ph 3.2			
abric heat loss, W	V/K = ∑(A ×	U)								(2	26)(30) +	(32) =	72.32	(3
leat capacity Cm :	= ∑(А х к)								(28)((30) + (32)	+ (32a)(32e) =	N/A	(3-
hermal mass para	ameter (TN	1P) in kJ/m²	^κ κ							Calcula	ated separa	ately =	100.00	(3
hermal bridges: ∑	Σ(L x Ψ) calo	culated usir	ng Appendi	хK									30.04	 (3
if details of the	ermal bridgi	ing are not	known thei	n (36) = 0.1	5 x (31)									_
otal fabric heat lo	OSS										(33) +	(36) =	102.36	(3
/entilation heat lo	oss calculate	ed monthly	0.33 x (25	5)m x (5)							()	.,		`
(38)m	19.43	18.95	18.95	17.97	17.32	16.99	16.	66 1	5.66	17.48	17.97	18.46	18.95	(38
leat transfer coef	ficient, W/I	K (37)m+	(38)m											_
(39)m	121.80	121.31	121.31	120.33	119.68	119.35	119	.03 11	9.03	119.84	120.33	120.82	121.31	
										Average =	∑(39)11	2/12 =	120.35	(3
leat loss paramet	ter (HLP), W	//m²K (39)	m ÷ (4)											
(40)m	1.20	1.20	1.20	1.19	1.18	1.18	1.1	18	18	1.18	1.19	1.19	1.20	
									/	Average =	∑(40)11	2/12 =	1.19	(40
4. Water heating	; energy rec	quirement												
													Wh/year	
ssumed occupan											2.7	5 (42	<u>!)</u>	
If TFA > 13.9, N		x [1 - exp(-0	J.000349 x	: (TFA - 13.9	9)²)] + 0.00	13 x (TFA - 1	13.9)							
If TFA ≤ 13.9, N														
Annual average ho		-		-							99.5			
Annual average ho per person per day		-		by 5% if th	e dwelling	is designea	to ach	ieve a wa	iter use	e target of	f not more	than 125 lit	res	
	Jan	Feb	Mar	Apr	May	Jun	Ju	il A	Aug	Sep	Oct	Nov	Dec	
lot water usage ir				1	1	1	1			_	1			-
(44)m	109.48	105.50	101.52	97.54	93.56	89.58	89.	58 9	3.56	97.54	101.52	·	109.48	
_											∑(44)1	12 =	1194.38	(44
nergy content of	hot water u	used - calcu	llated mon	thly = 4.190	J x Vd,m x	nm x Tm/3	500 k	Wh/mon	th (see	Fables 1b	, 1c 1d)			_
	100 7-	142.25			1	-							457.00	
(45)m	162.75	142.34	146.89	128.06	122.87	106.03	98.		2.75	114.09	132.97 Σ(45)1		157.62 1569.76	 (4:

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61) For community heating include distribution loss whether or not hot water tank is present

Distribution loss 0.15 x (45)m													
(46)m	24.41	21.35	22.03	19.21	18.43	15.90	14.74	16.91	17.11	19.94	21.77	23.64	(46)
Water storage loss	5:												
b) If manufacturer	's declared	cylinder lo	ss factor is	not known	:								
Cylinder volum	e (litres) in	cluding any	solar stora	ge within s	ame cylind	er			250.00	(50)			
If community h	eating and	no tank in	dwelling, ei	nter 110 lit	res in box (50)							
Otherwise if no	stored hot	water (this	s includes in	istantaneo	us combi bo	oilers) enter	r '0' in box ((50)					
Hot water stor	age loss fac	tor from Ta	able 2 (kWh	/litre/day)					0.01	(51)			
If community h	eating see	SAP 2009 s	ection 4.3										
Volume factor	from Table	2a							0.78	(52)			
Temperature fa	actor from [·]	Table 2b							0.54	(53)			
Energy lost from	m water sto	orage, kWl	h/day (50)	x (51) x (52			0.91	(54)					
Enter (49) or (54) i	in (55)								0.91	(55)			
Water storage loss	s calculated	l for each m	nonth = (55) x (41)m									
(56)m	28.09	25.37	28.09	27.18	28.09	27.18	28.09	28.09	27.18	28.09	27.18	28.09	(56)
If cylinder contain	s dedicated	l solar stora	nge, = (56)m	n x [(50) - (H		, else = (56)m where (H11) is fror	n Appendi>	кН			
(57)m	28.09	25.37	28.09	27.18	28.09	27.18	28.09	28.09	27.18	28.09	27.18	28.09	(57)
Primary circuit los	s (annual) f	rom Table 3	3						360.00	(58)			
Primary circuit los	s for each n	nonth (58)	÷ 365 × (41)m						-			
(modified by facto	r from Tabl	le H5 if thei	re is solar w	ater heatir	ng and a cyl	inder therr	nostat)						
(59)m	30.58	27.62	30.58	29.59	30.58	29.59	30.58	30.58	29.59	30.58	29.59	30.58	(59)
Combi loss for eac	h month fr	om Table 3	a, 3b or 3c	(enter '0' if	not a com	bi boiler)							
(61)m	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(61)
Total heat require	d for water	heating ca	lculated for	each mon	th 0.85 × (4	5)m + (46)	m + (57)m +	+ (59)m + (6	61)m				
(62)m	221.41	195.33	205.55	184.83	181.54	162.80	156.92	171.41	170.86	191.63	201.91	216.28	(62)
Solar DHW input o	alculated u	sing Appen	dix H (nega	tive quanti	ty) ('0' ente	ered if no s	olar contrib	ution to wa	ater heatin	g)			
(63)m	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
										∑(63)1	12 =	0.00	(63)
Output from wate													_
(64)m	221.41	195.33	205.55	184.83	181.54	162.80	156.92	171.41	170.86	191.63	201.91	216.28	
										∑(64)1	12 = 2	260.46	(64)
if (64)m < 0 then s	et to 0												
Heat gains from w	ater heatin	g, kWh/mo	onth 0.25 ×	[0.85 × (45)m + (61)m	n] + 0.8 × [(4	16)m + (57)	m + (59)m]					
(65)m	78.57	69.42	73.30	66.25	65.32	58.93	57.13	61.95	61.61	68.67	71.93	76.87	(65)
include (57)	m in calcul	ation of (65	5)m only if c	ylinder is ir	n the dwelli	ng or hot w	vater is fron	n communi	ty heating				
	/aaa Tabla I	F and Fa)											
5. Internal gains								-	-	• ·		_	
	Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (T (66)m	137.54	137.54	137.54	137.54	137.54	137.54	137.54	137.54	137.54	137.54	137.54	137.54	(66)
		1					137.34	137.34	137.34	137.34	137.34	137.54] (00)
Lighting gains (cale (67)m	23.03	20.46	16.64	9 or L9a), a 12.59	9.41	7.95	8.59	11.16	14.98	19.02	22.20	23.67	(67)
							0.39	11.10	14.90	19.02	22.20	23.07] (07)
Appliances gains ((68)m	258.33	261.01	254.26	239.88	221.72	204.66	193.26	190.58	197.34	211.72	229.87	246.93	(68)
							195.20	190.58	197.94	211.72	229.87	240.93] (08)
Cooking gains (cal (69)m	36.75	36.75	36.75	36.75	, also see 1 36.75	36.75	36.75	36.75	36.75	36.75	36.75	36.75	(69)
Pumps and fans ga			50.75	50.75	30.75		50.75	50.75	50.75	30.75	50.75	30.75	
(70)m		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(70)
(,),	0.00	0.00	0.00	5.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	

Losses e.g. evapor	ation (nega	tive values) (Table 5)										
(71)m	-110.03	-110.03	-110.03	-110.03	-110.03	-110.03	-110.03	-110.03	-110.03	-110.03	-110.03	-110.03	(71)
Water heating gains (Table 5)													
(72)m	105.61	103.31	98.52	92.01	87.79	81.84	76.79	83.26	85.57	92.30	99.90	103.32	(72)
Total internal gains (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m													
(73)m	451.24	449.04	433.68	408.75	383.19	358.71	342.90	349.27	362.15	387.31	416.24	438.18	(73)

6. Solar gains

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Rows (74) to (82) are used 12 times, one for each month, repeating as needed if there is more than one window type.

Details for month of January and annual totals are shown below:

	ļ	Access facto Table 6d	or	Area m²	So	lar flux W/	m² g	g Specific dat or Table 6b		F Specific da or Table 60		Gains (W)	
East		0.77] x	7.53] x	19.87	x 0.9 x	0.60	x	0.80	=	49.78	(76)
West		0.77] x	22.71] x	19.87] x 0.9 x	0.60	x	0.80] =	150.12	(80)
South		0.77	x	4.97] x	47.32	x 0.9 x	0.60	x	0.80] =	78.24	(78)
Solar gains in watt	s, calculate	ed for each	month ∑(74	4)m(82)m	1								
(83)m	278.13	515.06	775.10	1093.27	1298.22	1347.40	1310.19	1157.87	905.69	612.86	341.22	232.50	(83)
Total gains - interr	nal and sola	ar (73)m + (8	83)m										
(84)m	729.37	964.10	1208.77	1502.02	1681.41	1706.12	1653.09	1507.15	1267.84	1000.17	757.46	670.68	(84)
		(1					_						
7. Mean internal		-	-	_									1
Temperature duri	ng heating	periods in t	he living ar	ea from Ta	ble 9, Th1(°	°C)						21.00	(85)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor f	-	-									1		.
(86)m	0.95	0.91	0.83	0.71	0.56	0.41	0.29	0.31	0.54	0.79	0.92	0.96	(86)
Mean internal tem													٦
(87)m	18.72	19.15	19.75	20.29	20.70	20.90	20.97	20.97	20.80	20.24	19.28	18.72	(87)
Temperature duri	ng heating	periods in t	he living ar	ea from Ta	ble 9, Th2(°	°C)				_			-
(88)m	19.92	19.92	19.92	19.93	19.94	19.94	19.94	19.94	19.94	19.93	19.93	19.92	(88)
Utilisation factor f	or gains for	r rest of dw	elling η2,m	(see Table	9a)								-
(89)m	0.94	0.89	0.81	0.68	0.51	0.35	0.22	0.24	0.48	0.75	0.91	0.95	(89)
Mean internal terr	perature i	n the rest o	f dwelling 1	T2 (follow s	teps 3 to 7	in Table 9c)	· · · · · ·					-
(90)m	16.90	17.51	18.36	19.09	19.63	19.86	19.93	19.92	19.76	19.05	17.71	16.91	(90)
Living area fraction	n							fLA 🔤	30.00	÷ (4) =	=	0.30	(91)
Mean internal tem	nperature f	or the whol	e dwelling	fLA x T1 +(:	1 - fLA) x T2	!							
(92)m	17.44	18.00	18.77	19.45	19.95	20.17	20.24	20.23	20.07	19.40	18.17	17.45	(92)
Apply adjustment	to the mea	an internal t	emperatur	e from Tab	le 4e, wher	e appropria	ate						
(93)m	17.44	18.00	18.77	19.45	19.95	20.17	20.24	20.23	20.07	19.40	18.17	17.45	(93)
8. Space heating													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Set Ti to the mean			obtained a	it step 11 o	f Table 9b,	so that tim	= (93)m a	nd recalculat	te the uti	lisation facto	or for gains	using Table	39a)
Utilisation factor f		1	0.70	0.00	0.51	0.27	0.24	0.20	0.40	0.70	0.00	0.02	
(94)m	0.92	0.87	0.78	0.66	0.51	0.37	0.24	0.26	0.49	0.73	0.88	0.93	(94)
Useful gains, ηmG		1	0.40.00	000.04	00474	ca , 00	200 52	207.00	646.44	724.40	670.40	624.40	
(95)m	670.10	834.36	943.26	996.24	864.74	627.09	389.52	387.26	616.11	731.19	670.18	621.40	(95)
Monthly average		· · · · · · · · · · · · · · · · · · ·								10.00			1 (0.0)
(96)m	4.50	5.00	6.80	8.70	11.70	14.60	16.90	16.90	14.30	10.80	7.00	4.90	(96)
Heat loss rate for													1
(97)m	1575.79	1576.91	1452.49		986.80	664.25	397.24	396.74	691.02	1034.75	1350.06	1521.98	(97)
Space heating req	uirement fo	or each moi	nth, kWh/n	nonth = 0.0	24 x [(97)m	า - (95)m] x	(41)m						

(98)m	673.83 499.00	378.87 213.66	90.81	0.00	0.00	0.00	0.00	225.85		0.03
Space heating rec	quirement in kWh/m²/	year			Total per y	ear (kWh/y	year) = ∑(9	8)15, 10 (98) ·	[
9a. Energy Requ	uirements - Individual l	heating systems inclu	ding micro-C	Э						
Space heating:		6 · /····								
	heating from seconda	rv/supplementary sys	tem (Table 1	1)			0.00	(201)		
	heating from main sys		· · · · · ·	,			1.00	(202)		
	heating from main syst						0.00	(203)		
	space heat from main s		203)]				1.00	(204)		
	space heat from main s	, , , , , ,					0.00	(205)		
	n space heating system	, , , , , ,					91.00	(206)		
	or Table 4a/4b, adjusted		y the amoun	it shown in	the 'space			_ · ·	Table 4c)	
0	Jan Feb	Mar Apr	May	Jun	Jul	Aug	Sep	Oct	-	Dec
Space heating red	quirement, kWh/montl	h (as calculated above)							
(98)m	673.83 499.00	378.87 213.66	90.81	0.00	0.00	0.00	0.00	225.85	489.51 67	0.03
Space heating fue	el (main heating system	n 1), kWh/month = (98	3)m x (204) x	100 ÷ (206	5)					
(211)m	740.48 548.35	416.34 234.79	99.79	0.00	0.00	0.00	0.00	248.19	537.93 73	6.30
				т	otal per ye	ar (kWh/ye	ear) = ∑(21	1)15, 10	12 = 3562.	16 (211)
Water heating:										
Output from wate	er heater, kWh/month	(calculated above)								
(64)m	221.41 195.33	205.55 184.83	181.54	162.80	156.92	171.41	170.86	191.63	201.91 21	6.28
								∑(64)1	12 = 2260.	46 (64)
	er heater per month	, <u>,</u>						,		
(217)m	88.10 87.71	86.93 85.70	83.58	80.30	80.30	80.30	80.30	85.75	87.59 88	3.13
	ating, kWh/month = (6	1 1 1					L			
(219)m	251.33 222.69	236.46 215.66	217.21	202.74	195.41	213.46	212.78	223.46	I	5.40
					lotal	per year (I	kWh/year)	=∑(219)1	12 = 2667.	12 (219)
Annual Totals Su	-							kWh/ye	-	
	el used, main system 1	L							3562.	
Water heating fu									2667.	12 (219)
	mps, fans and electric								-	(222)
	entilation fans - balance ting system fans	ed, extract or positive	input from o	outside				0.00		(230a) (230b)
central heatin								130.00)	(230b) (230c)
oil boiler pum	01 1							0.00	<u>, </u>	(230d)
boiler flue fan								0.00		(230e)
maintaining e	lectric keep-hot facility	for gas combi boiler						0.00		(230f)
pump for sola	r water heating							0.00		(230g)
Total electricity for	or the above							∑(230a)(2	30g) 351.3	37 (231)
Electricity for ligh	hting (calculated in Ap	pendix L):							406.7	/3 (232)
12a. Carbon dio	oxide emissions - Indivi	dual heating systems	including mi	icro <u>-CHP</u>						
			-	nergy		Er	missions		Emissi	ons
				/h/year			Factor		(kgCO2/	year)
Space heating - m	nain system 1		35	562.16	x		0.198] =	705.3	31 (261)
Water heating			26	667.12	x		0.198] =	528.0)9 (264)
Space and water	heating					(26	51) + (262) -	- + (263) + (26	64) = 1233.	40 (265)
Pumps, fans and	electric keep-hot		3	51.37	x		0.517] =	181.6	6 (267)

Lighting	406.73	x	0.517	=	210.28	(268)
Total carbon dioxide emissions				∑(261)(271) =	1625.33	(272)
Dwelling Carbon Dioxide Emissions Rate (DER)					16.05	(273)

TER 2009 Worksheet Design - Draft



Assessor name	Mrs Farah Naz	Assessor number	1
Client		Last modified	21/02/2014
Address	3 Site 3 3 Kiln Place, Camden, Camden, Gospel Oak London, UK, NW5		

1. Overall dwel													
	ling dimensio	ons											
					Ar	ea (m²)			age storey ight (m)		Ve	olume (m³)	
Lowest occupied	I					27.00	(1a) x		3.00] (2a) =		81.00	(3
+1						37.00	(1b) x		3.00	(2b) =		111.00	3 (3
Total floor area		(1a)	+ (1b) + (1c) + (1d)(1	Ln) = 🤅	54.00	(4)						
Dwelling volume	2							(3a)	+ (3b) + (3	c) + (3d)(3n) =	192.00	(5
2. Ventilation ra	ate												
											m	³ per hour	
Number of chimr	neys								0] x 40	=	0	(6
Number of open	flues								0	x 20	=	0	6) (6
Number of interr	mittent fans								2] x 10	=	20	(7
Number of passiv	ve vents								0] x 10	=	0	(7
Number of fluele	ess gas fires								0] x 40	=	0	(7
											Air	changes pe hour	r
Infiltration due to	o chimneys, f	lues, fans,	PSVs		(6a) -	+ (6b) + (7a	i) + (7b) + (7	7c) =	20	÷ (5)	=	0.10	(8
lf a pressurisatio	n test has be	en carried c	out or is inte	ended, pro	ceed to (17)	, otherwise	e continue f	rom (9) to	(16)	-			-
Air permeability	value, q50, e	xpressed in	n cubic metr	es per hou	ır per squar	e metre of	envelope a	rea				10.00	(1
If based on air pe	ermeability va	alue, then (18) = [(17) -	÷ 20] + (8),	otherwise	(18) = (16)						0.60] (1
Air permeability	value applies	if a pressu	risation test	t has been	done, or a d	design or s	pecified air	permeabili	ty is being	used			
Number of sides	on which dw	elling is she	eltered									2	(1
Shelter factor									1 -	(0.075 x (2	L9)] =	0.85	(2
Adjusted infiltrat	tion rate									(18) x (20) =	0.51	(2
Infiltration rate n	modified for r	nonthly wi	nd speed:										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
								Aug					
, .	· · · · · · · · · · · · · · · · · · ·							-	-	1			7
Monthly average (22)m	e wind speed 5.40	from Table 5.10	2 7 5.10	4.50	4.10	3.90	3.70	3.70	4.20	4.50	4.80	5.10]
(22)m	5.40	5.10		4.50	4.10	3.90		-	-	4.50 Σ(22)1.	·	5.10]] (2
(22)m Wind Factor (22a	5.40 a)m = (22)m =	5.10 ÷ 4	5.10				3.70	3.70	4.20	∑(22)1	12 =	54.10]] (2
(22)m	5.40	5.10		4.50	4.10	3.90 0.98		-	-	∑(22)1 1.12	12 =	54.10	
(22)m Wind Factor (22a (22a)m	a)m = (22)m ÷	5.10 ÷ 4 1.27	5.10	1.12	1.02	0.98	3.70	3.70	4.20	∑(22)1	12 =	54.10	
(22)m Wind Factor (22a (22a)m Adjusted infiltrat	5.40 a)m = (22)m = 1.35 tion rate (allo	5.10 ÷ 4 1.27 wing for sh	5.10 1.27 nelter and w	1.12 rind speed)	1.02) = (21) × (2:	0.98 2a)m	3.70 0.92	3.70 0.92	4.20	Σ(22)1 1.12 Σ(22a)1	12 = 1.20 12 =	54.10 1.27 13.52	
(22)m Wind Factor (22a (22a)m	a)m = (22)m ÷	5.10 ÷ 4 1.27	5.10	1.12	1.02	0.98	3.70	3.70	4.20	Σ(22)1 1.12 Σ(22a)1 0.58	12 = 1.20 12 = 0.62	54.10 1.27 13.52 0.65	(2
(22)m Wind Factor (22a (22a)m Adjusted infiltrat (22b)m	5.40 a)m = (22)m = 1.35 tion rate (allo	5.10 ÷ 4 1.27 wing for sh 0.65	5.10 1.27 nelter and w 0.65	1.12 rind speed) 0.58	1.02) = (21) × (2:	0.98 2a)m	3.70 0.92	3.70 0.92	4.20	Σ(22)1 1.12 Σ(22a)1	12 = 1.20 12 = 0.62	54.10 1.27 13.52]] (2
Wind Factor (22a (22a)m Adjusted infiltrat	5.40 a)m = (22)m = 1.35 tion rate (allo 0.69 ve air change	5.10 ÷ 4 1.27 wing for sh 0.65 rate for the	5.10 1.27 nelter and w 0.65 e applicable	1.12 rind speed, 0.58 e case:	1.02) = (21) × (2:	0.98 2a)m	3.70 0.92	3.70 0.92	4.20	Σ(22)1 1.12 Σ(22a)1 0.58	12 = 1.20 12 = 0.62	54.10 1.27 13.52 0.65] (2] (2] (2] (2

If exhaust air h If balanced wit								250) - (250	1)			N/A N/A	_ (23b _ (23c
d) If natural ve	entilation or	whole hoເ	use positive	input venti	lation fror	n loft							
if (22b)m ≥		1						1					
(24d)m	0.74	0.71	0.71	0.67	0.64	0.63	0.61	0.61	0.65	0.67	0.69	0.71	(240
Effective air chang	_		1					1	1		1		_
(25)m	0.74	0.71	0.71	0.67	0.64	0.63	0.61	0.61	0.65	0.67	0.69	0.71	(25)
3. Heat losses ar	nd heat loss	s paramete	r										
The κ-value is the	heat capac	ity per unit	t area, see T	able 1e.									
El	ement		Gross Area, m ²	•	nings, 1²	Net area A, m²		alue, 'm²K	А x U, W/К		ilue, m².K	Ахк, kJ/K	
Doors						1.85	x 2	= 00	3.70	N	/A	N/A	(26)
Window*						14.15	x 1.	.85 =	26.20	N	/A	N/A	(27)
Exposed floor						27.00	x 0.	.25 =	6.75] N	/A	N/A	(28 k
Party Wall						153.00	x 0.	= 00.	0.00	N	/A	N/A	(32)
External wall						23.99	x 0.	.35 =	8.40	N	/A	N/A	(29a
Roof						37.00	x 0.	.16 =	5.92] N	/A	N/A	(30)
otal area of exte	rnal elemer	nts ∑A, m²				103.99	(31)						
* for windows and	d roof wind	ows, effect	ive window	U-value is a	calculated	using form	ula 1/[(1/U	Value)+0.04	4] paragrap	h 3.2			
abric heat loss, V	V/K = ∑(A ×	U)							(26	5)(30) + (32) =	50.97	(33)
leat capacity Cm	= ∑(А х к)							(28)	(30) + (32) -	+ (32a)(3	2e) = 📃	N/A	(34)
hermal mass par	ameter (TN	/IP) in kJ/m	²K						Calculat	ed separat	ely =	250.00	(35)
hermal bridges: if details of the					5 x (31)							11.44	(36)
otal fabric heat l	OSS	-								(33) + (1	36) =	62.41	(37)
/entilation heat lo	oss calculat	ed monthly	v 0.33 x (25	5)m x (5)						. , .	,		_ 、 ,
(38)m	46.91	45.26	45.26	42.25	40.46	39.62	38.83	38.83	40.89	42.25	43.71	45.26	(38)
leat transfer coe	fficient, W/	K (37)m+	(38)m										
(39)m	109.32	107.67	107.67	104.66	102.87	102.03	101.24	101.24	103.30	104.66	106.12	107.67	
leat loss parame	ter (HLP) M	//m²K (39)m ∸ (4)						Average = 2	<u>(</u> 39)112,	/12 =	104.87	(39)
(40)m	1.71	1.68	1.68	1.64	1.61	1.59	1.58	1.58	1.61	1.64	1.66	1.68	
、 ,						-	1	1	Average = 2		·	1.64	 (40)
A Meter bestin													_
4. Water heating	g energy rec	quirement									k	Wh/year	
Assumed occupar	N N									2.09			
If TFA > 13.9, N		x [1vn(0 000240 v	TEA 120	$(1^{2})^{1} + 0.00$	12 V /TEA -	12 0)			2.09	(42	.)	
If TFA \leq 13.9, 1		x [1 - 6xh(-	-0.000349 X	(IFA - 15.5)]] + 0.00	13 X (1FA	13.9)						
			\ //	d	(25 NI)	26				00.20		`	
Annual average h Annual average h		-					to achieve	a water ve	e target of	88.30			
per person per da		-		by 576 ij tin	e uwennig	is designed	to acmeve	u water us	e largel of i		1011 125 m	163	
	Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
lot water usage i		-		1									-
(44)m	97.13	93.60	90.07	86.54	83.01	79.47	79.47	83.01	86.54	90.07	93.60	97.13	 ¬ .
· · · ·	1								T -11 ···	∑(44)1	.12 =	1059.65	(44)
nergy content of		-	-) x va,m x	nm x 1m/36	DUU KWh/	month (see	e lables 1b,	TC TQ)		-	-
(4E)m	1 1 1 1 1 1 1	1 1 2 2 2 0	120 22	112 C1	100 01	04 07	07 17	100 00	101 22	11707	100 77	120.04	
(45)m	144.39	126.29	130.32	113.61	109.01	94.07	87.17	100.03	101.22	117.97 Σ(45)1	128.77	139.84	 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61) For community heating include distribution loss whether or not hot water tank is present

Distribution loss 0).15 x (45)m	า											
(46)m	21.66	18.94	19.55	17.04	16.35	14.11	13.08	15.00	15.18	17.70	19.32	20.98	(46)
Water storage loss	5:												
b) If manufacturer	's declared	cylinder lo	ss factor is	not known:									
Cylinder volum	e (litres) in	cluding any	solar stora	ge within s	ame cylind	er		1	150.00	(50)			
<i>If community h</i>	eating and	no tank in	dwelling, ei	nter 110 liti	res in box (S	50)							
Otherwise if no	stored hot	water (this	s includes in	istantaneo	us combi bo	oilers) ente	r '0' in box ((50)					
Hot water stora	age loss fac	tor from Ta	ble 2 (kWh	/litre/day)					0.02] (51)			
<i>If community h</i>	eating see	SAP 2009 s	ection 4.3										
Volume factor	from Table	2a							0.93	(52)			
Temperature fa	actor from [·]	Table 2b							0.54	(53)			
Energy lost from	m water sto	orage, kWl	h/day (50)	x (51) x (52	2) x (53)				1.44	(54)			
Enter (49) or (54) i	in (55)								1.44	(55)			
Water storage loss	s calculated	l for each m	nonth = (55) x (41)m						-			
(56)m	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)
If cylinder contain	s dedicated	l solar stora	ige, = (56)m	n x [(50) - (H	111)] ÷ (50)	, else = (56)m where (H11) is fror	n Appendix	кн			-
(57)m	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 circuit los	s (annual) f	rom Table 3	3					E	510.00	(58)			_
Primary circuit los	s for each n	nonth (58)	÷ 365 × (41)m						-			
(modified by facto			-	•	ng and a cyl	inder therr	nostat)						
(59)m	51.81	46.79	51.81	50.14	51.81	50.14	51.81	51.81	50.14	51.81	50.14	51.81	(59)
Combi loss for eac	h month fr	om Table 3	a, 3b or 3c	(enter '0' if	not a com	oi boiler)							
(61)m	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(61)
Total heat require	d for water	heating ca	lculated for	each mon	th 0.85 × (4	5)m + (46)	m + (57)m +	+ (59)m + (6	51)m				
(62)m	240.73	213.30	226.65	206.84	205.35	187.30	183.51	196.37	194.45	214.30	222.00	236.17	(62)
Solar DHW input c	alculated u	sing Appen	dix H (nega	itive quanti	ty) ('0' ente	ered if no s	olar contrib	ution to wa	ater heatin	g)			
(63)m	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00]
										∑(63)1	12 =	0.00	(63)
Output from wate	r heater foi	r each mon	th, kWh/mo	onth (62)m	ı + (63)m								
(64)m	240.73	213.30	226.65	206.84	205.35	187.30	183.51	196.37	194.45	214.30	222.00	236.17]
										∑(64)1	12 = 2	526.98	(64)
if (64)m < 0 then s	et to 0												
Heat gains from w	ater heatin	g, kWh/mo	onth 0.25 ×	[0.85 × (45)m + (61)m	i] + 0.8 × [(4	46)m + (57)	m + (59)m]					
(65)m	125.08	111.60	120.40	112.36	113.32	105.86	106.05	110.33	108.24	116.29	117.40	123.56	(65)
include (57)	m in calcul	ation of (65	;)m only if c	ylinder is in	the dwelli	ng or hot w	vater is fron	n communi	ty heating				
5. Internal gains	(see Table !	5 and 5a)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (T													7
(66)m	104.61	104.61	104.61	104.61	104.61	104.61	104.61	104.61	104.61	104.61	104.61	104.61	(66)
Lighting gains (cal	· · · · · · · · · · · · · · · · · · ·												7
(67)m	27.73	24.63	20.03	15.16	11.33	9.57	10.34	13.44	18.04	22.90	26.73	28.50	(67)
Appliances gains (] (60)
(68)m	182.91	184.81	180.03	169.84	156.99	144.91	136.84	134.94	139.72	149.91	162.76	174.84	(68)
Cooking gains (cal				-			22.40	22.40	22.40	22.40	22.40	22.40	
(69)m	33.46	33.46	33.46	33.46	33.46	33.46	33.46	33.46	33.46	33.46	33.46	33.46	(69)
Pumps and fans ga	ains (Table 1 10.00		10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	
(70)m	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	(70)

Losses e.g. evapor	ration (nega	ative values) (Table 5)										
(71)m	-83.69	-83.69	-83.69	-83.69	-83.69	-83.69	-83.69	-83.69	-83.69	-83.69	-83.69	-83.69	(71)
Water heating gai	ins (Table 5))			•							•	-
(72)m	168.12	166.07	161.83	156.05	152.31	147.03	142.55	148.29	150.33	156.31	163.05	166.08	(72)
Total internal gair	ns (66)m + ((67)m + (68)m + (69)m	+ (70)m +	(71)m + (72	2)m		•					
(73)m	443.14	439.89	426.26	405.44	385.01	365.89	354.11	361.05	372.48	393.50	416.93	433.80	(73)
								1			1], ,
6. Solar gains													
Solar gains are ca	lculated usi	ing solar flu	x from Tab	le 6a and a	ssociated e	quations to	convert to	the applica	able oriento	ation.			
Rows (74) to (82)	are used 12	times, one	for each m	onth, repe	ating as neo	eded if ther	e is more t	han one wii	ndow type.				
Details for month	of January	and annual	totals are	shown belo	w:								
	P	Access facto Table 6d	or	Area m²	So	lar flux W/	-	Specific da or Table 6b		Specific da or Table 60		Gains (W)	
East		0.77	x	14.15	x	19.87	x 0.9 x	0.72	x	0.70	=	98.21	(76)
Solar gains in wat	ts, calculate	ed for each	month Σ(74	4)m(82)m	1								-
(83)m	98.21	190.37	304.27	451.77	549.67	573.55	556.70	484.51	363.76	231.83	122.11	81.02	(83)
Total gains - inter	nal and sola	ar (73)m + (8	83)m		•			•					-
(84)m	541.35	630.26	730.53	857.21	934.68	939.44	910.80	845.56	736.24	625.33	539.03	514.82	(84)
()] (-)
7. Mean interna	l temperatı	ure (heatinູ	g season)										
Temperature duri	ng heating	periods in t	he living ar	ea from Ta	ble 9, Th1(°	°C)						21.00	(85)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor	for gains for	r living area	, η1,m (see	e Table 9a)									
(86)m	0.99	0.99	0.97	0.92	0.80	0.63	0.44	0.48	0.77	0.94	0.99	0.99	(86)
Mean internal ter	np of living	area T1 (ste	eps 3 to 7 ir	n Table 9c)									
(87)m	19.31	19.53	19.90	20.33	20.72	20.92	20.99	20.98	20.83	20.36	19.72	19.36	(87)
Temperature duri	ng heating	periods in t	he living ar	ea from Ta	ble 9, Th2(°	°C)			7	•	•	•	-
(88)m	19.54	19.56	19.56	19.59	19.61	19.62	19.63	19.63	19.61	19.59	19.58	19.56	(88)
Utilisation factor	for gains for	r rest of dw	elling ŋ2,m	(see Table	9a)				•	•	•	•	-
(89)m	0.99	0.98	0.95	0.89	0.74	0.52	0.30	0.32	0.66	0.91	0.98	0.99	(89)
Mean internal ter	nperature i	n the rest o	f dwelling 1	F2 (follow s	teps 3 to 7	in Table 9c)	•				•	-
(90)m	18.06	18.29	18.65	19.08	19.44	19.59	19.63	19.63	19.53	19.12	18.49	18.13	(90)
Living area fractio	'n							fLA	41.00	÷ (4) =	-	0.64	(91)
Mean internal ter		or the who	e dwelling	fIΔ x T1 +('	1 - fl A) x T2] ()] (-)
(92)m	18.86	19.08	19.45	19.88	20.26	20.44	20.50	20.50	20.36	19.91	19.28	18.92	(92)
Apply adjustment						_] (= _/
(93)m	18.86	19.08	19.45	19.88	20.26	20.44	20.50	20.50	20.36	19.91	19.28	18.92	(93)
(00)	10.00	10.00	101.10	10.00			_0.00		20.00	10:01	10.20	10:01] (50)
8. Space heating	requireme	nt											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Set Ti to the mear	n internal te	emperature	obtained a	nt step 11 o	f Table 9b,	so that tim	= (93)m ar	nd recalcula	te the utilis	sation facto	r for gains	using Table	e 9a)
Utilisation factor	for gains, ηr	n											
(94)m	0.99	0.98	0.95	0.90	0.77	0.59	0.39	0.42	0.73	0.92	0.98	0.99	(94)
Useful gains, ŋmG	im, W = (94)m x (84)m											
(95)m	534.48	616.37	696.04	767.69	720.50	554.83	358.20	356.28	534.45	576.19	527.75	508.79	(95)
Monthly average	external ter	nperature	from Table	8									
(96)m	4.50	5.00	6.80	8.70	11.70	14.60	16.90	16.90	14.30	10.80	7.00	4.90	(96)
Heat loss rate for	mean inter	nal tempera	ature, Lm, V	W									
(97)m	1570.17	1516.12	1362.16	1169.99	880.79	596.19	364.24	363.97	626.21	953.67	1302.96	1509.59	(97)
Space heating req	uirement fo	or each mo	nth, kWh/n	nonth = 0.0	24 x [(97)m	n - (95)m] x	(41)m						
(98)m	770.55	604.63	495.60	289.66	119.26	0.00	0.00	0.00	0.00	280.84	558.15	744.60]
							Total per y	/ear (kWh/y	/ear) = ∑(98	3)15, 10	12 = 3	863.29	(98)

Space heating - main system 1

(99)

						Energy Vh/year		E	missions Factor			nissions CO2/year)	
12a. Carbon dio	kide emissi	ons - Indivio	dual heatir	ng systems	including m	nicro-CHP							
Electricity for ligh	ting (calcul	lated in App	pendix L):									489.66	(23
Total electricity fo	or the above	e								∑(230a)(2	30g)	175.00	(23
pump for solar		-								0.00	20-)	175.00	(23 (25
maintaining el			for gas co	nbi boiler						0.00			(23
boiler flue fan										45.00			(23
oil boiler pump	C									0.00			(2
central heating	g pump									130.00)		(2
warm air heati										0.00			(2
mechanical ve	• •			-	input from	outside				0.00			(2
Electricity for pun	nps, fans ai	nd electric l	keep-hot (Table 4f):									-
Water heating fu	el used										3	465.93	_ (2:
Space heating fue	el used, sec	ondary										386.33	(21
Space heating fue	el used, ma	in system 1									4	406.80	(21
Annual Totals Sur	nmary:									kWh/ye	ar k\	Wh/year	
							Tota	l per year (kWh/year)	= ∑(219)1	12 = 3	465.93	(21
(219)m	316.65	281.52	301.48	279.18	285.36	272.24	266.73	285.42	282.64	289.91	294.03	310.78	
Fuel for water hea	ating, kWh/	/month = (6	4)m x 100	÷ (217)m									_
(217)m	76.02	75.77	75.18	74.09	71.96	68.80	68.80	68.80	68.80	73.92	75.50	75.99	
Efficiency of wate	r heater pe	r month											-
										∑(64)1	12 = 2	526.98	(64
(64)m	240.73	213.30	226.65	206.84	205.35	187.30	183.51	196.37	194.45	214.30	222.00	236.17	
Output from wate		1		1						· · · ·			7
Water heating:													
							Total per ye	ear (kWh/y	ear) = ∑(21	5)15, 10	12 =	386.33	(21
(215)m	77.05	60.46	49.56	28.97	11.93	0.00	0.00	0.00	0.00	28.08	55.82	74.46]
Space heating fue	· ·	1		1	1		0.05	0.05	0.05				7
							Total per ye	ear (kWh/y	ear) = ∑(21	1)15, 10	12 = 4	406.80	(21
(211)m	878.95	689.70	565.32	330.41	136.04	0.00	0.00	0.00	0.00	320.36	636.68	849.35	
Space heating fue	-	1		1	1		1	0.00	0.00	220.20	<u></u>	040.05	7
(98)m	770.55	604.63	495.60	289.66	119.26	0.00	0.00	0.00	0.00	280.84	558.15	744.60	
Space heating req		1		1	1	0.07	0.05						7
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Efficiency of secor	ndary/supp	lementary h	neating sys	tem, from	Table 4a or	Appendix I	E (%)		100.00	(208)			
(from database or	r Table 4a∕4	4b, adjustea	l where ap	propriate b	y the amou	nt shown ii	n the 'space	e efficiency	adjustmen	t' column of	Table 4c)		
Efficiency of main	space heat	ting system	1 (%)						78.90	(206)			
Fraction of total s	pace heat f	rom main s	ystem 2 (2	202) x (203)					0.00	(205)			
Fraction of total s	pace heat f	rom main s	ystem 1 (2	202) x [1 - (2	203)]				0.90	(204)			
Fraction of main h	neating fror	n main syst	em 2						0.00	(203)			
Fraction of space	heating fro	m main syst	tem(s) 1 -	(201)					0.90	(202)			
Fraction of space	heating fro	m secondar	y/supplem	ientary syst	em (Table 1	L1)			0.10	(201)			
										_			

854.92

(261)

4406.80

0.194

=

х

Space heating - secondary	386.33	х	0.422] =	163.03	(263)
Water heating	3465.93	х	0.194	=	672.39	(264)
Space and water heating			(261) + (262) -	+ (263) + (264) =	1690.34	(265)
Pumps, fans and electric keep-hot	175.00	x	0.422] =	73.85	(267)
Lighting	489.66	x	0.422] =	206.64	(268)
Total carbon dioxide emissions				∑(261)(271) =	1970.83	(272)
Emissions per m ² for space and water heating					27.57	(272a)
Emissions per m ² for lighting					3.23	(272b)

Target Carbon Dioxide Emissions Rate (TER)

[(27.57 × FF × EFA) + (3.23 × EFA)] × (0.6)

19.25

(273)

DER 2009 Worksheet Design - Draft



Assessor name	Mrs Farah Naz	Assessor number	1
Client		Last modified	21/02/2014
Address	3 Site 3 3 Kiln Place, Camden, Camden, Gospel Oak London, UK, NW5		

1. Overall dwel	ling dimensi	ons											
					Ar	rea (m²)			rage storey eight (m)	,	V	olume (m³)	
Lowest occupied						27.00	(1a) x		3.00	(2a) =		81.00	(3a)
+1						37.00	(1b) x		3.00	(2b) =		111.00	(3b)
Total floor area		(1a)	+ (1b) + (1c	:) + (1d)(1	1n) =	64.00	(4)			-			_
Dwelling volume							-	(3a) + (3b) + (3	sc) + (3d)(3n) =	192.00	(5)
													_
2. Ventilation r	ate												
											n	n ³ per hour	
Number of chimi	neys								0	x 40	-	0	(6a)
Number of open	flues								0	x 20	-	0	(6b)
Number of inter	mittent fans								0	x 10	=	0	(7a)
Number of passiv	ve vents								0	x 10	=	0	(7b)
Number of fluele	ess gas fires								0	x 40 ×	=	0	(7c)
											Air	changes pe hour	er
Infiltration due to	o chimneys, t	flues, fans,	PSVs		(6a)	+ (6b) + (7a	a) + (7b) +	(7c) =	0	÷ (5)	=	0.00	(8)
If a pressurisatio	n test has be	en carried o	out or is inte	ended, pro	ceed to (17,), otherwis	e continue	from (9) to	(16)				
Air permeability	value, q50, e	expressed in	cubic metr	res per hou	ır per squar	re metre of	f envelope	area				2.00	(17)
If based on air pe	ermeability v	alue, then (18) = [(17) -	÷ 20] + (8),	otherwise	(18) = (16)						0.10	(18)
Air permeability	value applies	s if a pressu	risation tes	t has been	done, or a	design or s	pecified ail	r permeabil	lity is being	used			
Number of sides	on which dw	velling is she	eltered									1	(19)
Shelter factor									1	- [0.075 x (1	.9)] =	0.92	(20)
Adjusted infiltrat	ion rate									(18) x (20) =	0.09	(21)
Infiltration rate r	nodified for I	monthly wi	nd speed:										
	Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Monthly average							1	1	-		T		_
(22)m	5.40	5.10	5.10	4.50	4.10	3.90	3.70	3.70	4.20	4.50	4.80	5.10	
										∑(22)1	.12 =	54.10	(22)
Wind Factor (22a			1.27	1.12	4.02	0.00	0.02	0.02	4.05	4.42	4.00		-
(22a)m	1.35	1.27	1.27	1.12	1.02	0.98	0.92	0.92	1.05	1.12	1.20	1.27	 (aa
Addition to file of			- 14	daala "		2 -)				∑(22a)1	.12 =	13.52	(22a
Adjusted infiltrat	0.12	0.12	0.12	0.10		2a)m 0.09	0.00	0.00	0.10	0.10	0.11	0.12	7
(22b)m	0.12	0.12	0.12	0.10	0.09	0.09	0.09	0.09	0.10	0.10	0.11	0.12	
Calculate offectiv	o air changa	rata far th	opplicable							∑(22b)1	.12	1.25	(22k
Calculate effectiv	-											0.50	(1)-
If mechanical	ventilation:	air criange i	ate throug	n system								0.50	(23a

							[]						(2
a) If balanced (24a)m	0.24	0.23	with heat	0.22	лvнк) (22 0.21	0.20	x [1 - (23c) ÷ 100] =	0.21	0.22	0.22	0.23] (2
fective air char					I		0.20	0.20	0.21	0.22	0.22	0.25	_ (4
(25)m	0.24	0.23	0.23	0.22	0.21	0.20	0.20	0.20	0.21	0.22	0.22	0.23] (2
(23)111	0.24	0.25	0.25	0.22	0.21	0.20	0.20	0.20	0.21	0.22	0.22	0.25	_ (2
. Heat losses a	nd heat loss	paramete	r										
he к-value is the	e heat capac	ity per unit	area, see T	Table 1e.									
Element		•			nings, n²	Net area A, m²		U-value, W/m²K		АхU, к-val W/K kJ/m			
oors						4.40	x 1.	= 00	4.40] N	/A	N/A	(2
'indow*						19.64	x 0.	96 =	18.88	N	/A	N/A	(:
posed floor						27.00	x 0.	10 =	2.70] N	/A	N/A	(
ternal wall						15.95	x 0.	10 =	1.60] N	/A	N/A	(:
arty Wall						153.00	x 0.	= 00	0.00] N	/A	N/A	(3
oof						37.00	x 0.	10 =	3.70	N	/A	N/A	(3
otal area of exte	ernal elemer	nts ∑A, m²				103.99	(31)						
for windows ar	nd roof winde	ows, effecti	ve window	v U-value is	calculated	using formu	la 1/[(1/U	Value)+0.04	4] paragrap	oh 3.2			
ıbric heat loss,	W/K = ∑(A ×	U)							(2	6)(30) + (32) =	31.28	(
eat capacity Cm = Σ (A x κ)							(28)(30) + (32) + (32a)(32e) = N/A						
hermal mass parameter (TMP) in kJ/m ² K							Calculated separately = 450.00						
ermal bridges:	Σ(L x Ψ) cal	culated usir	ng Append	ix K								10.40	(
if details of th	ermal bridgi	ing are not	known the	n (36) = 0.1	5 x (31)								
otal fabric heat	loss									(33) + (36) =	41.68] (
entilation heat	loss calculate	ed monthly	0.33 x (2	5)m x (5)									_
(38)m	15.09	14.65	14.65	13.77	13.18	12.89	12.60	12.60	13.33	13.77	14.21	14.65	(
eat transfer coe	efficient, W/	K (37)m+	(38)m										
(39)m	56.77	56.33	56.33	55.45	54.86	54.57	54.28	54.28	55.01	55.45	55.89	56.33	
									Average =	∑(39)112,	/12 =	55.46	(
eat loss parame	eter (HLP), W	//m²K (39)	m ÷ (4)										_
40)m	0.89	0.88	0.88	0.87	0.86	0.85	0.85	0.85	0.86	0.87	0.87	0.88	
									Average =	∑(40)112,	/12 =	0.87	(
. Water heatin	a oporav rov	nuiromont											
. Water neath	ig energy rec	quirement									L	wh/year	
										2.00		-	
sumed occupa		[4 (1211 0.000	40 (TEA 4	2.0)			2.09	(42	2)	
If TFA > 13.9,		x [1 - exp(-	0.000349>	(TFA - 13.9	9)²)] + 0.00:	13 X (IFA - 1	3.9)						
If TFA ≤ 13.9,													
inual average l		-		-						83.89			
nual average l r parcon par d		-		l by 5% if th	e dwelling	is designed	to achieve	a water us	e target of	not more ti	nan 125 lit	res	
er person per de							11	A	Com	Ort	N	Dee	
t water usage	Jan	Feb	Mar	Apr	May		Jul	Aug	Sep	Oct	Nov	Dec	
ot water usage 44)m	92.28	88.92	85.57	82.21	78.86	75.50	75.50	78.86	82.21	85.57	88.92	92.28	٦
	52.20	00.92	05.57	02.21	1 , 0.00	, 5.50	, 5.50	, 0.00	02.21	<u>Σ(44)1</u>	·	1006.67	_] (
						- 10.0	00 LM/L/		Tables 1b		.12 =	1000.01] (
orau contant -	f hot water	ucod colo	lated man	+hlv - 1 101	1 v 1/4 m								
ergy content c 45)m	of hot water 137.17	used - calcu 119.97	llated mon 123.80	107.93 107.93	103.56	nm x 1m/36 89.37	82.81	month (see 95.03	96.16	1c 1d) 112.07	122.33	132.85	٦

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61) For community heating include distribution loss whether or not hot water tank is present

Distribution loss ().15 x (45)n	n													
(46)m	20.58	18.00	18.57	16.19	15.53	13.41	12.42	14.25	14.42	16.81	18.35	19.93	(46)		
Water storage los	s:														
b) If manufacturer's declared cylinder loss factor is not known:															
Cylinder volume (litres) including any solar storage within same cylinder 250.00 (50)															
If community heating and no tank in dwelling, enter 110 litres in box (50)															
Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in box (50)															
Hot water stor	age loss fac	tor from Ta	able 2 (kWh	n/litre/day)					0.01	(51)					
If community heating see SAP 2009 section 4.3															
Volume factor from Table 2a									0.78	(52)					
Temperature factor from Table 2b									0.54 (53)						
Energy lost from water storage, kWh/day $(50) \times (51) \times (52) \times (53)$									0.91 (54)						
Enter (49) or (54) in (55)									0.91 (55)						
Water storage loss calculated for each month = $(55) \times (41)$ m															
(56)m	28.09	25.37	28.09	27.18	28.09	27.18	28.09	28.09	27.18	28.09	27.18	28.09	(56)		
$\frac{20.05}{25.05} = \frac{25.05}{25.10} = \frac{20.05}{25.10} = \frac{20.05}{2$] (00)			
(57)m	28.09	25.37	28.09	27.18	28.09	27.18	28.09	28.09	27.18	28.09	27.18	28.09	(57)		
					20100	27.20			360.00	(58)	27120	20.00			
Primary circuit loss (annual) from Table 3 (58) Primary circuit loss for each month (58) ÷ 365 × (41)m															
(modified by facto					ng and a cyl	inder there	mostat)								
(59)m	30.58	27.62	30.58	29.59	30.58	29.59	30.58	30.58	29.59	30.58	29.59	30.58	(59)		
Combi loss for ead] (,		
(61)m	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(61)		
Total heat require									-] (/		
(62)m	195.84	172.96	182.46	164.70	162.23	146.14	141.47	153.69	152.93	170.73	179.10	191.51	(62)		
Solar DHW input o		1													
(63)m	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7		
								1	1	<u>Σ</u> (63)1	12 =	0.00	(63)		
Output from wate	r heater fo	r each mon	th. kWh/m	onth (62)m	1 + (63)m					2()] (,		
•		172.96				146.14	141.47	153.69	152.93	170.73	179.10	191.51	7		
(-)										∑(64)1		013.76	(64)		
if (64)m < 0 then s	et to 0									2()=] ()		
Heat gains from w		a kWh/mc	onth 0.25 x	[0 85 × (45	3m + (61)m	1 ± 0 8 × [(,	16)m ± (57)	m + (50)ml							
(65)m	70.07	61.98	65.62	59.56	58.90	53.39	52.00	56.06	55.65	61.72	64.35	68.63	(65)		
include (57)										01.72	04.55	00.05] (03)		
include (57)	in in calcul		i in only ij c	.yiirider is ii	i the awein	ng or not w		n commun	ty neuting						
5. Internal gains	(see Table	5 and 5a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
Metabolic gains (T	able 5), Wa	atts													
(66)m	104.61	104.61	104.61	104.61	104.61	104.61	104.61	104.61	104.61	104.61	104.61	104.61	(66)		
Lighting gains (cal	culated in A	Appendix L,	equation L	9 or L9a), a	lso see Tab	le 5									
(67)m	16.31	14.48	11.78	8.92	6.67	5.63	6.08	7.90	10.61	13.47	15.72	16.76	(67)		
Appliances gains (calculated i	in Appendix	L, equatio	n L13 or L1	3a), also se	e Table 5									
(68)m	182.91	184.81	180.03	169.84	156.99	144.91	136.84	134.94	139.72	149.91	162.76	174.84	(68)		
Cooking gains (cal	culated in A	Appendix L,	equation L	15 or L15a)	, also see T	able 5									
(69)m	33.46	33.46	33.46	33.46	33.46	33.46	33.46	33.46	33.46	33.46	33.46	33.46	(69)		
Pumps and fans g	ains (Table	5a)													
(70)m	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(70)		

Losses e.g. evapor	ration (nega	ative values) (Table 5)										
(71)m	-83.69	-83.69	-83.69	-83.69	-83.69	-83.69	-83.69	-83.69	-83.69	-83.69	-83.69	-83.69	(71)
Water heating gai	ns (Table 5))											
(72)m	94.18	92.24	88.20	82.72	79.16	74.15	69.89	75.35	77.29	82.96	89.37	92.25	(72)
Total internal gair	ıs (66)m + ((67)m + (68)m + (69)m	+ (70)m +	(71)m + (72	.)m							
(73)m	347.78	345.91	334.39	315.86	297.20	279.07	267.19	272.57	282.00	300.72	322.23	338.23	(73)

6. Solar gains

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Rows (74) to (82) are used 12 times, one for each month, repeating as needed if there is more than one window type.

Details for month of January and annual totals are shown below:

Details for month of surfaces	Access facto Table 6d		Area m²		lar flux W/	m² į	g Specific da or Table 6b		F Specific da or Table 60		Gains (W)	
East	0.77] x	17.88	х	19.87	x 0.9 x	0.60	x	0.80	=	118.19	(76)
North	0.77] x	1.76	х	10.73	x 0.9 x	0.60	x	0.80	=	6.28	(74)
Solar gains in watts, calculat	ed for each	month ∑(74	4)m(82)m									
(83)m 124.47	241.01	385.67	575.66	705.53	739.46	716.27	619.11	461.82	293.52	154.68	102.74	(83)
Total gains - internal and so	lar (73)m + (8	83)m										
(84)m 472.25	586.93	720.06	891.52	1002.72	1018.53	983.46	891.69	743.82	594.24	476.92	440.96	(84)
7. Mean internal temperat	ture (heating	g season)										
Temperature during heating	g periods in t	he living ar	ea from Tal	ble 9. Th1(°	C)						21.00	(85)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec] ()
Utilisation factor for gains for	or living area		•							-		
(86)m 1.00	1.00	0.95	0.75	0.51	0.34	0.23	0.25	0.50	0.89	1.00	1.00	(86)
Mean internal temp of living	g area T1 (ste	eps 3 to 7 ir	n Table 9c)								·	-
(87)m 20.57	20.71	20.89	20.99	21.00	21.00	21.00	21.00	21.00	20.97	20.72	20.57	(87)
Temperature during heating	g periods in t	he living ar	ea from Tal	ble 9 <i>,</i> Th2(°	C)							_
(88)m 20.18	20.19	20.19	20.20	20.21	20.21	20.21	20.21	20.20	20.20	20.19	20.19	(88)
Utilisation factor for gains for	or rest of dw	elling η2,m	(see Table	9a)								
(89)m 1.00	0.99	0.93	0.71	0.47	0.30	0.18	0.20	0.44	0.84	1.00	1.00	(89)
Mean internal temperature	in the rest o	f dwelling T	T2 (follow st	teps 3 to 7	in Table 9c)							
(90)m 19.61	19.82	20.07	20.19	20.21	20.21	20.21	20.21	20.20	20.17	19.84	19.62	(90)
Living area fraction							fLA	41.00	÷ (4) =	-	0.64	(91)
Mean internal temperature	for the whol	le dwelling	fLA x T1 +(1	L - fLA) x T2								
(92)m 20.23	20.39	20.60	20.70	20.71	20.72	20.72	20.72	20.71	20.68	20.40	20.23	(92)
Apply adjustment to the me	an internal t	emperatur	e from Tabl	le 4e, wher	e appropria	te						
(93)m 20.23	20.39	20.60	20.70	20.71	20.72	20.72	20.72	20.71	20.68	20.40	20.23	(93)
8. Space heating requirem	ent											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Set Ti to the mean internal t							-	•				e 9a)
Utilisation factor for gains, r						ζ, γ				0	U	,
(94)m 1.00	0.99	0.94	0.74	0.49	0.33	0.21	0.23	0.47	0.87	1.00	1.00	(94)
Useful gains, ηmGm, W = (9	4)m x (84)m											
(95)m 471.96	583.69	679.29	657.72	494.41	333.73	207.18	207.18	352.74	518.30	475.42	440.77	(95)
Monthly average external te	emperature f	from Table	8									
(96)m 4.50	5.00	6.80	8.70	11.70	14.60	16.90	16.90	14.30	10.80	7.00	4.90	(96)
Heat loss rate for mean inte	rnal tempera	ature, Lm, V	W									
(97)m 892.70	866.68	777.27	665.55	494.53	333.73	207.18	207.18	352.80	547.80	748.85	863.24	(97)
Space heating requirement	for each moi	nth, kWh/n	nonth = 0.0	24 x [(97)m	n - (95)m] x	(41)m						
												_

	Total per year (kWh/year) = ∑(98)15, 1012 = 1114.97 (9	98)
Space heating requirement in kWh/m ² /year	(98) ÷ (4) 17.42 (9	99)
9a. Energy Requirements - Individual heating systems including micro-CHP		
Space heating:		
Fraction of space heating from secondary/supplementary system (Table 11)	0.00 (201)	
Fraction of space heating from main system(s) 1 - (201)	1.00 (202)	
Fraction of main heating from main system 2	0.00 (203)	
Fraction of total space heat from main system 1 (202) x [1 - (203)]	1.00 (204)	
Fraction of total space heat from main system 2 (202) x (203)	0.00 (205)	
Efficiency of main space heating system 1 (%)	91.00 (206)	
(from database or Table 4a/4b, adjusted where appropriate by the amount shown		
Jan Feb Mar Apr May Jun	Jul Aug Sep Oct Nov Dec	
Space heating requirement, kWh/month (as calculated above)		
(98)m 313.03 190.17 72.90 5.64 0.10 0.00	0.00 0.00 0.00 21.95 196.87 314.32	
Space heating fuel (main heating system 1), kWh/month = (98)m x (204) x 100 \div (20	06)	
(211)m 343.99 208.98 80.11 6.20 0.10 0.00	0.00 0.00 0.00 24.12 216.34 345.40	
	Total per year (kWh/year) = $\Sigma(211)15$, 1012 = 1225.25 (2	211)
Water heating:		
Output from water heater, kWh/month (calculated above)		
(64)m 195.84 172.96 182.46 164.70 162.23 146.14	141.47 153.69 152.93 170.73 179.10 191.51	
	Σ(64)112 = 2013.76 (6	64)
Efficiency of water heater per month		
(217)m 86.56 85.57 83.09 80.61 80.31 80.30	80.30 80.30 80.30 81.39 85.57 86.63	
Fuel for water heating, kWh/month = (64)m x 100 ÷ (217)m		
(219)m 226.24 202.13 219.60 204.31 202.01 181.99	176.18 191.40 190.45 209.77 209.31 221.06	
	Total per year (kWh/year) = Σ (219)112 = 2434.44 (2	219)
Annual Totals Summary:	kWh/year kWh/year	
Space heating fuel used, main system 1	1225.25 (2	211)
Water heating fuel used		219)
Electricity for pumps, fans and electric keep-hot (Table 4f):		- /
mechanical ventilation fans - balanced, extract or positive input from outside	149.33 (2	230a)
warm air heating system fans		230b)
central heating pump		230c)
oil boiler pump		230d)
boiler flue fan	0.00 (2	230e)
maintaining electric keep-hot facility for gas combi boiler	0.00 (2	230f)
pump for solar water heating	0.00 (2	230g)
Total electricity for the above	Σ(230a)(230g) 279.33 (2	231)
Electricity for lighting (calculated in Appendix L):	287.98 (2	232)
Energy saving/generation technologies (Appendices M, N and Q):		
Electricity generated by PVs (Appendix M) (negative quantity)	-223.18 (2	233)
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP		
	Emissions Emissions	
Energy kW/b/year	Emissions Emissions Emissions (kgCQ2/year)	

Pumps, fans and electric keep-hot	279.33	x	0.517	=	144.41	(267)
Lighting	287.98	x	0.517	=	148.89	(268)
Energy saving/generation technologies:						
PV emission savings (negative quantity)	-223.18	x	0.529	=	-118.06	(269)
Total carbon dioxide emissions				∑(261)(271) =	899.85	(272)
Dwelling Carbon Dioxide Emissions Rate (DER)					14.06	(273)

TER 2009 Worksheet Design - Draft



This design submission has been carried out using Approved SAP software. It has been prepared from plans and specifications and may not reflect the property as constructed.

Assessor name	Mrs Farah Naz	Assessor number	1
Client		Last modified	21/02/2014
Address	5.3 Site 5 5.3 Kiln Place, Camden, Camden, Gospel Oak London, UK, NV	V5	

1. Overall dwe	elling dimensio	ns											
					Area (n	1 ²)		Average s height	-		V	olume (m³))
Lowest occupie	d				53.00	(1a)	x	3.00		(2a) =		159.00	(3
Total floor area		(1a)) + (1b) + (1e	c) + (1d)((1n) = 53.00	(4)		<u>.</u>					
Dwelling volum	e							(3a) + (3l	o) + (3c)	+ (3d)((3n) =	159.00	(5
2. Ventilation	rate												
											r	n³ per hour	•
Number of chin	nneys							0		x 40	=	0	(6
Number of ope	n flues							0		x 20	=	0	(6
Number of inte	rmittent fans							2		x 10	=	20	(7
Number of pass	sive vents							0		x 10	=	0	(7
Number of flue	less gas fires							0		x 40	=	0	(7
											Aiı	r changes po hour	er
nfiltration due	to chimneys, fl	lues, fans,	, PSVs		(6a) + (6b) + (7a) + (7	b) + (7c)) = 20		÷ (5)	=	0.13	(8
f a pressurisati	on test has bee	en carried	out or is int	ended, pro	oceed to (17), oth	erwise cont	inue fro	m (9) to (16)					
Air permeability	y value, q50, ex	opressed i	in cubic met	res per ho	ur per square me	tre of enve	lope are	ea				10.00	(1
f based on air p	permeability va	lue, then	(18) = [(17)	÷ 20] + (8)), otherwise (18) =	= (16)						0.63	(1
Air permeability	y value applies	if a pressu	urisation tes	t has been	n done, or a desig	n or specifi	ed air pe	ermeability is	being u	sed			
Number of side	es on which dwe	elling is sh	neltered									2	(1
Shelter factor									1 - [0.075 x (2	19)] =	0.85	(2
Adjusted infiltra	ation rate									(18) x ((20) =	0.53	(2
nfiltration rate	modified for m	nonthly w	vind speed:										
	Jan	Feb	Mar	Apr	May Ju	ın J	ul	Aug S	ер	Oct	Nov	Dec	
	ge wind speed f	from Tabl	e 7										_
(22)m	5.40	5.10	5.10	4.50	4.10 3.	90 3.	70	3.70 4	.20	4.50	4.80	5.10	
										∑(22)1.	12 =	54.10	(2
	2a)m = (22)m ÷										1		_
(22a)m	1.35	1.27	1.27	1.12	1.02 0.	98 0.	92	0.92 1	.05	1.12	1.20	1.27	
										∑(22a)1.	12 =	13.52	(2
-	· · · · ·	-			d) = (21) × (22a)m		40	0.40		0.00	0.00	0.00	
(22b)m	0.72	0.68	0.68	0.60	0.55 0.	52 0.	49	0.49 0	.56	0.60	0.64	0.68	
Calaulata (f. 1	the starts	unter free et	ha avert - 11							∑(22b)1.	12 =	7.19	(2
	tive air change										Г	NI / 2	/_
	al ventilation: a	-	-									N/A	(2 (2
												N/A	

If balanced wit	th heat recov	very: efficie	ency in % a	llowing for	in-use fact	or (from Ta	ble 4h) =					N/A	(23c)
d) If natural ve	entilation or v	whole hou	se positive	input vent	ilation fron	n loft							
if (22b)m ≥	1, then (24d	l)m = (22b)	m; otherw	vise (24d)m	= 0.5 + [(22	2b)m2 x 0.5]						_
(24d)m	0.76	0.73	0.73	0.68	0.65	0.63	0.62	0.62	0.66	0.68	0.70	0.73	(24d)
Effective air chang	ge rate - ente	er (24a) or	(24b) or (2	24c) or (24c	l) in box (25	5)							
(25)m	0.76	0.73	0.73	0.68	0.65	0.63	0.62	0.62	0.66	0.68	0.70	0.73	(25)
3. Heat losses an	nd heat loss	parameter											
The κ-value is the	heat capacit	ty per unit	area, see T	able 1e.									
El	ement		Gross Area, m ²	•	nings, n²	Net area A, m²		value, /m²K	А x U, W/K		alue, m².K	Ахк,	
			Area, m	'		-	, <u> </u>					kJ/K	
Doors						1.85		.00 =	3.70		I/A	N/A	(26)
Window*						11.40		.85 =	21.11		I/A	N/A	(27)
Ground floor						53.00		.25 =	13.25		I/A	N/A	(28a)
External wall						77.47		.35 =	27.11		I/A	N/A	(29a)
Roof						53.00		= .16	8.48		I/A	N/A	(30)
Total area of exte		_				196.72	(31)		_				
* for windows and	d roof windo	ws, effecti	ve window	U-value is	calculated	using formu	ıla 1/[(1/U	Value)+0.0					_
Fabric heat loss, V	V/K = ∑(A × l))							(26	6)(30) + (32) =	73.66	(33)
Heat capacity Cm	=∑(Ахк)							(28)	.(30) + (32) +	+ (32a)(3	2e) =	N/A	(34)
Thermal mass par	ameter (TM	P) in kJ/m²	К						Calculat	ed separat	tely =	250.00	(35)
Thermal bridges:	∑(L x Ψ) calc	ulated usir	ng Appendi	x K								21.64	(36)
if details of the	ermal bridgin	ng are not	known the	n (36) = 0.1	5 x (31)								
Total fabric heat l	oss									(33) + (36) =	95.29	(37)
Ventilation heat lo	oss calculate	d monthly	0.33 x (2	5)m x (5)									
(38)m	39.76	38.30	38.30	35.63	34.03	33.29	32.59	32.59	34.42	35.63	36.92	38.30	(38)
Heat transfer coef	fficient, W/K	(37)m +	(38)m										_
(39)m	135.06	133.60	133.60	130.92	129.33	128.59	127.88	127.88	129.71	130.92	132.22	133.60	
									Average = ∑	(39)112	/12 =	131.11	(39)
Heat loss paramet	ter (HLP), W	/m²K (39)	m ÷ (4)										_
(40)m	2.55	2.52	2.52	2.47	2.44	2.43	2.41	2.41	2.45	2.47	2.49	2.52	
									Average = ∑	(40)112	/12 =	2.47	(40)
4. Water heating	o energy rea	uirement					·						
- Water neuting	5 circi 6 y req	unement									k	Wh/year	
A										1 70			
Assumed occupan		[1 ava()	000240	/TEA 120	N2N1 + 0.002	12/TEA 1	2.0)			1.78	(42	.)	
If TFA > 13.9, N		([1 - exp(-	J.000349 X	(TFA - 13.5	9] ⁻]] + 0.00.	13 X (IFA - J	.3.9)						
If TFA ≤ 13.9, N					(0)								
Annual average h		-		-						80.40			
Annual average h		-		by 5% if th	e dwelling	is designed	to achieve	e a water us	se target of r	not more ti	nan 125 lit	res	
per person per da						I	1.1	A	Com	0.4	N	Dee	
	Jan Blitros por d	Feb	Mar h month W	Apr d m = facto	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage i (44)m	88.51	85.29	n month vo 82.07	d,m = facto 78.85	75.64	72.42	72.42	75.64	78.85	82.07	85.29	88.51	7
()	00.71	03.23	02.07	, 0.05	, , , , , , , , , , , , , , , , , , , ,	, 2.42	, 2.42	1 75.04	/0.05	Σ(44)1	·	965.57	
Enormy content -	hot water	cod color	lated man	+bby = 4.40) v)/d	nm v Tre lac	00 LANE	month 1	o Tablas 14			15.50	(44)
Energy content of (45)m	131.57	115.07	118.75	tniy = 4.19	99.34	85.72	оо куул, 79.43	91.15	92.24	1c 1d) 107.49	117.34	127.42	7
(+5)11	131.37	113.07	110.75	103.33	1 55.54	05.72	19.43	1 91.13	92.24	<u>107.49</u> Σ(45)1	·	1269.04	 (45)
lf instantaneous w	vater heating	at noint i	of use Inc b	not water c	torane) en	ter () in hov	es (16) to 1	(61)		۲(۲۵)۲۰۰		1203.04	_ (+)
For community he	-		· ·		0 //			<u>, , , , , , , , , , , , , , , , , , , </u>					

Distribution loss	0.15 x (45)n	n											_
(46)m	19.74	17.26	17.81	15.53	14.90	12.86	11.91	13.67	13.84	16.12	17.60	19.11	(46)
Water storage los	s:												
b) If manufacture	r's declared	l cylinder lo	ss factor is	not known	:								
Cylinder volum	ne (litres) in	cluding any	v solar stora	ge within s	same cylind	er			150.00	(50)			
If community h	neating and	l no tank in	dwelling, ei	nter 110 lit	res in box (50)							
Otherwise if no	o stored hot	t water (thi	s includes in	nstantaneo	us combi bo	oilers) ente	r '0' in box	(50)					
Hot water stor	age loss fac	ctor from Ta	able 2 (kWh	/litre/day)					0.02	(51)			
If community h	neating see	SAP 2009 s	ection 4.3										
Volume factor	from Table	2a							0.93	(52)			
Temperature f	actor from	Table 2b							0.54	(53)			
Energy lost fro			h/day (50)	x (51) x (5	2) x (53)				1.44	(54)			
Enter (49) or (54)			i, aay (30)	x (31) x (3	2) x (33)				1.44	(55)			
Water storage los		d for oach n	oonth - (FF	(41)m					1.44	(55)			
(56)m	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)
If cylinder contain					1						43.05		_ (50)
(57)m	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 circuit los	L			43.05		43.05	4.55	·	510.00	(58)	43.05		
				\					510.00	(56)			
Primary circuit los					ag and a cul	indor thor	mactat)						
(modified by facto (59)m	51.81	46.79	51.81	50.14	51.81	50.14	51.81	51.81	50.14	51.81	50.14	51.81	(59)
							51.81	51.81	50.14	51.81	50.14		_ (55)
Combi loss for ead (61)m	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)
										0.00	0.00	0.00	
Total heat require (62)m	227.91	202.09	215.08	196.75	195.67	178.95	m + (57)m · 175.77	187.48	185.47	203.83	210.57	223.76	(62)
											210.57	223.70	_ (02)
Solar DHW input of (63)m	0.00	0.00	0.00	0.00	0.00	0.00	0.00		o.00	g) 0.00	0.00	0.00	٦
(03)11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		I		
			the LAND Los							∑(63)1	.12 =	0.00	(63)
Output from wate			215.08			178.95	175.77	187.48	185.47	203.83	210.57	223.76	7
(64)m	227.91	202.09	215.08	190.75	195.07	176.95	1/5.//	107.40	105.47		·		
if (CA) and the second										∑(64)1	.12 =	403.32	(64)
if (64)m < 0 then s							7.						
Heat gains from w							1		1	442.04	442.62		
(65)m	120.82	107.87	116.55	109.01	110.10	103.08	103.48	107.38	105.25	112.81	113.60	119.44	(65)
include (57)m in calcul	ation of (65)m only if c	sylinder is il	n the dwelli	ng or hot v	vater is fror	n communi	ty heating				
5. Internal gains	(see Table	5 and 5a)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Metabolic gains (1			iviai		inay	Juli	541	745	Sch	ott		Dee	
(66)m	88.93	88.93	88.93	88.93	88.93	88.93	88.93	88.93	88.93	88.93	88.93	88.93	(66)
Lighting gains (cal													_ (/
(67)m	23.52	20.89	16.99	12.86	9.62	8.12	8.77	11.40	15.30	19.43	22.68	24.18	(67)
Appliances gains (1								_ (/
(68)m	155.02	156.63	152.57	143.94	133.05	122.81	115.97	114.36	118.42	127.05	137.94	148.18	(68)
Cooking gains (cal		1	1 1		1		113.37	11.00	110.12	127.05	137.31	110.10	_ (00)
(69)m	31.89	31.89	31.89	31.89	31.89	31.89	31.89	31.89	31.89	31.89	31.89	31.89	(69)
Pumps and fans g		1	01.05	21.05	01.00	21.05	01.00		01.00	01.00	21.05		_ (00)
(70)m	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	(70)
Losses e.g. evapor		1		_0.00	0.00	_0.00	_0.00	0.00	_0.00	_0.00	0.00		
(71)m	-71.14	-71.14	-71.14	-71.14	-71.14	-71.14	-71.14	-71.14	-71.14	-71.14	-71.14	-71.14	(71)
(/ =)	/ 1.14	/1.14	, 1.14	/ 1.14	/ 1.14	/1.14	/1.14	/ 1.14	/ 1.14	/ 1.14	/ 1.14	1.14] (/ 1)

Water heating gai	ns (Table 5))											
(72)m	162.39	160.53	156.66	151.40	147.98	143.17	139.09	144.32	146.18	151.63	157.77	160.53	(72)
Total internal gain	s (66)m + ((67)m + (68)m + (69)m	+ (70)m +	(71)m + (72	2)m							
(73)m	400.61	397.72	385.90	367.88	350.33	333.78	323.51	329.77	339.58	357.78	378.07	392.57	(73)
6. Solar gains													
Solar gains are ca			-										
Rows (74) to (82)						eded if the	re is more t	han one wii	ndow type				
Details for month	of January	and annual	totals are	shown belo	w:								
	P	Access facto Table 6d	or	Area m²	So	lar flux W/	•	Specific da or Table 6b		F Specific da or Table 60		Gains (W)	
East		0.77] x	11.40] x	19.87	x 0.9 x	0.72] x	0.70] =	79.13	(76)
Solar gains in watt	s, calculate	ed for each	month ∑(74	4)m(82)m	1								
(83)m	79.13	153.37	245.13	363.97	442.84	462.08	448.51	390.34	293.07	186.78	98.37	65.27	(83)
Total gains - interr	nal and sola	ar (73)m + (8	83)m										
(84)m	479.74	551.09	631.03	731.85	793.17	795.87	772.01	720.11	632.65	544.56	476.45	457.84	(84)
		•	·		•			•			•		
7. Mean internal	temperatu	ure (heating	g season)										
Temperature duri	ng heating	periods in t	he living ar	ea from Ta	ble 9, Th1(ʿ	°C)						21.00	(85)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor f	or gains for	r living area	, η1,m (see	e Table 9a)									
(86)m	0.99	0.98	0.97	0.94	0.87	0.76	0.59	0.62	0.85	0.95	0.98	0.99	(86)
Mean internal ten	np of living	area T1 (ste	eps 3 to 7 ir	n Table 9c)									
(87)m	18.52	18.74	19.18	19.68	20.27	20.68	20.90	20.89	20.52	19.83	19.03	18.59	(87)
Temperature duri	ng heating	periods in t	he living ar	ea from Ta	ble 9, Th2('	°C)							
(88)m	19.00	19.02	19.02	19.05	19.07	19.07	19.08	19.08	19.06	19.05	19.03	19.02	(88)
Utilisation factor f	or gains for	r rest of dw	elling η2,m	(see Table	9a)								
(89)m	0.99	0.98	0.96	0.91	0.81	0.61	0.35	0.37	0.73	0.93	0.98	0.99	(89)
Mean internal ten	nperature i	n the rest o	f dwelling 1	F2 (follow s	teps 3 to 7	in Table 9c	:)	•	•	•	•		
(90)m	16.90	17.13	17.56	18.07	. 18.62	18.95	19.07	19.07	18.84	18.23	17.43	16.98	(90)
Living area fractio	n							fLA	27.00	÷ (4) =	=	0.51	(91)
Mean internal ten		or the whol	e dwelling	$f \Delta \times T1 + ($	1 - fl Δ) x T2	,							1. ,
(92)m	17.73	17.95	18.38	18.89	19.46	19.83	20.00	19.99	19.70	19.05	18.25	17.80	(92)
Apply adjustment		1] (/
(93)m	17.73	17.95	18.38	18.89	19.46	19.83	20.00	19.99	19.70	19.05	18.25	17.80	(93)
(00)	27.170	11.00	10.00	10.05	10110	10100		10.00	20070	10.00	10.20	17.00] (30)
8. Space heating	requireme	nt											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Set Ti to the mean	internal te	emperature	obtained a	t step 11 o	f Table 9b,	so that tim	ı = (93)m ar	id recalcula	te the util	isation facto	or for gains	using Table	9a)
Utilisation factor f	or gains, ηr	n											
(94)m	0.98	0.97	0.95	0.91	0.82	0.68	0.48	0.50	0.78	0.93	0.97	0.98	(94)
Useful gains, ηmG	m, W = (94)m x (84)m											
(95)m	471.03	536.27	600.73	666.67	653.01	540.21	366.81	361.25	493.11	503.93	463.74	449.97	(95)
Monthly average	external ter	nperature f	from Table	8									
(96)m	4.50	5.00	6.80	8.70	11.70	14.60	16.90	16.90	14.30	10.80	7.00	4.90	(96)
Heat loss rate for	mean inter	nal tempera	ature, Lm, V	w	•	•		•	•	•	•		
(97)m	1786.73	1729.81	1547.71	1334.23	1003.36	672.83	396.61	395.55	700.20	1079.48	1487.16	1723.94	(97)
Space heating req		1	nth, kWh/n	1	1	1	1	•	•		•	•	
(98)m	978.88	802.06	704.55	480.64	260.66	0.00	0.00	0.00	0.00	428.21	736.86	947.84]
						•		1		98)15, 10	· · · · · ·	339.70	(98)
Space heating req	uiromont in	$k h/h /m^2 /.$	loar					((((()))))	,,			100.75	(99)
space nearing req	anementil	- KVVII/111 / Y	cai							(90)	· (+)	100.75] (22)

9a. Energy Requi	irements - I	Individual h	neating sys	tems includ	ling micro-	СНР							
Space heating:													
Fraction of space	heating from	m secondar	y/supplem	entary syste	em (Table :	11)			0.10	(201)			
Fraction of space	heating fro	m main syst	tem(s) 1 -	(201)					0.90	(202)			
Fraction of main h	neating from	n main syste	em 2						0.00	(203)			
Fraction of total s	-			02) x [1 - (2	03)]				0.90	(204)			
Fraction of total s					/]				0.00	(205)			
Efficiency of main				.02) x (200)					78.90	(206)			
(from database or	•	0,	· · /	propriato bi	, the amou	nt chown in	the lenge				able 1c)		
Efficiency of secor		-							100.00	(208)	uble 4cj		
Linclency of secon	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating req				•	•	Juli	501	Aug	Jeb	000	NOV	Dec	
(98)m	978.88	802.06	704.55	480.64	260.66	0.00	0.00	0.00	0.00	428.21	736.86	947.84]
Space heating fue	L	1		1		11				1			1
(211)m	1116.59	914.90	803.67	548.26	297.34	0.00	0.00	0.00	0.00	488.45	840.52	1081.18]
X Y										1)15, 101		6090.91	(211)
Space heating fue	l (secondar	v kWh/mc	onth = (98)	m v (201) v 1	100 ± (208)		otal per y		year) <u>Z</u> (23	.1,1	-	0000.01] (===)
(215)m	97.89	80.21	70.46	48.06	26.07	0.00	0.00	0.00	0.00	42.82	73.69	94.78]
(====)	57105	00.22	70110		20107					.5)15, 101		533.97	(215)
Water heating:						,	otur per y	cui (kvvii)	yeur) - 2(23	.5715, 101	<u> </u>	555.57] (213)
-	wheatar k	N/b/month	(coloulato)	d abaya)									
Output from wate (64)m	227.91	202.09	215.08	196.75	195.67	178.95	175.77	187.48	185.47	203.83	210.57	223.76	1
(0-)	227.51	202.05	215.00	150.75	155.07	170.55	175.77	107.40	105.47	<u>Σ(64)11</u>		2403.32	
										2(04)11	2 -	2405.52	J (64)
Efficiency of wate (217)m	r neater pe 76.59	76.45	76.07	75.44	73.96	68.80	68.80	68.80	68.80	75.09	76.20	76.56	1
· ·					73.90	08.80	08.80	08.80	08.80	73.09	70.20	70.50]
Fuel for water hea (219)m	297.57	264.36	4)m x 100 · 282.74	260.82	264.56	260.10	255.48	272.51	269.57	271.46	276.32	292.25	1
(213)	257.57	204.50	202.74	200.02	204.50	200.10						3267.72	(219)
							1012	агрегуеат	(KVVII) year	= ∑(219)11	2 -	3207.72] (215)
Annual Tatala Sur										kWh/yea	r b	Wh/year	
Annual Totals Sur	•									KVVII/ yea			
Space heating fue												6090.91	(211)
Space heating fue	-	ondary										533.97	(215)
Water heating fue												3267.72	(219)
Electricity for pun	-												
mechanical ver			d, extract o	or positive i	nput from	outside				0.00			(230a)
warm air heati		fans								0.00			(230b)
central heating										130.00			(230c)
oil boiler pump boiler flue fan)									0.00			(230d)
maintaining el	ectric keen.	bot facility	for gas cor	nhi hoiler						0.00			(230e) (230f)
pump for solar				nor bolier						0.00			(230g)
Total electricity fo		-								Σ(230a)(23	0g)	175.00	(231)
···· · · · · · · · · · · · · · · · · ·										2(, (] (-)
Electricity for ligh	ting (calcul	ated in App	oendix L):									415.44	(232)
12a. Carbon diox	kide <u>emissi</u> a	ons <u>- Indivi</u> a	dual heatin	ng sy <u>stems i</u>	ncluding m	nicro-CHP							
				<u> </u>	-	Energy			Emissions		F	missions	
						Vh/year		-	Factor			CO2/year)	
Space heating - m	ain system	1			6	090.91	х		0.194] =		1181.64	(261)
Space heating - se	-					533.97	х		0.422			225.34	(263)
. 0.00	,							L			L		1 · · · /

Water heating	3267.72	х	0.194	=	633.94	(264)
Space and water heating			(261) + (262)	+ (263) + (264) =	2040.91	(265)
Pumps, fans and electric keep-hot	175.00	х	0.422	=	73.85	(267)
Lighting	415.44	x	0.422	=	175.32	(268)
Total carbon dioxide emissions				∑(261)(271) =	2290.08	(272)
Emissions per m ² for space and water heating					39.90	(272a)
Emissions per m ² for lighting					3.31	(272b)
Target Carbon Dioxide Emissions Rate (TER)		[(39.90>	× FF × EFA) + (3.3	31 × EFA)] × (0.6)	26.87	(273)

DER 2009 Worksheet Design - Draft



This design submission has been carried out using Approved SAP software. It has been prepared from plans and specifications and may not reflect the property as constructed.

Assessor name	Mrs Farah Naz	Assessor number	1
Client		Last modified	21/02/2014
Address	5.3 Site 5 5.3 Kiln Place, Camden, Camden, Gospel Oak London, UK, NV	V5	

1. Overall dwelling di	nensions												
					Area	(m²)			erage storey eight (m)	,		Volume (m³)	
Lowest occupied					53.0	00 (1	a) x		3.00	(2a) =		159.00	(3a)
Total floor area		(1a) +	· (1b) + (1c	c) + (1d)(1n) = 53.0	00 (4							
Dwelling volume								(3a	ı) + (3b) + (3	c) + (3d)(3	3n) = 🗌	159.00	(5)
2. Ventilation rate													
												m ³ per hour	
Number of chimneys									0	x 40 =	: F	0	(6a)
Number of open flues									0	x 10		0] (60)
Number of intermitten	fans								0	x 10 =		0	(00) (7a)
Number of passive ven									0	x 10 =		0	(70) (7b)
Number of flueless gas									0] x 40 =		0] (7c)
Number of fideless gas	in es								Ū			ir changes pe	
												hour	
Infiltration due to chim	neys, flues,	, fans, P	SVs		(6a) + (6	b) + (7a) +	(7b) + (7	/c) =	0	÷ (5) =	= [0.00	(8)
If a pressurisation test	nas been ca	arried o	ut or is inte	ended, pro	ceed to (17), ot	herwise co	ntinue f	rom (9) to	o (16)	_			
Air permeability value,	q50, expre	ssed in	cubic met	res per hou	ur per square m	netre of env	velope a	rea			Γ	2.00	(17)
If based on air permea	ility value,	then (1	.8) = [(17)	÷ 20] + (8),	, otherwise (18) = (16)					Γ	0.10	(18)
Air permeability value	pplies if a	pressuri	isation tes	t has been	done, or a desi	ign or speci	fied air	permeabi	lity is being	used			
Number of sides on wh	ich dwellin	g is she	Itered								Г	1	(19)
Shelter factor									1	- [0.075 x (1	9)] = [0.92	(20)
Adjusted infiltration ra	e									(18) x (2	20) = [0.09	(21)
Infiltration rate modifie	d for mont	thly win	d speed:										
L	an F	eb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	No	/ Dec	
Monthly average wind	speed from	n Table I	7										
(22)m 5	40 5	.10	5.10	4.50	4.10	3.90	3.70	3.70	4.20	4.50	4.80	5.10	
										∑(22)1	.12 = 🗌	54.10	(22)
Wind Factor (22a)m = (22)m ÷ 4									_			_
(22a)m 1	35 1	.27	1.27	1.12	1.02	0.98	0.92	0.92	1.05	1.12	1.20	0 1.27	
										∑(22a)1	.12 =	13.52	(22a
Adjusted infiltration ra		g for she		vind speed) = (21) × (22a)				-				_
(22b)m 0	12 0	.12	0.12	0.10	0.09	0.09	0.09	0.09	0.10	0.10	0.12	1 0.12	
										∑(22b)1	.12 =	1.25	(22
Calculate effective air o	hange rate	for the	applicable	e case:							_		_
If mechanical ventil	ation: air ch	nange ra	ate throug	h system								0.50	(23a
If exhaust air heat p	ump using	Append	lix N, (23b) = (23a) ×	Fmv (equation	(N5)) <i>,</i> othe	erwise (2	23b) = (23	a)			0.50	(23k

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 77.35 (23c)a) If balanced mechanical ventilation with heat recovery (MVHR) $(22b)m + (23b)x [1 - (23c) \div 100] =$ (24a)m 0.24 0.23 0.23 0.22 0.21 0.20 0.20 0.20 0.21 0.22 0.22 0.23 (24a)Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25) 0.24 0.23 0.23 0.20 0.21 0.22 0.22 0.23 (25)m 0.22 0.21 0.20 0.20 (25)3. Heat losses and heat loss parameter The κ -value is the heat capacity per unit area, see Table 1e. Element Gross Openings, U-value, A x U, к-value, Net area Ахк. Area, m² m² A, m² W/m²K W/K kJ/m².K kJ/K Window* 13.72 0.96 13.19 (27) = N/A N/A х Ground floor 53.00 0.10 5.30 N/A N/A (28a)х = External wall 77.00 0.15 = 11.55 N/A N/A (29a) х N/A Roof 53.00 х 0.10 5.30 N/A (30)196.72 Total area of external elements ∑A, m² (31)* for windows and roof windows, effective window U-value is calculated using formula 1/[(1/UValue)+0.04] paragraph 3.2 Fabric heat loss, $W/K = \Sigma(A \times U)$ (26)...(30) + (32) =35.34 (33)Heat capacity $Cm = \sum (A \times \kappa)$ (28)...(30) + (32) + (32a)...(32e) = N/A (34)Thermal mass parameter (TMP) in kJ/m²K Calculated separately = 450.00 (35)Thermal bridges: $\Sigma(L \times \Psi)$ calculated using Appendix K 19.67 (36)if details of thermal bridging are not known then $(36) = 0.15 \times (31)$ Total fabric heat loss (33) + (36) =55.01 (37)Ventilation heat loss calculated monthly 0.33 x (25)m x (5) 10.67 10.43 10.43 12.13 (38)m 12.49 12.13 12.13 11.40 10.92 11.04 11.40 11.77 (38) Heat transfer coefficient, W/K (37)m + (38)m (39)m 67.51 67.14 67.14 66.42 65.93 65.69 65.45 65.45 66.05 66.42 66.78 67.14 66.43 Average = $\sum (39)1...12/12 =$ (39) Heat loss parameter (HLP), W/m²K (39)m ÷ (4) (40)m 1.27 1.27 1.27 1.25 1.24 1.24 1.23 1.23 1.25 1.25 1.26 1.27 Average = $\sum (40)1...12/12 =$ 1.25 (40)4. Water heating energy requirement kWh/year 1.78 Assumed occupancy, N (42) If TFA > 13.9, N = 1 + 1.76 x $[1 - exp(-0.000349 x (TFA - 13.9)^2)] + 0.0013 x (TFA - 13.9)$ If TFA ≤ 13.9, N = 1 Annual average hot water usage in litres per day Vd, average = (25 x N) + 36 76.44 (43) Annual average hot water usage has been reduced by 5% if the dwelling is designed to achieve a water use target of not more than 125 litres per person per day (all water use, hot and cold) Jan Feb Jul Oct Nov Dec Mar Apr May Jun Aug Sep Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43)(44)m 84.08 81.03 77.97 74.91 68.80 71.85 74.91 77.97 81.03 84.08 71.85 68.80 ∑(44)1...12 = 917.29 (44)Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x Tm/3600 kWh/month (see Tables 1b, 1c 1d) (45)m 124.99 109.32 112.81 98.35 94.37 81.43 75.46 86.59 87.63 102.12 111.47 121.05 ∑(45)1...12 = 1205.59 (45)

If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)

For community heating include distribution loss whether or not hot water tank is present

Distribution loss 0.15 x (45)m

(40)	(46)m	18.75	16.40	16.92	14.75	14.16	12.21	11.32	12.99	13.14	15.32	16.72	18.16	(46)
------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	------

Water storage loss: b) If manufacturer's declared cylinder loss factor is not known: Cylinder volume (litres) including any solar storage within same cylinder 250.00 (50) If community heating and no tank in dwelling, enter 110 litres in box (50) Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in box (50) 0.01 Hot water storage loss factor from Table 2 (kWh/litre/day) (51) If community heating see SAP 2009 section 4.3 Volume factor from Table 2a 0.78 (52) Temperature factor from Table 2b 0.54 (53) 0.91 Energy lost from water storage, kWh/day (50) x (51) x (52) x (53) (54)Enter (49) or (54) in (55) 0.91 (55) Water storage loss calculated for each month = (55) x (41)m 28.09 25.37 28.09 27.18 28.09 27.18 28.09 28.09 27.18 28.09 27.18 28.09 (56) (56)m If cylinder contains dedicated solar storage, = (56)m x [(50) - (H11)] ÷ (50), else = (56)m where (H11) is from Appendix H 27.18 28.09 (57)m 28.09 25.37 28.09 27.18 28.09 27.18 28.09 28.09 27.18 28.09 (57)360.00 Primary circuit loss (annual) from Table 3 (58) Primary circuit loss for each month (58) ÷ 365 × (41)m (modified by factor from Table H5 if there is solar water heating and a cylinder thermostat) 30.58 27.62 30.58 29.59 30.58 29.59 30.58 30.58 29.59 30.58 29.59 30.58 (59)(59)m Combi loss for each month from Table 3a, 3b or 3c (enter '0' if not a combi boiler) 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 (61) 0.00 0.00 0.00 (61)m Total heat required for water heating calculated for each month $0.85 \times (45)m + (46)m + (57)m + (59)m + (61)m$ 183.66 162.31 171.47 155.12 153.03 138.20 134.12 144.39 160.78 168.24 179.71 (62)m 145.25 (62) Solar DHW input calculated using Appendix H (negative quantity) ('0' entered if no solar contribution to water heating) 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 (63)m 0.00 0.00 0.00 ∑(63)1...12 = 0.00 (63) Output from water heater for each month, kWh/month (62)m + (63)m 168.24 (64)m 183.66 162.31 171.47 155.12 153.03 138.20 134.12 145.25 144.39 160.78 179.71 ∑(64)1...12 = 1896.28 (64)if (64)m < 0 then set to 0 Heat gains from water heating, kWh/month 0.25 × [0.85 × (45)m + (61)m] + 0.8 × [(46)m + (57)m + (59)m] 66.02 58.44 61.97 56.37 55.84 50.75 58.41 60.74 64.71 (65)m 49.55 53.25 52.81 (65)include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating 5. Internal gains (see Table 5 and 5a) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Metabolic gains (Table 5), Watts 88.93 88.93 88.93 88.93 88.93 88.93 88.93 88.93 88.93 88.93 88.93 88.93 (66)m (66)Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5 12.27 7.56 (67)m 13.82 9.98 5.65 4.77 5.15 6.70 8.99 11.42 13.32 14.20 (67) Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 155.02 156.63 152.57 143.94 133.05 122.81 115.97 114.36 118.42 127.05 137.94 148.18 (68)(68)m Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 31.89 31.89 (69)m 31.89 31.89 31.89 31.89 31.89 31.89 31.89 31.89 31.89 31.89 (69)

0.00

-71.14

70.48

0.00

-71.14

66.60

0.00

-71.14

71.57

0.00

-71.14

73.34

0.00

-71.14

78.51

0.00

-71.14

84.35

0.00

-71.14

86.97

(70)

(71)

(72)

Pumps and fans gains (Table 5a)

Water heating gains (Table 5)

0.00

-71.14

88.74

Losses e.g. evaporation (negative values) (Table 5)

0.00

-71.14

86.97

0.00

-71.14

83.29

0.00

-71.14

78.30

0.00

-71.14

75.05

(70)m

(71)m

(72)m

otal internal gaiı (73)m	307.25	305.55	295.53	279.47	263.43	247.74	237.40	242.32	250.43	266.66	285.30	299.04 (
(, , , , , , , , , , , , , , , , , , ,	007.20		200.00		200110		207710		200110		200100	(
. Solar gains												
olar gains are ca	lculated usi	ing solar flu	x from Tab	le 6a and a	ssociated e	quations to	convert to	the applica	ible orient	ation.		
ows (74) to (82)	are used 12	times, one	for each n	nonth, repe	ating as ne	eded if ther	e is more t	han one wir	ndow type			
etails for month	of January	and annual	totals are	shown belo	w:							
	Ļ	Access facto Table 6d	or	Area m ²	So	lar flux W/	-	Specific dat or Table 6b		F Specific da or Table 60		Gains (W)
ast		0.77	x	11.16	x	19.87	x 0.9 x	0.60	x	0.80	=	73.77 (
outh		0.77] x	2.56] x	47.32	x 0.9 x	0.60	x	0.80] =	40.30 (
olar gains in wat	ts, calculate	ed for each	month ∑(7	4)m(82)m	1							
(83)m	114.07	208.72	308.80	428.85	505.31	523.55	509.39	452.39	358.38	246.77	139.46	95.68 (8
otal gains - inter	nal and sola	ar (73)m + (83)m									
(84)m	421.32	514.26	604.33	708.32	768.74	771.29	746.79	694.71	608.81	513.42	424.76	394.71 (8
									_			
7. Mean interna	l temperatu	ure (heating	g season)									
emperature dur	ing heating	periods in t	he living ar	ea from Ta	ble 9, Th1(°C)						21.00 (8
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tilisation factor	for gains for	r living area	, η1,m (see	e Table 9a)						_		
(86)m	1.00	1.00	0.99	0.94	0.76	0.54	0.36	0.39	0.71	0.97	1.00	1.00 (8
lean internal ter	mp of living	area T1 (ste	eps 3 to 7 i	n Table 9c)								
(87)m	20.26	20.40	20.62	20.84	20.97	21.00	21.00	21.00	20.99	20.81	20.45	20.26 (8
emperature dur	ing heating	periods in t	he living ar	ea from Ta	ble 9, Th2(°C)						
(88)m	19.86	19.87	19.87	19.88	19.89	19.89	19.89	19.89	19.89	19.88	19.87	19.87 (8
tilisation factor	for gains for	r rest of dw	elling η2,m	ı (see Table	9a)							
(89)m	1.00	1.00	0.98	0.90	0.69	0.45	0.26	0.28	0.60	0.94	1.00	1.00 (8
lean internal ter	mperature i	n the rest o	f dwelling ⁻	T2 (follow s	teps 3 to 7	in Table 9c						
(90)m	18.90	19.11	19.42	19.72	19.87	19.89	19.89	19.89	19.88	19.69	19.19	18.91 (9
iving area fractio	on							fLA	27.00	÷ (4) :	=	0.51 (9
/lean internal ter	nperature f	or the whol	le dwelling	fLA x T1 +(:	1 - fLA) x T2	2				_		
(92)m	19.59	19.77	20.03	20.29	20.43	20.45	20.46	20.46	20.44	20.26	19.83	19.60 (9
pply adjustment	t to the mea	n internal t	emperatur	e from Tab	le 4e, wher	e appropria	ite					
(93)m	19.59	19.77	20.03	20.29	20.43	20.45	20.46	20.46	20.44	20.26	19.83	19.60 (9
										-		
8. Space heating	g requireme	ent										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
et Ti to the mea	n internal te	emperature	obtained a	at step 11 o	f Table 9b,	so that tim	= (93)m ar	nd recalcula	te the utili	isation facto	or for gains	using Table 9a
tilisation factor	for gains, ηι	m				1				-		
(94)m	1.00	1.00	0.98	0.92	0.73	0.50	0.31	0.34	0.66	0.95	1.00	1.00 (9
seful gains, ηmQ	6m, W = (94					1				-		
(95)m	421.01	512.55	593.51	649.96	558.73	383.70	232.82	232.81	399.71	489.16	423.74	394.48 (9
Ionthly average	external ter	mperature	from Table			1				-	1	
(96)m	4.50	5.00	6.80	8.70	11.70	14.60	16.90	16.90	14.30	10.80	7.00	4.90 (9
eat loss rate for	mean inter	nal tempera	ature, Lm, '	W								
(97)m	1018.77	991.40	888.44	769.65	575.70	384.59	232.84	232.84	405.89	628.31	857.00	987.07 (9
pace heating rec	quirement fo	or each moi	nth, kWh/r	nonth = 0.0	24 x [(97)n	n - (95)m] x	(41)m					
(98)m	444.73	321.79	219.43	86.18	12.63	0.00	0.00	0.00	0.00	103.52	311.95	440.88
							Total per y	/ear (kWh/y	′ear) = ∑(9	8)15, 10	.12 =	1941.12 (9
bace heating red	quirement in	ነ kWh/m²ለ	/ear							(98)	÷ (4)	36.62 (9
0		,								(7	· /	(

9a. Energy Requirements - Individual heating systems including micro-CHP

Space heating:
Fraction of space heating from secondary/supplementary system (Table 11) 0.00 (201)
Fraction of space heating from main system(s) 1 - (201) 1.00 (202)
Fraction of main heating from main system 2 0.00 (203)
Fraction of total space heat from main system 1 (202) x [1 - (203)] 1.00 (204)
Fraction of total space heat from main system 2 (202) x (203) 0.00 (205)
Efficiency of main space heating system 1 (%) 91.00 (206)
(from database or Table 4a/4b, adjusted where appropriate by the amount shown in the 'space efficiency adjustment' column of Table 4c)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
Space heating requirement, kWh/month (as calculated above)
(98)m 444.73 321.79 219.43 86.18 12.63 0.00 0.00 0.00 103.52 311.95 440.88
Space heating fuel (main heating system 1), kWh/month = (98)m x (204) x 100 ÷ (206)
(211)m 488.72 353.62 241.13 94.70 13.88 0.00 0.00 0.00 113.76 342.81 484.49
Total per year (kWh/year) = $\Sigma(211)15$, 1012 = 2133.10 (211)
Water heating:
Output from water heater, kWh/month (calculated above)
(64)m 183.66 162.31 171.47 155.12 153.03 138.20 134.12 145.25 144.39 160.78 168.24 179.71
$\Sigma(64)112 = 1896.28$ (64)
Efficiency of water heater per month
(217)m 87.59 87.11 85.97 83.82 81.03 80.30 80.30 80.30 80.30 84.18 86.94 87.62
Fuel for water heating, kWh/month = (64) m x 100 ÷ (217)m
(219)m 209.68 186.33 199.44 185.06 188.86 172.11 167.03 180.89 179.82 191.00 193.51 205.11
Total per year (kWh/year) = $\Sigma(219)112 = 2258.83$ (219)
Annual Totals Summary: kWh/year kWh/year
Space heating fuel used, main system 1 2133.10 (211)
Water heating fuel used 2258.83 (219)
Electricity for pumps, fans and electric keep-hot (Table 4f): mechanical ventilation fans - balanced, extract or positive input from outside 123.66 (230a)
mechanical ventilation fans - balanced, extract or positive input from outside123.66(230a)warm air heating system fans0.00(230b)
central heating pump 130.00 (230c)
oil boiler pump 0.00 (230d)
boiler flue fan 0.00 (230e)
maintaining electric keep-hot facility for gas combi boiler 0.00 (230f)
pump for solar water heating 0.00 (230g)
Total electricity for the above $\Sigma(230a)(230g)$ 253.66(231)
Electricity for lighting (calculated in Appendix L): 244.06 (232)
Energy saving/generation technologies (Appendices M, N and Q):
Electricity generated by PVs (Appendix M) (negative quantity) -223.18 (233)
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP
EnergyEmissionsEmissionskWh/yearFactor(kgCO2/year)
Space heating - main system 1 2133.10 x 0.198 = 422.35 (261) Material heating 2250.02 x 0.402 147.25 (264)
Water heating 2258.83 x 0.198 = 447.25 (264)
Space and water heating $(261) + (262) + (263) + (264) = 869.60$ (265)
Pumps, fans and electric keep-hot 253.66 x 0.517 = 131.14 (267)
Lighting 244.06 x 0.517 = 126.18 (268)

PV emission savings (negative quantity)	-223.18	x	0.529	=	-118.06	(269)
Total carbon dioxide emissions				∑(261)(271) =	1008.86	(272)
Dwelling Carbon Dioxide Emissions Rate (DER)					19.04	(273)

TER 2009 Worksheet Design - Draft



This design submission has been carried out using Approved SAP software. It has been prepared from plans and specifications and may not reflect the property as constructed.

Assessor name	Mrs Farah Naz	Assessor number	1
Client		Last modified	24/09/2014
Address	Unit 6 Unit 6 on Site 6 6 Kiln Place, Camden, Camden, Gospel Oak Lond	lon, UK, NW5	

1. Overall dwe	Iling dimension	าร											
					Area	a (m²)			erage storey neight (m)		v	olume (m³)	1
Lowest occupie	d				60	.00	(1a) x		2.66] (2a) =		159.60	(3a)
Total floor area		(1a)	+ (1b) + (1	c) + (1d)(1n) = 60	.00	(4)						
Dwelling volum	e							(33	a) + (3b) + (3	c) + (3d)(3	n) = 🗌	159.60	(5)
2. Ventilation	rate												
											r	n³ per hour	
Number of chin	nneys								0] x 40 =		0	(6a)
Number of ope	n flues								0] x 20 =		0	(6b)
Number of inte	rmittent fans								2] x 10 =		20	(7a)
Number of pass	ive vents								0] x 10 =		0	(7b)
Number of flue	ess gas fires								0] x 40 =		0	(7c)
											Aiı	changes pe hour	er
Infiltration due	to chimneys, flu	ues, fans,	PSVs		(6a) + (6b) + (7a) + (7b) + (1	7c) =	20	÷ (5) =		0.13	(8)
lf a pressurisati	on test has beel	n carried	out or is int	tended, pro	ceed to (17), o	otherwise	continue f	from (9) t	o (16)				
Air permeability	value, q50, ex	pressed in	n cubic met	tres per hou	ur per square	metre of	envelope a	irea				10.00	(17)
If based on air p	ermeability val	ue, then	(18) = [(17)	÷ 20] + (8)	, otherwise (1	8) = (16)						0.63	(18)
Air permeability	value applies i	f a pressu	irisation tes	st has been	done, or a de	sign or sp	ecified air	permeab	ility is being	used			
Number of side	s on which dwe	lling is sh	eltered									2	(19)
Shelter factor									1 -	[0.075 x (1	9)] =	0.85	(20)
Adjusted infiltra	ntion rate									(18) x (2	0) =	0.53	(21)
Infiltration rate	modified for m	onthly wi	ind speed:										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Monthly average	e wind speed fi		e 7							,			_
(22)m	5.40	5.10	5.10	4.50	4.10	3.90	3.70	3.70	4.20	4.50	4.80	5.10	
										∑(22)1	12 =	54.10	(22)
Wind Factor (22													_
(22a)m	1.35	1.27	1.27	1.12	1.02	0.98	0.92	0.92	1.05	1.12	1.20	1.27	
										∑(22a)1	12 =	13.52	(22a)
Adjusted infiltra		-	1				0.40	0.40	0.56	0.60	0.64	0.68	_
(22b)m	0.72	0.68	0.68	0.60	0.54	0.52	0.49	0.49	0.56	0.60	0.64	7.10	 (225)
Calculate offert	ivo air change -	ato for th	o applicabl							∑(22b)1	17 = [7.19	(22b)
Calculate effect	-											NI / A	(22-)
	Il ventilation: ai r heat pump us	_			Emulaquetia	n (NE)) -	thonuico ()))))))))))))))))))				N/A N/A	(23a) (23b)
	i neal pump US	ing addel	101X N. (230	× (באבו) = וב	rinv (equatio	н ниэл. О	merwise C	2301 = (2:	bal		1	NI / A	11230

If balanced wi	th heat reco	overy: effici	ency in % a	llowing for	in-use fact	or (from Ta	ble 4h) =					N/A	(23c)
d) If natural ve	entilation or	whole hou	se positive	input vent	ilation fron	n loft							
if (22b)m ≥	1, then (24	d)m = (22b)	m; otherw	vise (24d)m	= 0.5 + [(22	2b)m2 x 0.5]						_
(24d)m	0.76	0.73	0.73	0.68	0.65	0.63	0.62	0.62	0.66	0.68	0.70	0.73	(24d)
Effective air chan	ge rate - ent	ter (24a) or	(24b) or (2	24c) or (24d) in box (25	5)							
(25)m	0.76	0.73	0.73	0.68	0.65	0.63	0.62	0.62	0.66	0.68	0.70	0.73	(25)
3. Heat losses a	nd heat loss	parameter	r										
The к-value is the				Table 1e.									
E	lement		Gross Area, m ²	-	nings, n²	Net area A, m²		alue, 'm²K	А x U, W/K		alue, m².K	Ахк, kJ/К	
Doors						1.85	x 2	.00 =	3.70		I/A	N/A	(26)
Window*						13.15	x 1.	.85 =	24.35		I/A	N/A	(27)
Ground floor						60.00	x 0.	.25 =	15.00		I/A	N/A	 (28a)
Party Wall						30.75	x 0.	.00 =	0.00		I/A	N/A	(32)
External wall						209.50	x 0	.35 =	73.32		I/A	N/A	(29a)
Roof						60.00		.16 =	9.60		, I/A	N/A	(30)
Total area of exte	rnal elemer	nts ΣA. m²				344.50	(31)		5.00		.,,.	,,,] (88)
* for windows an		_	ve window	U-value is	calculated			Value)+0.0)4] paragraj	oh 3.2			
Fabric heat loss, \	N/K = Σ(A ×	U)							(2	(30) + ((32) =	125.98	(33)
Heat capacity Cm								(28)	.(30) + (32)			N/A	(34)
Thermal mass par	rameter (TN	/IP) in kJ/m²	κ						Calcula	ted separa	tely =	250.00	(35)
Thermal bridges:	Σ(L x Ψ) cal	culated usir	ng Appendi	ix K								37.90	(36)
if details of th					5 x (31)], ,
Total fabric heat		-								(33) + ((36) =	163.87	(37)
Ventilation heat l	oss calculat	ed monthly	0.33 x (2	5)m x (5)									
(38)m	39.89	38.43	38.43	35.75	34.15	33.41	32.70	32.70	34.54	35.75	37.05	38.43	(38)
Heat transfer coe	fficient, W/	K (37)m+	(38)m										
(39)m	203.76	202.30	202.30	199.62	198.02	197.28	196.57	196.57	198.41	199.62	200.92	202.30]
									Average =	∑(39)112	/12 =	199.81	(39)
Heat loss parame	ter (HLP), W	//m²K (39)	m ÷ (4)					1	1	i	i	i	-
(40)m	3.40	3.37	3.37	3.33	3.30	3.29	3.28	3.28	3.31	3.33	3.35	3.37	
									Average =	∑(40)112	/12 =	3.33	(40)
4. Water heating	g energy red	quirement											
											k	Wh/year	
Assumed occupar	ncy, N									1.98	3 (42)	
If TFA > 13.9, I	N = 1 + 1.76	x [1 - exp(-	0.000349 x	(TFA - 13.9	$()^{2})] + 0.001$	13 x (TFA - 1	.3.9)					-	
If TFA ≤ 13.9, I	N = 1												
Annual average h		age in litres	per day V	d,average =	(25 x N) +	36				85.5	4 (43)	
Annual average h		-		-			to achieve	a water u	se target of	not more t	han 125 lit	res	
per person per da	ıy (all water	use, hot an	d cold)		-	-							
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage i	in litres per	day for eac	h month V	d,m = facto	r from Tab	le 1c x (43)							_
(44)m	94.09	90.67	87.25	83.83	80.41	76.99	76.99	80.41	83.83	87.25	90.67	94.09	
										∑(44)1.	12 =	1026.49	(44)
Energy content o		1		-		-							-
(45)m	139.87	122.33	126.24	110.06	105.60	91.13	84.44	96.90	98.06	114.28	124.74	135.46	
										∑(45)1.	12 =	1349.11	(45)
If instantaneous v	water heatir	ng at point o	of use (no l	hot water s	torage), en	ter 0 in box	es (46) to (61)					

For community heating include distribution loss whether or not hot water tank is present

Distribution loss 0	.15 x (45)n	า											
(46)m	20.98	18.35	18.94	16.51	15.84	13.67	12.67	14.53	14.71	17.14	18.71	20.32	(46)
Water storage loss	:												
b) If manufacturer	's declared	cylinder lo	ss factor is	not known	:								
Cylinder volum	e (litres) in	cluding any	solar stora	ige within s	ame cylind	er		1	150.00	(50)			
If community h	eating and	no tank in	dwelling, e	nter 110 lit	res in box (5	50)							
Otherwise if no	stored hot	water (this	s includes ir	nstantaneo	us combi bo	oilers) ente	r '0' in box ((50)					
Hot water stora	age loss fac	tor from Ta	ble 2 (kWh	/litre/day)					0.02	(51)			
If community h	eating see	SAP 2009 s	ection 4.3										
Volume factor	from Table	2a							0.93	(52)			
Temperature fa	actor from	Table 2b							0.54	(53)			
Energy lost from	n water sto	orage, kWl	h/day (50)	x (51) x (52	2) x (53)				1.44	(54)			
Enter (49) or (54) i	n (55)								1.44	(55)			
Water storage loss	calculated	l for each m	nonth = (55) x (41)m						1			
(56)m	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)
If cylinder contains	dedicated	l solar stora	ige, = (56)n	n x [(50) - (H	+11)] ÷ (50)	, else = (56)m where (H11) is fror	n Appendi	хH		•	-
(57)m	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 circuit loss	s (annual) f	rom Table 3	3					E	510.00	(58)			_
Primary circuit loss	s for each r	nonth (58)	÷ 365 × (41)m						-			
(modified by facto	r from Tab	le H5 if thei	re is solar w	vater heatir	ng and a cyl	inder theri	mostat)						
(59)m	51.81	46.79	51.81	50.14	51.81	50.14	51.81	51.81	50.14	51.81	50.14	51.81	(59)
Combi loss for eac	h month fr	om Table 3	a, 3b or 3c	(enter '0' if	not a comb	oi boiler)							
(61)m	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(61)
Total heat require	d for water	heating ca	lculated for	r each mon	th 0.85 × (4	5)m + (46)	m + (57)m ·	+ (59)m + (6	61)m				
(62)m	236.21	209.35	222.57	203.29	201.94	184.36	180.78	193.24	191.29	210.61	217.97	231.80	(62)
Solar DHW input c	alculated u	ising Appen	dix H (nega	tive quanti	ity) ('0' ente	ered if no s	olar contrib	oution to wa	ater heatin	g)			_
(63)m	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
										∑(63)1	.12 =	0.00	(63)
Output from wate	r heater fo	r each mon	th, kWh/m	onth (62)m	n + (63)m								_
(64)m	236.21	209.35	222.57	203.29	201.94	184.36	180.78	193.24	191.29	210.61	217.97	231.80	
										∑(64)1	.12 = 2	483.39	(64)
if (64)m < 0 then s	et to 0												
Heat gains from w	ater heatin	g, kWh/mo	nth 0.25 ×	[0.85 × (45	5)m + (61)m] + 0.8 × [(4	46)m + (57)	m + (59)m]					_
(65)m	123.58	110.29	119.04	111.18	112.18	104.88	105.15	109.29	107.19	115.07	116.06	122.11	(65)
include (57)	m in calcul	ation of (65	i)m only if c	cylinder is ir	n the dwelli	ng or hot w	vater is from	n communi	ty heating				
5. Internal gains	see Table	5 and 5a)			_	·							
5. Internal gains			Mar	A	May	1	11	A	For	Oct	Nev	Dee	
Metabolic gains (T	Jan	Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	99.08	99.08	99.08	99.08	99.08	99.08	99.08	99.08	99.08	99.08	99.08	99.08	(66)
Lighting gains (cal							55.00	33.00	55.00	55.00	55.00	33.00] (00)
(67)m	26.22	23.29	18.94	14.34	10.72	9.05	9.78	12.71	17.06	21.66	25.28	26.95	(67)
Appliances gains (1] (/
(68)m	172.95	174.74	170.22	160.59	148.44	137.02	129.38	127.59	132.11	141.74	153.89	165.32	(68)
Cooking gains (cal										1] (/
(69)m	32.91	32.91	32.91	32.91	32.91	32.91	32.91	32.91	32.91	32.91	32.91	32.91	(69)
Pumps and fans ga		1										•	_ · · /
(70)m	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	(70)
Losses e.g. evapor	ation (nega	ative values) (Table 5)										
0 1													

(= .)	(71)m -79.27 -79.27 -79.27 -79.27 -79.27 -79.27 -79.27 -79.27 -79.27 -79.27 -79.27 -79.27 -79.27 -79.27 (71) Water heating gains (Table 5)													
			-79.27	-/9.2/	-/9.2/	-/9.2/	-79.27	-/9.2/	-79.27	-79.27	-79.27	-79.27] (/1)	
	166.10		160.00	154.41	150.70	145.67	141 22	146.90	140.07	154.66	161 10	164.12	(72)	
(72)m		164.12		154.41	150.78		141.33	146.89	148.87	154.66	161.19	164.13] (72)	
Total internal gain (73)m	427.99	424.88	411.89	392.07	372.66	354.46	343.21	349.92	360.77	380.79	403.09	419.12	(73)	
(73)	427.55	424.00	411.05	332.07	372.00	334.40	545.21	343.32	500.77	500.75	405.05	415.12] (73)	
6. Solar gains														
Solar gains are ca	lculated usi	ing solar flu	x from Tabl	le 6a and a	ssociated e	quations to	convert to	the applica	able oriente	ation.				
Rows (74) to (82)						eded if ther	e is more t	han one wii	ndow type.					
Details for month	of January	and annual	totals are s	shown belo										
	,	Access facto Table 6d	or	Area m ²	So	lar flux W/	-	Specific da or Table 6b		Specific da or Table 6		Gains (W)		
East		0.77	x	13.15	x	19.87	x 0.9 x	0.72	x	0.70] =	91.27	(76)	
Solar gains in wat	s, calculate	ed for each	nonth Σ(74	1)m(82)m	1				1		J], ,	
(83)m	91.27	176.91	282.76	419.84	510.82	533.02	517.36	450.27	338.06	215.45	113.48	75.29	(83)	
Total gains - interr	nal and sola	ar (73)m + (8	83)m		•								-	
(84)m	519.27	601.79	694.65	811.91	883.49	887.48	860.57	800.18	698.82	596.23	516.57	494.41	(84)	
												•	_	
7. Mean internal													1	
Temperature duri			-							_		21.00	(85)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation factor f	-	-			0.00	0.92	0.68	0.71	0.80	0.06	0.00	0.00		
(86)m	0.99	0.98	0.97	0.95	0.90	0.82	0.68	0.71	0.89	0.96	0.99	0.99] (86)	
Mean internal ten (87)m	17.84	area 11 (ste 18.05	2ps 3 to 7 ir 18.55	19.11	19.83	20.40	20.75	20.73	20.20	19.36	18.43	17.92	(87)	
							20.75	20.75	20.20	19.50	10.45	17.92] (07)	
Temperature duri (88)m	18.58	18.59	18.59	18.61	18.63	18.63	18.64	18.64	18.62	18.61	18.60	18.59	(88)	
Utilisation factor f						10.05	10.04	10.04	10.02	10.01	10.00	10.55] (00)	
(89)m	0.99	0.98	0.96	0.93	0.84	0.67	0.37	0.39	0.77	0.94	0.98	0.99	(89)	
Mean internal ten	nperature i	n the rest o	f dwelling T	2 (follow s					-] ()	
(90)m	15.96	16.19	16.68	17.24	17.92	18.40	18.61	18.61	18.27	17.49	16.56	16.05	(90)	
Living area fractio	n	•						fLA	40.00	÷(4) =	=	0.67	(91)	
Mean internal ten		or the whol	e dwelling	fLA x T1 +(:	1 - fLA) x T2								J · ·	
(92)m	17.21	17.43	17.93	18.49	19.19	19.73	20.04	20.02	19.56	18.74	17.80	17.29	(92)	
Apply adjustment	to the mea	an internal t	emperatur	e from Tab	le 4e, wher	e appropria	ite							
(93)m	17.21	17.43	17.93	18.49	19.19	19.73	20.04	20.02	19.56	18.74	17.80	17.29	(93)	
8. Space heating	requireme	ont												
o. space nearing	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Set Ti to the mear								-	-				9a)	
Utilisation factor f			obtained a	t 5tep 11 0			(55)				i toi guilio		50)	
(94)m	0.98	0.97	0.96	0.92	0.86	0.75	0.58	0.61	0.83	0.94	0.97	0.98	(94)	
Useful gains, ηmG	m, W = (94)m x (84)m											-	
(95)m	509.92	586.29	664.60	750.71	759.31	666.91	501.82	487.23	580.24	558.96	503.60	485.95	(95)	
Monthly average	external ter	mperature f	rom Table	8										
(96)m	4.50	5.00	6.80	8.70	11.70	14.60	16.90	16.90	14.30	10.80	7.00	4.90	(96)	
Heat loss rate for	mean inter	nal tempera	ature, Lm, \	N									_	
(97)m	2590.33	2514.82	2251.27	1954.05	1483.20	1012.24	617.15	613.88	1042.99	1584.47	2170.84	2507.38	(97)	
Space heating req					1	n - (95)m] x		1				1	7	
(98)m	1547.83	1295.97	1180.49	866.41	538.58	0.00	0.00	0.00	0.00	762.98	1200.42	1503.94]	
							Total per y	/ear (kWh/y	/ear) = ∑(98			3896.60	(98)	
Space heating req	uirement ir	n kWh/m²/y	vear							(98)	÷ (4)	148.28	(99)	

9a. Energy Requ	irements - I	ndividual h	eating sys	tems includ	ling micro-	СНР							
Space heating:													
Fraction of space	heating from	m secondar	y/supplem	entary system	em (Table :	11)			0.10	(201)			
Fraction of space	heating from	m main syst	:em(s) 1 -	(201)					0.90	(202)			
Fraction of main h	neating fron	n main syste	em 2						0.00	(203)			
Fraction of total s	pace heat fi	rom main sy	ystem 1 (2	02) x [1 - (2	03)]				0.90	(204)			
Fraction of total s	pace heat fi	rom main sv	ystem 2 (2	02) x (203)					0.00	(205)			
Efficiency of main									78.90	(206)			
(from database or	•	• ·		propriate by	, the amou	nt shown i	n the 'space	efficiencv			Table 4c)		
Efficiency of secon							•		100.00	(208)	,		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating req	luirement, k	Wh/month	(as calcula	ated above)									
(98)m	1547.83	1295.97	1180.49	866.41	538.58	0.00	0.00	0.00	0.00	762.98	1200.42	1503.94]
Space heating fue	l (main hea	ting system	1), kWh/n	nonth = (98)m x (204) :	x 100 ÷ (20)6)						
(211)m	1765.58	1478.29	1346.56	988.30	614.34	0.00	0.00	0.00	0.00	870.32	1369.30	1715.52]
							Total per ye	ear (kWh/y	ear) = ∑(2:	11)15, 10	12 = 1	0148.21	(211)
Space heating fue	l (secondar	y), kWh/mc	onth = (98)	m x (201) x	100 ÷ (208))							
(215)m	154.78	129.60	118.05	86.64	53.86	0.00	0.00	0.00	0.00	76.30	120.04	150.39]
							Total per ye	ear (kWh/y	ear) = ∑(2:	15)15, 10	12 =	889.66	(215)
Water heating:													
Output from wate	er heater, k\	Wh/month	(calculate	d above)									
(64)m	236.21	209.35	222.57	203.29	201.94	184.36	180.78	193.24	191.29	210.61	217.97	231.80]
										∑(64)1	12 =	2483.39	(64)
Efficiency of wate	r heater pe	r month											
(217)m	77.26	77.18	76.94	76.58	75.63	68.80	68.80	68.80	68.80	76.27	77.00	77.24]
Fuel for water hea	ating, kWh/	month = (64	4)m x 100 ·	÷ (217)m									
(219)m	305.75	271.26	289.27	265.47	266.99	267.96	262.76	280.87	278.03	276.13	283.07	300.09]
							Tota	l per year (kWh/year) = ∑(219)1	12 =	3347.66	(219)
Annual Totals Sur	mmary:									kWh/ye	ar k	Wh/year	
Space heating fue	el used, mai	in system 1									1	0148.21	(211)
Space heating fue	el used, seco	ondary										889.66	(215)
Water heating fu	el used											3347.66	(219)
Electricity for pur	nps, fans ar	nd electric k	(eep-hot (Table 4f):									
mechanical ve	ntilation far	ns - balance	d, extract	or positive i	nput from	outside				0.00			(230a)
warm air heati	ing system f	ans								0.00			(230b)
central heating	g pump									130.00)		(230c)
oil boiler pum	р									0.00			(230d)
boiler flue fan										45.00			(230e)
maintaining el	ectric keep-	hot facility	for gas cor	nbi boiler						0.00			(230f)
pump for solar	r water heat	ting								0.00			(230g)
Total electricity fo	or the above	5								∑(230a)(2	30g)	175.00	(231)
Electricity for ligh	ting (calcul	ated in App	endix L):									463.12] (232)
12a. Carbon diox	xide emissio	ons - Individ	dual heatir	ıg systems i	ncluding n	nicro-CHP							
						Energy Nh/year			missions Factor			missions CO2/year)	
Space heating - m	ain system	1			10	0148.21	x		0.194	=		1968.75	(261)
Space heating - se	econdary					889.66	x		0.422	=		375.44	(263)

SAP version 9.90

Water heating	3347.66	х	0.194	=	649.45	(264)
Space and water heating			(261) + (262)	+ (263) + (264) =	2993.64	(265)
Pumps, fans and electric keep-hot	175.00	х	0.422	=	73.85	(267)
Lighting	463.12	x	0.422	=	195.43	(268)
Total carbon dioxide emissions				∑(261)(271) =	3262.92	(272)
Emissions per m ² for space and water heating					51.12	(272a)
Emissions per m ² for lighting					3.26	(272b)
Target Carbon Dioxide Emissions Rate (TER)		[(51.12 >	× FF × EFA) + (3.2	26 × EFA)] × (0.6)	33.70	(273)

DER 2009 Worksheet Design - Draft



This design submission has been carried out using Approved SAP software. It has been prepared from plans and specifications and may not reflect the property as constructed.

Assessor name	Mrs Farah Naz	Assessor number	1
Client		Last modified	24/09/2014
Address	Unit 6 Unit 6 on Site 6 6 Kiln Place, Camden, Camden, Gospel Oak Lond	on, UK, NW5	

1. Overall dwo	elling dimensi	ons											
					Area	(m²)			rage storey eight (m)	,		Volume (m³)	
Lowest occupie	ed				60.	00	(1a) x		2.66] (2a) =		159.60	(3a)
Total floor area	1	(1a)) + (1b) + (1	c) + (1d)(1	1n) = 60.	00	(4)						
Dwelling volum	ie							(3a	i) + (3b) + (3	c) + (3d)(3n) = 🗌	159.60	(5)
2. Ventilation	rate												
												m ³ per hour	
Number of chir	nneys								0] x 40 =	= [0	(6a)
Number of ope	n flues								0] x 20 =	=	0	(6b)
Number of inte	ermittent fans								0	x 10 =	-	0	(7a)
Number of pas	sive vents								0] x 10 =	-	0	(7b)
Number of flue	less gas fires								0	x 40 =	-	0	(7c)
											А	ir changes pe hour	er
Infiltration due	to chimneys,	flues, fans,	PSVs		(6a) + (6	ib) + (7a)	+ (7b) + (7c) =	0	÷ (5)	-	0.00	(8)
If a pressurisati	ion test has be	en carried	out or is int	ended, pro	ceed to (17), o	therwise	continue	from (9) to	o (16)				
Air permeabilit	y value, q50, e	expressed i	n cubic met	res per hou	ur per square n	netre of e	envelope a	area				3.00	(17)
If based on air	permeability v	alue, then	(18) = [(17)	÷ 20] + (8),	, otherwise (18) = (16)						0.15	(18)
Air permeabilit	y value applies	s if a pressu	urisation tes	st has been	done, or a des	ign or sp	ecified air	permeabi	lity is being	used			
Number of side	es on which dv	velling is sh	neltered									2	(19)
Shelter factor									1	· [0.075 x (1	.9)] = [0.85	(20)
Adjusted infiltr	ation rate									(18) x (20) =	0.13	(21)
Infiltration rate	modified for	monthly w	ind speed:										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Monthly average	ge wind speed	from Table	e 7										_
(22)m	5.40	5.10	5.10	4.50	4.10	3.90	3.70	3.70	4.20	4.50	4.80		
										∑(22)1	.12 =	54.10	(22)
Wind Factor (2													_
(22a)m	1.35	1.27	1.27	1.12	1.02	0.98	0.92	0.92	1.05	1.12	1.20		
										∑(22a)1	.12 =	13.52	(22 a
Adjusted infiltr		-	-				0.12	0.12	0.42	0.14	0.45	0.16	_
(22b)m	0.17	0.16	0.16	0.14	0.13	0.12	0.12	0.12	0.13	0.14	0.15		 (22)-
										∑(22b)1	.12 =	1.72	(22b
Calculate effect	-										Г	0.50	
	al ventilation: ir heat pump ι	_	-	-	_ /	(0.50	(23a (23b
												0.50	

If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 80.75 (23c)a) If balanced mechanical ventilation with heat recovery (MVHR) $(22b)m + (23b)x [1 - (23c) \div 100] =$ (24a)m 0.27 0.26 0.26 0.24 0.23 0.22 0.21 0.21 0.23 0.24 0.25 0.26 (24a)Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25) 0.26 0.21 0.25 0.26 (25)m 0.27 0.26 0.24 0.23 0.22 0.21 0.23 0.24 (25)3. Heat losses and heat loss parameter The κ -value is the heat capacity per unit area, see Table 1e. Element Openings, U-value, A x U, к-value, Gross Net area Ахк. Area, m² m² A, m² W/m²K W/K kJ/m².K kJ/K 21.54 0.96 (27) Window* 22.40 = N/A N/A х Doors 2.20 1.00 2.20 N/A N/A (26)х = Ground floor 60.00 0.10 = 6.00 N/A N/A (28a) х External wall 199.90 0.15 29.98 N/A N/A (29a) х = Party Wall 30.75 0.00 0.00 N/A N/A (32)х = Roof 60.00 х 0.10 = 6.00 N/A N/A (30)Total area of external elements ∑A, m² 344.50 (31) * for windows and roof windows, effective window U-value is calculated using formula 1/[(1/UValue)+0.04] paragraph 3.2 (26)...(30) + (32) = Fabric heat loss, $W/K = \Sigma(A \times U)$ 65.73 (33)Heat capacity $Cm = \Sigma(A \times \kappa)$ (28)...(30) + (32) + (32a)...(32e) =N/A (34)Thermal mass parameter (TMP) in kJ/m²K Calculated separately = 285.00 (35)Thermal bridges: $\Sigma(L \times \Psi)$ calculated using Appendix K 34.45 (36)if details of thermal bridging are not known then $(36) = 0.15 \times (31)$ Total fabric heat loss (33) + (36) =100.18 (37)Ventilation heat loss calculated monthly 0.33 x (25)m x (5) (38)m 14.13 13.63 13.63 12.62 11.95 11.62 11.28 11.28 12.12 12.62 13.13 13.63 (38)Heat transfer coefficient, W/K (37)m + (38)m (39)m 114.31 113.81 113.81 112.80 112.13 111.79 111.46 111.46 112.30 112.80 113.30 113.81 Average = $\sum(39)1...12/12 =$ 112.81 (39) Heat loss parameter (HLP), W/m²K (39)m ÷ (4) (40)m 1.91 1.90 1.90 1.88 1.87 1.86 1.86 1.86 1.87 1.88 1.89 1.90 Average = $\sum (40)1...12/12 =$ 1.88 (40)4. Water heating energy requirement kWh/year Assumed occupancy, N 1.98 (42)If TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA - 13.9)²)] + 0.0013 x (TFA - 13.9) If TFA ≤ 13.9. N = 1 Annual average hot water usage in litres per day Vd, average = (25 x N) + 36 81.26 (43)Annual average hot water usage has been reduced by 5% if the dwelling is designed to achieve a water use target of not more than 125 litres per person per day (all water use, hot and cold) Jan Feb Mar Apr Mav Jun Jul Aug Oct Nov Dec Sep Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43) 89.39 86.14 82.89 79.64 76.39 76.39 79.64 82.89 86.14 89.39 (44)m 73.14 73.14 ∑(44)1...12 = 975.17 (44)Energy content of hot water used - calculated monthly = 4.190 x Vd,m x nm x Tm/3600 kWh/month (see Tables 1b, 1c 1d) (45)m 132.88 116.22 119.93 104.55 100.32 86.57 80.22 92.05 93.15 108.56 118.50 128.69 ∑(45)1...12 = (45) 1281.66 If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61) For community heating include distribution loss whether or not hot water tank is present

Distribution loss	0.15 x (45)n	n											_
(46)m	19.93	17.43	17.99	15.68	15.05	12.99	12.03	13.81	13.97	16.28	17.78	19.30	(46)
Water storage los	s:												
Cylinder volum	ne (litres) in	cluding any	solar stora	ige within s	ame cylind	er			0	(50)			
Energy lost fro	om water sto	orage, kWl	h/day (50)	x (51) x (5	2) x (53)				0.00	(54)			
Enter (49) or (54)	in (55)								0.00	(55)			
Water storage los		l for each m	onth = (55)) x (41)m], ,			
(56)m	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)
					1			1			0.00	0.00] (30)
If cylinder contain		0.00	0.00	0.00	(50)	0.00 0.00	0.00	0.00			0.00	0.00	7 (57)
(57)m		1		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(57)
Primary circuit los	ss (annual) f	rom Table 3	3						0.00	(58)			
Primary circuit los	ss for each r	nonth (58)	÷ 365 × (41)m									
(modified by facto				ater heatiı		inder therr	nostat)					1	-
(59)m	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 for each	ch month fr	om Table 3	a, 3b or 3c	(enter '0' if	not a coml	oi boiler)							_
(61)m	45.55	39.65	42.24	39.27	38.93	36.07	37.27	38.93	39.27	42.24	42.48	45.55	(61)
Total heat require	ed for water	heating ca	lculated for	r each mon	th 0.85 × (4	5)m + (46)	m + (57)m ·	+ (59)m + (6	51)m				
(62)m	178.43	155.87	162.17	143.83	139.25	122.64	117.49	130.98	132.43	150.80	160.98	174.24	(62)
Solar DHW input	calculated u	ising Appen	dix H (nega	tive quant	ity) ('0' ente	ered if no s	olar contrik	oution to w	ater heatin	g)			
(63)m	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1
										<u>Σ</u> (63)1	.12 =	0.00	_ (63)
Output from wate	or hostor fo	r each mon	th kWh/m	onth (62)n	1 + (63)m					2()] (,
(64)m	178.43	155.87	162.17	143.83	139.25	122.64	117.49	130.98	132.43	150.80	160.98	174.24	1
(0-)	170.45	155.07	102.17	143.05	155.25	122.04	117.45	150.50	152.45		·		
16 (C A)										∑(64)1	.12 = 1	769.10] (64)
if (64)m < 0 then s	set to 0									<u>≥(</u> 64)1	.12 =1	769.10] (64)
Heat gains from w		ng, kWh/mo	nth 0.25 ×	[0.85 × (45	5)m + (61)m	n] + 0.8 × [(4	16)m + (57)	m + (59)m]		2(64)1	.12 =1	769.10] (04)
		ng, kWh/mo 48.55	onth 0.25 × 50.44	[0.85 × (45 44.58	5)m + (61)m 43.09	n] + 0.8 × [(4 37.80	46)m + (57) 35.99	m + (59)m] 40.34	40.79	2(64)1 46.66	50.02	54.18	
Heat gains from w (65)m	vater heatin	48.55	50.44	44.58	43.09	37.80	35.99	40.34	40.79				
Heat gains from w (65)m include (57	vater heatin 55.57 ()m in calcul	48.55 ation of (65	50.44	44.58	43.09	37.80	35.99	40.34	40.79				
Heat gains from w (65)m	vater heatin 55.57 ()m in calcul	48.55 ation of (65	50.44	44.58	43.09	37.80	35.99	40.34	40.79				
Heat gains from w (65)m include (57	vater heatin 55.57 ()m in calcul	48.55 ation of (65	50.44	44.58	43.09	37.80	35.99	40.34	40.79				
Heat gains from w (65)m include (57	vater heatin 55.57 ()m in calcul (see Table Jan	48.55 ation of (65 5 and 5a) Feb	50.44 ;)m only if c	44.58 Sylinder is in	43.09 In the dwelli	37.80 ng or hot w	35.99 vater is fror	40.34 n communi	40.79 ty heating	46.66	50.02	54.18	
Heat gains from w (65)m <i>include (57</i>) 5. Internal gains	vater heatin 55.57 ()m in calcul (see Table Jan	48.55 ation of (65 5 and 5a) Feb	50.44 ;)m only if c	44.58 Sylinder is in	43.09 In the dwelli	37.80 ng or hot w	35.99 vater is fror	40.34 n communi	40.79 ty heating	46.66	50.02	54.18] (64)] (65)] (66)
Heat gains from w (65)m <i>include (57</i>) 5. Internal gains Metabolic gains (vater heatin 55.57 ()m in calcul (see Table Jan Table 5), Wa 99.08	48.55 ation of (65 5 and 5a) Feb atts 99.08	50.44 ;)m only if c Mar 99.08	44.58 sylinder is in Apr 99.08	43.09 In the dwelli May 99.08	37.80 ng or hot w Jun 99.08	35.99 vater is fron Jul	40.34 n communi Aug	40.79 ity heating Sep	46.66 Oct	50.02 Nov	54.18 Dec] (65)
Heat gains from w (65)m <i>include (57</i> 5. Internal gains Metabolic gains (* (66)m	vater heatin 55.57 ()m in calcul (see Table Jan Table 5), Wa 99.08	48.55 ation of (65 5 and 5a) Feb atts 99.08	50.44 ;)m only if c Mar 99.08	44.58 sylinder is in Apr 99.08	43.09 In the dwelli May 99.08	37.80 ng or hot w Jun 99.08	35.99 vater is fron Jul	40.34 n communi Aug	40.79 ity heating Sep	46.66 Oct	50.02 Nov	54.18 Dec] (65)
Heat gains from w (65)m <i>include (57)</i> 5. Internal gains Metabolic gains (7 (66)m Lighting gains (cal	vater heatin 55.57 ()m in calcul (see Table Jan Table 5), Wa 99.08 (culated in A 15.42	48.55 ation of (65 5 and 5a) Feb atts 99.08 Appendix L, 13.69	50.44 5) m only if c Mar 99.08 equation L 11.14	44.58 sylinder is in Apr 99.08 9 or L9a), a 8.43	43.09 In the dwelli May 99.08 Iso see Tab 6.30	37.80 ng or hot w Jun 99.08 le 5 5.32	35.99 vater is fror Jul 99.08	40.34 n communi Aug 99.08	40.79 ity heating Sep 99.08	46.66 Oct 99.08	50.02 Nov 99.08	54.18 Dec 99.08] (65)
Heat gains from w (65)m <i>include (57</i>) 5. Internal gains Metabolic gains (* (66)m Lighting gains (cal (67)m	vater heatin 55.57 ()m in calcul (see Table Jan Table 5), Wa 99.08 (culated in A 15.42	48.55 ation of (65 5 and 5a) Feb atts 99.08 Appendix L, 13.69	50.44 5) m only if c Mar 99.08 equation L 11.14	44.58 sylinder is in Apr 99.08 9 or L9a), a 8.43	43.09 In the dwelli May 99.08 Iso see Tab 6.30	37.80 ng or hot w Jun 99.08 le 5 5.32	35.99 vater is fror Jul 99.08	40.34 n communi Aug 99.08	40.79 ity heating Sep 99.08	46.66 Oct 99.08	50.02 Nov 99.08	54.18 Dec 99.08] (65)] (66)] (67)
Heat gains from w (65)m include (57) 5. Internal gains Metabolic gains (7) (66)m Lighting gains (cal (67)m Appliances gains ((68)m	vater heatin 55.57 ()m in calcul (see Table Jan Table 5), Wa 99.08 (culated in A 15.42 (calculated i 172.95	48.55 ation of (65 5 and 5a) Feb atts 99.08 Appendix L, 13.69 in Appendix 174.74	50.44 5)m only if c Mar 99.08 equation L 11.14 c L, equatio 170.22	44.58 sylinder is in Apr 99.08 9 or L9a), a 8.43 n L13 or L1 160.59	43.09 a the dwelli May 99.08 Iso see Tab 6.30 3a), also se 148.44	37.80 ng or hot w Jun 99.08 le 5 5.32 e Table 5 137.02	35.99 vater is fror Jul 99.08 5.75	40.34 n communi Aug 99.08 7.47	40.79 ity heating Sep 99.08 10.03	46.66 Oct 99.08	50.02 Nov 99.08 14.87	54.18 Dec 99.08 15.85] (65)] (66)] (67)
Heat gains from w (65)m include (57) 5. Internal gains Metabolic gains (1 (66)m Lighting gains (cal (67)m Appliances gains ((68)m Cooking gains (cal	vater heatin 55.57 ()m in calcul (see Table Jan Table 5), Wa 99.08 (culated in A (15.42 (calculated in A (172.95 (culated in A	48.55 ation of (65 5 and 5a) Feb atts 99.08 Appendix L, 13.69 in Appendix 174.74 Appendix L,	50.44 5) m only if c Mar 99.08 equation L 11.14 (L, equation 170.22 equation L	44.58 cylinder is in Apr 99.08 9 or L9a), a 8.43 n L13 or L1 160.59 15 or L15a	43.09 <i>h the dwelli</i> May 99.08 Iso see Tab 6.30 3a), also see 148.44), also see T	37.80 ng or hot w Jun 99.08 le 5 5.32 e Table 5 137.02 able 5	35.99 vater is from Jul 99.08 5.75 129.38	40.34 n communi Aug 99.08 7.47 127.59	40.79 ity heating Sep 99.08 10.03 132.11	46.66 Oct 99.08 12.74 141.74	50.02 Nov 99.08 14.87 153.89	54.18 Dec 99.08 15.85 165.32] (65)] (66)] (67)] (68)
Heat gains from w (65)m include (57) 5. Internal gains Metabolic gains (7) (66)m Lighting gains (cal (67)m Appliances gains ((68)m Cooking gains (cal (69)m	vater heatin 55.57 ()m in calcul (see Table Jan Table 5), Wa 99.08 (culated in A (calculated in 172.95 (culated in A (calculated in A (calculated in A (calculated in A)	48.55 ation of (65 5 and 5a) Feb atts 99.08 Appendix L, 13.69 in Appendix L, 174.74 Appendix L, 32.91	50.44 5)m only if c Mar 99.08 equation L 11.14 c L, equatio 170.22	44.58 sylinder is in Apr 99.08 9 or L9a), a 8.43 n L13 or L1 160.59	43.09 a the dwelli May 99.08 Iso see Tab 6.30 3a), also se 148.44	37.80 ng or hot w Jun 99.08 le 5 5.32 e Table 5 137.02	35.99 vater is fror Jul 99.08 5.75	40.34 n communi Aug 99.08 7.47	40.79 ity heating Sep 99.08 10.03	46.66 Oct 99.08	50.02 Nov 99.08 14.87	54.18 Dec 99.08 15.85] (65)] (66)] (67)] (68)
Heat gains from w (65)m include (57) 5. Internal gains Metabolic gains (1 (66)m Lighting gains (cal (67)m Appliances gains (cal (68)m Cooking gains (cal (69)m Pumps and fans g	vater heatin 55.57 (m in calcul (see Table Jan Table 5), Wa 99.08 (culated in A 15.42 (calculated in 172.95 (culated in A 32.91 ains (Table	48.55 ation of (65 5 and 5a) Feb atts 99.08 Appendix L, 13.69 in Appendix L, 174.74 Appendix L, 32.91 5a)	50.44 5) m only if c Mar 99.08 equation L 11.14 (L, equation 170.22 equation L 32.91	44.58 cylinder is in Apr 99.08 9 or L9a), a 8.43 n L13 or L1 160.59 15 or L15a 32.91	43.09 n the dwelli May 99.08 Iso see Tab 6.30 3a), also see 148.44), also see T 32.91	37.80 ng or hot w Jun 99.08 le 5 5.32 e Table 5 137.02 able 5 32.91	35.99 vater is from Jul 99.08 5.75 129.38 32.91	40.34 n communi Aug 99.08 7.47 127.59 32.91	40.79 ity heating Sep 99.08 10.03 132.11 32.91	46.66 Oct 99.08 12.74 141.74 32.91	50.02 Nov 99.08 14.87 153.89 32.91	54.18 Dec 99.08 15.85 165.32 32.91] (65)] (66)] (67)] (68)] (69)
Heat gains from w (65)m include (57) 5. Internal gains Metabolic gains (7) (66)m Lighting gains (cal (67)m Appliances gains ((68)m Cooking gains (cal (69)m Pumps and fans g (70)m	vater heatin 55.57 ()m in calcul (see Table Jan Table 5), Wa 99.08 (culated in A (15.42 (calculated in 172.95 (culated in A 32.91 ains (Table 10.00	48.55 ation of (65 5 and 5a) Feb atts 99.08 Appendix L, 13.69 in Appendix L, 174.74 Appendix L, 32.91 5a) 10.00	50.44 5) m only if c Mar 99.08 equation L4 11.14 (L, equation 170.22 equation L 32.91 10.00	44.58 cylinder is in Apr 99.08 9 or L9a), a 8.43 n L13 or L1 160.59 15 or L15a	43.09 <i>h the dwelli</i> May 99.08 Iso see Tab 6.30 3a), also see 148.44), also see T	37.80 ng or hot w Jun 99.08 le 5 5.32 e Table 5 137.02 able 5	35.99 vater is from Jul 99.08 5.75 129.38	40.34 n communi Aug 99.08 7.47 127.59	40.79 ity heating Sep 99.08 10.03 132.11	46.66 Oct 99.08 12.74 141.74	50.02 Nov 99.08 14.87 153.89	54.18 Dec 99.08 15.85 165.32] (65)
Heat gains from w (65)m include (57) 5. Internal gains Metabolic gains (7) (66)m Lighting gains (cal (67)m Appliances gains (cal (68)m Cooking gains (cal (69)m Pumps and fans g (70)m Losses e.g. evapor	vater heatin 55.57 (m in calcul (see Table Jan Table 5), Wa 99.08 (culated in A 15.42 (calculated in 172.95 (calculated in A 32.91 ains (Table 10.00 ration (nega	48.55 ation of (65 5 and 5a) Feb atts 99.08 Appendix L, 13.69 in Appendix L, 174.74 Appendix L, 32.91 5a) 10.00 ative values	50.44 5) m only if c Mar 99.08 equation L 11.14 (L, equation 170.22 equation L 32.91 10.00) (Table 5)	44.58 sylinder is in Apr 99.08 9 or L9a), a 8.43 n L13 or L1 160.59 15 or L15a 32.91 10.00	43.09 a the dwelli May 99.08 Iso see Tab 6.30 3a), also see 148.44), also see T 32.91 10.00	37.80 ng or hot w Jun 99.08 le 5 5.32 e Table 5 137.02 able 5 32.91 10.00	35.99 vater is from Jul 99.08 5.75 129.38 32.91 10.00	40.34 n communi Aug 99.08 7.47 127.59 32.91 10.00	40.79 ty heating Sep 99.08 10.03 132.11 32.91 10.00	46.66 Oct 99.08 12.74 141.74 32.91 10.00	50.02 Nov 99.08 14.87 153.89 32.91 10.00	54.18 Dec 99.08 15.85 165.32 32.91 10.00] (65)] (66)] (67)] (68)] (69)] (70)
Heat gains from w (65)m include (57) 5. Internal gains Metabolic gains (7) (66)m Lighting gains (cal (67)m Appliances gains (cal (67)m Cooking gains (cal (69)m Pumps and fans g (70)m Losses e.g. evapor (71)m	vater heatin 55.57 (m in calcul Jan Table 5), Wa 99.08 (culated in A 15.42 (calculated in A 172.95 (calculated in A 32.91 ains (Table 10.00 ration (nega -79.27	48.55 ation of (65 5 and 5a) Feb atts 99.08 Appendix L, 13.69 in Appendix L, 174.74 Appendix L, 32.91 5a) 10.00 ative values -79.27	50.44 5) m only if c Mar 99.08 equation L4 11.14 (L, equation 170.22 equation L 32.91 10.00	44.58 cylinder is in Apr 99.08 9 or L9a), a 8.43 n L13 or L1 160.59 15 or L15a 32.91	43.09 n the dwelli May 99.08 Iso see Tab 6.30 3a), also see 148.44), also see T 32.91	37.80 ng or hot w Jun 99.08 le 5 5.32 e Table 5 137.02 able 5 32.91	35.99 vater is from Jul 99.08 5.75 129.38 32.91	40.34 n communi Aug 99.08 7.47 127.59 32.91	40.79 ity heating Sep 99.08 10.03 132.11 32.91	46.66 Oct 99.08 12.74 141.74 32.91	50.02 Nov 99.08 14.87 153.89 32.91	54.18 Dec 99.08 15.85 165.32 32.91] (65)] (66)] (67)] (68)] (69)] (70)
Heat gains from w (65)m include (57) 5. Internal gains Metabolic gains (7) (66)m Lighting gains (cal (67)m Appliances gains (cal (68)m Cooking gains (cal (69)m Pumps and fans g (70)m Losses e.g. evapor	vater heatin 55.57 (m in calcul (see Table Jan Table 5), Wa 99.08 (culated in A 15.42 (calculated in 172.95 (calculated in A 32.91 ains (Table 10.00 ration (negative -79.27 ins (Table 5)	48.55 ation of (65 5 and 5a) Feb atts 99.08 Appendix L, 13.69 in Appendix L, 174.74 Appendix L, 32.91 5a) 10.00 ative values -79.27	50.44 5) m only if c Mar 99.08 equation L 11.14 (L, equation 170.22 equation L 32.91 10.00) (Table 5) -79.27	44.58 sylinder is in Apr 99.08 9 or L9a), a 8.43 n L13 or L1 160.59 15 or L15a] 32.91 10.00 -79.27	43.09 n the dwelli May 99.08 Iso see Tab 6.30 3a), also see 148.44), also see T 32.91 10.00 -79.27	37.80 ng or hot w Jun 99.08 le 5 5.32 e Table 5 137.02 able 5 32.91 10.00 -79.27	35.99 vater is from Jul 99.08 5.75 129.38 32.91 10.00	40.34 n communi Aug 99.08 7.47 127.59 32.91 10.00 -79.27	40.79 ty heating Sep 99.08 10.03 132.11 32.91 10.00 -79.27	46.66 Oct 99.08 12.74 141.74 32.91 10.00 -79.27	50.02 Nov 99.08 14.87 153.89 32.91 10.00	54.18 Dec 99.08 15.85 165.32 32.91 10.00 -79.27] (65)] (66)] (67)] (68)] (69)] (70)] (71)
Heat gains from w (65)m include (57) 5. Internal gains Metabolic gains (7) (66)m Lighting gains (cal (67)m Appliances gains (cal (67)m Cooking gains (cal (69)m Pumps and fans g (70)m Losses e.g. evapor (71)m	vater heatin 55.57 (m in calcul Jan Table 5), Wa 99.08 (culated in A 15.42 (calculated in A 172.95 (calculated in A 32.91 ains (Table 10.00 ration (nega -79.27	48.55 ation of (65 5 and 5a) Feb atts 99.08 Appendix L, 13.69 in Appendix L, 174.74 Appendix L, 32.91 5a) 10.00 ative values -79.27	50.44 5) m only if c Mar 99.08 equation L 11.14 (L, equation 170.22 equation L 32.91 10.00) (Table 5)	44.58 sylinder is in Apr 99.08 9 or L9a), a 8.43 n L13 or L1 160.59 15 or L15a 32.91 10.00	43.09 a the dwelli May 99.08 Iso see Tab 6.30 3a), also see 148.44), also see T 32.91 10.00	37.80 ng or hot w Jun 99.08 le 5 5.32 e Table 5 137.02 able 5 32.91 10.00	35.99 vater is from Jul 99.08 5.75 129.38 32.91 10.00	40.34 n communi Aug 99.08 7.47 127.59 32.91 10.00	40.79 ty heating Sep 99.08 10.03 132.11 32.91 10.00	46.66 Oct 99.08 12.74 141.74 32.91 10.00	50.02 Nov 99.08 14.87 153.89 32.91 10.00	54.18 Dec 99.08 15.85 165.32 32.91 10.00] (65)] (66)] (67)] (68)] (69)] (70)
Heat gains from w (65)m include (57) 5. Internal gains Metabolic gains (7) (66)m Lighting gains (cal (67)m Appliances gains (cal (67)m Cooking gains (cal (68)m Cooking gains (cal (69)m Pumps and fans g (70)m Losses e.g. evapor (71)m Water heating gain	vater heatin 55.57 (min calcul Jan Table 5), Wa 99.08 (culated in A 15.42 (calculated in A 172.95 (calculated in A 32.91 ains (Table 10.00 ration (nega -79.27 ins (Table 5) 74.69	48.55 ation of (65 5 and 5a) Feb atts 99.08 Appendix L, 13.69 in Appendix L, 32.91 5a) 10.00 ative values -79.27	50.44 5)m only if c Mar 99.08 equation L 11.14 L, equation 170.22 equation L 32.91 10.00) (Table 5) -79.27 67.79	44.58 sylinder is in Apr 99.08 9 or L9a), a 8.43 n L13 or L1 160.59 15 or L15a 32.91 10.00 -79.27 61.92	43.09 a the dwelli May 99.08 Iso see Tab 6.30 3a), also see 148.44), also see T 32.91 10.00 -79.27 57.92	37.80 ng or hot w Jun 99.08 le 5 5.32 e Table 5 137.02 able 5 32.91 10.00 -79.27 52.50	35.99 vater is from Jul 99.08 5.75 129.38 32.91 10.00 -79.27	40.34 n communi Aug 99.08 7.47 127.59 32.91 10.00 -79.27	40.79 ty heating Sep 99.08 10.03 132.11 32.91 10.00 -79.27	46.66 Oct 99.08 12.74 141.74 32.91 10.00 -79.27	50.02 Nov 99.08 14.87 153.89 32.91 10.00 -79.27	54.18 Dec 99.08 15.85 165.32 32.91 10.00 -79.27] (65)] (66)] (67)] (68)] (69)] (70)] (71)
Heat gains from w (65)m include (57) 5. Internal gains Metabolic gains (7) (66)m Lighting gains (cal (67)m Appliances gains (cal (67)m Cooking gains (cal (69)m Pumps and fans g (70)m Losses e.g. evapor (71)m Water heating gai (72)m	vater heatin 55.57 (min calcul Jan Table 5), Wa 99.08 (culated in A 15.42 (calculated in A 172.95 (calculated in A 32.91 ains (Table 10.00 ration (nega -79.27 ins (Table 5) 74.69	48.55 ation of (65 5 and 5a) Feb atts 99.08 Appendix L, 13.69 in Appendix L, 32.91 5a) 10.00 ative values -79.27	50.44 5)m only if c Mar 99.08 equation L 11.14 L, equation 170.22 equation L 32.91 10.00) (Table 5) -79.27 67.79	44.58 sylinder is in Apr 99.08 9 or L9a), a 8.43 n L13 or L1 160.59 15 or L15a 32.91 10.00 -79.27 61.92	43.09 a the dwelli May 99.08 Iso see Tab 6.30 3a), also see 148.44), also see T 32.91 10.00 -79.27 57.92	37.80 ng or hot w Jun 99.08 le 5 5.32 e Table 5 137.02 able 5 32.91 10.00 -79.27 52.50	35.99 vater is from Jul 99.08 5.75 129.38 32.91 10.00 -79.27	40.34 n communi Aug 99.08 7.47 127.59 32.91 10.00 -79.27	40.79 ty heating Sep 99.08 10.03 132.11 32.91 10.00 -79.27	46.66 Oct 99.08 12.74 141.74 32.91 10.00 -79.27	50.02 Nov 99.08 14.87 153.89 32.91 10.00 -79.27	54.18 Dec 99.08 15.85 165.32 32.91 10.00 -79.27] (65)] (66)] (67)] (68)] (69)] (70)] (71)

6. Solar gains

Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.

Rows (74) to (82) are used 12 times, one for each month, repeating as needed if there is more than one window type.

Details for month of January and annual totals are shown below:

	Gains (W)
North 0.77 x 7.60 x 10.73 x 0.9 x 0.60 x 0.80 =	27.13 (74)
South 0.77 x 14.80 x 47.32 x 0.9 x 0.60 x 0.80 =	232.98 (78)
Solar gains in watts, calculated for each month ∑(74)m(82)m	
(83)m 260.11 431.48 548.24 655.70 724.66 748.82 727.58 667.15 596.19 482.67 309.47	223.93 (83)
Total gains - internal and solar (73)m + (83)m	
(84)m 585.89 754.89 860.11 949.37 1000.04 1006.38 973.81 919.16 857.71 762.58 610.43	540.64 (84)
7. Mean internal temperature (heating season)	
Temperature during heating periods in the living area from Table 9, Th1(°C)	21.00 (85)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov	Dec
Utilisation factor for gains for living area, η1,m (see Table 9a)	
(86)m 0.99 0.98 0.95 0.91 0.81 0.64 0.46 0.48 0.74 0.92 0.98	0.99 (86)
Mean internal temp of living area T1 (steps 3 to 7 in Table 9c)	
(87)m 19.36 19.64 20.00 20.34 20.71 20.91 20.98 20.98 20.85 20.43 19.76	19.37 (87)
Temperature during heating periods in the living area from Table 9, Th2(°C)	
(88)m 19.40 19.41 19.41 19.42 19.43 19.43 19.44 19.44 19.43 19.42 19.41	19.41 (88)
Utilisation factor for gains for rest of dwelling η2,m (see Table 9a)	
(89)m 0.99 0.97 0.94 0.88 0.73 0.51 0.29 0.31 0.61 0.88 0.98	0.99 (89)
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)	
(90)m 17.34 17.74 18.25 18.72 19.18 19.39 19.43 19.43 19.34 18.86 17.92	17.36 <mark>(90)</mark>
Living area fraction fLA 40.00 \div (4) =	0.67 (91)
Mean internal temperature for the whole dwelling fLA x T1 +(1 - fLA) x T2	
(92)m 18.69 19.01 19.42 19.80 20.20 20.40 20.47 20.46 20.35 19.91 19.15	18.70 <mark>(92)</mark>
Apply adjustment to the mean internal temperature from Table 4e, where appropriate	
(93)m 18.54 18.86 19.27 19.65 20.05 20.25 20.32 20.31 20.20 19.76 19.00	18.55 (93)
8. Space heating requirement	
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov	Dec
Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that tim = (93)m and recalculate the utilisation factor for gains	using Table 9a)
Utilisation factor for gains, ηm	
(94)m 0.99 0.97 0.93 0.88 0.77 0.58 0.38 0.41 0.68 0.89 0.97	0.99 (94)
Useful gains, ηmGm, W = (94)m x (84)m	
(95)m 577.49 729.91 804.00 837.07 765.71 587.87 374.39 372.83 583.24 676.20 593.96	534.09 (95)
Monthly average external temperature from Table 8	
(96)m 4.50 5.00 6.80 8.70 11.70 14.60 16.90 16.90 14.30 10.80 7.00	4.90 (96)
Heat loss rate for mean internal temperature, Lm, W	
(97)m 1604.72 1577.14 1419.02 1235.49 935.95 632.09 380.74 380.47 662.01 1010.53 1359.38	1553.63 (97)
Space heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m	
	758.54
(98)m 764.26 569.34 457.58 286.86 126.66 0.00 0.00 0.00 0.00 248.74 551.10	
(98)m 764.26 569.34 457.58 286.86 126.66 0.00 0.00 0.00 0.00 248.74 551.10	3763.08 (98)
(98)m 764.26 569.34 457.58 286.86 126.66 0.00 0.00 0.00 0.00 248.74 551.10	
(98)m 764.26 569.34 457.58 286.86 126.66 0.00 0.00 0.00 248.74 551.10 Total per year (kWh/year) = ∑(98)15, 1012 =	3763.08 (98)
(98)m 764.26 569.34 457.58 286.86 126.66 0.00 0.00 0.00 248.74 551.10 Total per year (kWh/year) = Σ (98)15, 1012 = Σ Space heating requirement in kWh/m²/year	3763.08 (98)
(98)m 764.26 569.34 457.58 286.86 126.66 0.00 0.00 0.00 248.74 551.10 Total per year (kWh/year) = ∑(98)15, 1012 = ∑ Space heating requirement in kWh/m²/year 9a. Energy Requirements - Individual heating systems including micro-CHP Space heating:	3763.08 (98)
(98)m $\overline{764.26}$ $\overline{569.34}$ 457.58 286.86 126.66 0.00 0.00 0.00 248.74 551.10 Total per year (kWh/year) = Σ (98)15, 1012 =Space heating requirement in kWh/m²/year9a. Energy Requirements - Individual heating systems including micro-CHPSpace heating:Fraction of space heating from secondary/supplementary system (Table 11)0.00(201)	3763.08 (98)
(98)m 764.26 569.34 457.58 286.86 126.66 0.00 0.00 0.00 248.74 551.10 Total per year (kWh/year) = ∑(98)15, 1012 = ∑ Space heating requirement in kWh/m²/year 9a. Energy Requirements - Individual heating systems including micro-CHP Space heating:	3763.08 (98)

								-			
Fraction of total space heat from m		02) x (203)					0.00	(205)			
Efficiency of main space heating sys	stem 1 (%)						94.90	(206)			
(from database or Table 4a/4b, adj	usted where app	propriate by	the amou	nt shown ir	the 'space	efficiency	adjustment	t' column of	Table 4c)		
Jan Fe		Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement, kWh/m		1				1	1	,		1	I
(98)m 764.26 569	.34 457.58	286.86	126.66	0.00	0.00	0.00	0.00	248.74	551.10	758.54	
Space heating fuel (main heating sy	stem 1), kWh/n	nonth = (98))m x (204) x	x 100 ÷ (20	5)		•	·			
(211)m 805.33 599	.94 482.17	302.28	133.47	0.00	0.00	0.00	0.00	262.11	580.72	799.30	
				٦	otal per ye	ar (kWh/ye	ear) = ∑(212	1)15, 10	12 = 3	3965.31	(211)
Water heating:											
Output from water heater, kWh/mo	onth (calculated	d above)									
(64)m 178.43 155	.87 162.17	143.83	139.25	122.64	117.49	130.98	132.43	150.80	160.98	174.24	
								<u>Σ(64)1</u>	12 = 1	L769.10	(64)
Efficiency of water heater per mont	th										
(217)m 92.81 92.	1	91.27	89.33	84.80	84.80	84.80	84.80	90.82	92.41	92.83	
Fuel for water heating, kWh/month		ļ							-		I
(219)m 192.26 168		157.59	155.88	144.62	138.55	154.46	156.16	166.05	174.20	187.69	
		107.00	100.00	1				= Σ(219)1:		1972.12	(219)
					Total	per year (i	k vv i i / year j	- 2(219)1		1972.12	(213)
Annual Totals Summary:								kWh/ye	ar kl	Wh/year	
Space heating fuel used, main system	om 1							kun, ye		3965.31	(211)
Water heating fuel used										1972.12	(211)
Electricity for pumps, fans and electricity	tric keen-bot (1	Table (1f):								1972.12	(219)
	the keep-hot (abie 417.									
								120.00			(220-)
mechanical ventilation fans - ba	lanced, extract o	or positive i	nput from	outside				129.00			(230a)
warm air heating system fans	lanced, extract o	or positive i	nput from	outside				0.00			(230b)
warm air heating system fans central heating pump	lanced, extract o	or positive i	nput from	outside				0.00			(230b) (230c)
warm air heating system fans central heating pump oil boiler pump	lanced, extract o	or positive i	nput from o	outside				0.00 130.00 0.00			(230b) (230c) (230d)
warm air heating system fans central heating pump oil boiler pump boiler flue fan			nput from o	outside				0.00 130.00 0.00 45.00			(230b) (230c) (230d) (230e)
warm air heating system fans central heating pump oil boiler pump boiler flue fan maintaining electric keep-hot fa			nput from (outside				0.00 130.00 0.00 45.00 0.00			(230b) (230c) (230d) (230e) (230f)
warm air heating system fans central heating pump oil boiler pump boiler flue fan maintaining electric keep-hot fa pump for solar water heating			nput from o	outside				0.00 130.00 0.00 45.00 0.00 0.00		304 00	(230b) (230c) (230d) (230e) (230f) (230g)
warm air heating system fans central heating pump oil boiler pump boiler flue fan maintaining electric keep-hot fa			nput from o	outside				0.00 130.00 0.00 45.00 0.00		304.00	(230b) (230c) (230d) (230e) (230f)
warm air heating system fans central heating pump oil boiler pump boiler flue fan maintaining electric keep-hot fa pump for solar water heating Total electricity for the above	cility for gas cor		nput from o	outside				0.00 130.00 0.00 45.00 0.00 0.00	30g)		(230b) (230c) (230d) (230e) (230f) (230g) (231)
warm air heating system fans central heating pump oil boiler pump boiler flue fan maintaining electric keep-hot fa pump for solar water heating	cility for gas cor		nput from o	outside				0.00 130.00 0.00 45.00 0.00 0.00	30g)	304.00 272.29	(230b) (230c) (230d) (230e) (230f) (230g)
warm air heating system fans central heating pump oil boiler pump boiler flue fan maintaining electric keep-hot fa pump for solar water heating Total electricity for the above	cility for gas cor n Appendix L):	nbi boiler						0.00 130.00 0.00 45.00 0.00 0.00	30g)		(230b) (230c) (230d) (230e) (230f) (230g) (231)
warm air heating system fans central heating pump oil boiler pump boiler flue fan maintaining electric keep-hot fa pump for solar water heating Total electricity for the above Electricity for lighting (calculated in	cility for gas cor n Appendix L):	nbi boiler	ncluding m			Er	nissions	0.00 130.00 0.00 45.00 0.00 0.00	30g)	272.29 missions	(230b) (230c) (230d) (230e) (230f) (230g) (231)
warm air heating system fans central heating pump oil boiler pump boiler flue fan maintaining electric keep-hot fa pump for solar water heating Total electricity for the above Electricity for lighting (calculated in	cility for gas cor n Appendix L):	nbi boiler	ncluding m	nicro-CHP				0.00 130.00 0.00 45.00 0.00 0.00	30g)	272.29	(230b) (230c) (230d) (230e) (230f) (230g) (231)
warm air heating system fans central heating pump oil boiler pump boiler flue fan maintaining electric keep-hot fa pump for solar water heating Total electricity for the above Electricity for lighting (calculated in	cility for gas cor n Appendix L):	nbi boiler	ncluding m kV	nicro-CHP Energy	x		nissions	0.00 130.00 0.00 45.00 0.00 0.00	BOg) Er (kg	272.29 missions	(230b) (230c) (230d) (230e) (230f) (230g) (231)
warm air heating system fans central heating pump oil boiler pump boiler flue fan maintaining electric keep-hot fa pump for solar water heating Total electricity for the above Electricity for lighting (calculated in 12a. Carbon dioxide emissions - In	cility for gas cor n Appendix L):	nbi boiler	ncluding m kV 3	nicro-CHP Energy Vh/year	x		nissions Factor	0.00 130.00 0.00 45.00 0.00 0.00 Σ(230a)(23	30g)	272.29 missions CO2/year)	(230b) (230c) (230d) (230e) (230g) (230g) (231) (232)

Water heating	1972.12] x	0.198] =	390.48	(264)
Space and water heating			(261) + (262) -	- (263) + (264) =	1175.61	(265)
Pumps, fans and electric keep-hot	304.00) x	0.517] =	157.17	(267)
Lighting	272.29	x	0.517] =	140.78	(268)
Total carbon dioxide emissions				∑(261)(271) =	1473.55	(272)
Dwelling Carbon Dioxide Emissions Rate (DER)					24.56	(273)

DEVELOPMENT OF CAMDEN SITES KILN PLACE STAGE D DESIGN REPORT

Appendix C: Code for Sustainable Homes Pre Assessment



	- I I										1	
			1	I								
	Code f	or Sustain	able Homes Pre-Ass	essment								
							THE SUS	CODE FOR TAINABLE IOMES™				
Project Name			Kiln Place				H	IOMES™				
Design Team:	Client		Camden					Prepared by:	Farah Naz			
	Architect		Peter BarberARCHITECTS					Checked by:				
	Contractor		not known					Date	26/09/2013			
	Developer		not known									
	M+E Engir		Ramboll UK									
	Structural		Ramboll UK									
	Planning (Quod									
		ental Engineer	Ramboll UK									
	Acousticia		Peter BarberARCHITECTS									
	Ecologist		Ramboll UK									
	Landscape		Peter BarberARCHITECTS						· · · · · · · · · · · · · · · · · · ·			
	Quantity S		EC Harris									
	Quantity 5								· · · · · · · · · · · · · · · · · · ·			
Difficulty of achiev	ving credit - 1	Fraffic Light Approac	h									
		ightforward to achieve										
			esign and additional work									
		cult to achieve										
	Credit dilli											
			SUMMARY: Achieved Code Level in	ncluding Mandatory	Standards	1	1		Code Level	Benchmarks		
OPTION 1	Achieved?	1	2	3	4	5	6		Level 1	≥36		
69.0%	Achic	YES	YES	YES	YES	NO	NO		Level 2	≥48		
									Level 3	≥57		
	~		SUMMARY: Achieved Code Level in	ncluding Mandatory	Standards				Level 4	≥68		
OPTION 2	Achieved	1	2	3	4	5	6		Level 5	≥84		
0.0%	Ach	NO	NO	NO	NO	NO	NO		Level 6	≥90		
	~		SUMMARY: Achieved Code Level in	ncluding Mandatory	Standards							
OPTION 3	Achieved?	1	2	3	4	5	6					
0.0%	Aci	NO	NO	NO	NO	NO	NO					
											、	
				1	1	1	1				1	

r			1	T	1										
	Cotomore	Dee		Number of	Credits	Credits	Credits		Man	datory	/ Sta	ndards Levels	6	Deenensihilitu	Notos
	Category		ription	credits available	achieved - Option 1	achieved - Option 2	achieved - Option 3	1	2	3	4	5	6	Responsibility	Notes
Energy a	and CO ₂ Emissions														
Ene 1	Dwelling and Emission Rate	Credits awarded based on percentage i 2009	mprovement of DER over TER using SAP	10	3	0	0			:	3	9	10	Accredited Energy Assessor / M+E Engineer	Aim for 28% improvement to achieve 3credits to onatin Code Level 4. Part L 2010 improved U values, whole house ventilation, Accrediated Cons 2.5m³/h.m²@50PA) , Please refer to the DER worksheet for details.Confirm
Ene 2	Building Fabric	Credits are awarded based on the Fabri dwelling. Minimum standards apply at C taken from the SAP 2009 worksheet.	ic Energy Efficiency (kWh/m2/yr) of the ode levels 5 and 6. The FEE value is	9	5	0	0	3+	3+ ::	3+ 3	3+	7	7	Accredited Energy Assessor / Architect	(FEE) Fabric Energy Efficiency Energy demand for space heating and cooling expressed in kilowatt-hours of (kWh/m2/year). Fabric energy efficiency is calculated according to the conditions defined in The type of dwelling under assessment determines the applicable FEE and The FEE scale of ≤48 kWh/m2/year to ≤32 kWh/m2/year is applicable to: • Apartment blocks • Mid-terrace houses / bungalows The FEE scale of ≤60 kWh/m2/year to ≤38 kWh/m2/year is applicable to: • End terrace houses / bungalows • Semi-detached houses / bungalows • Detached houses / bungalows. Energy averaging For all apartment blocks, it is acceptable to assess this issue based on the a dwellings within the building. The area weighted average FEE performance must be calculated in accord In Kiln place the average FEE is 52.28 approx based on the sampled mod
Ene 3	Energy Display Devices	Credits are awarded where a correctly s installed monitoring electricity and/or pri		2	2	0	0				_			Developer / M+E Engineer	1 credit - Where current electricity OR primary heating fuel consumption dat energy display device. 2 credits - Where current electricity AND primary heating fuel consumption of energy display device. Default case (2 credits): Where electricity is the primary heating fuel and cur occupants by a correctly specified energy display device.
Ene 4	Drying Space		external secure drying space with posts g 4m+ for 1-2 bed dwellings or 6m+ for 3+	1	1	0	0							Architect	The ecological value before and after development is measured, and the ov 1 credit: Minor negative change: between –9 and less than or equal to –3 2 credits: Neutral: greater than –3 and less than or equal to +3 3 cr
Ene 5	Energy Labelled White Goods	Credits are awarded where each dwellin about the EU Energy Labelling Scheme A+ to B or a combination of the previous	, White Goods with ratings ranging from	2	2	0	0							Camden/ Client	1st credit - A+ rated fridges and freezers or fridge-freezers 2nd credit - A-rated washing machine and dishwasher AND EITHER B-rated OR 1 credit - Where no white goods are provided but EU Energy Efficiency Labo Camden to Confirm this credit.
Ene 6	External Lighting	Credits are awarded based on the provi energy efficient fittings and security ligh	sion of space lighting with dedicated ting fittings with appropriate control gear.	2	2	0	0							M+E Engineer	1st credit - Where all external space lighting, including lighting in common a with appropriate control systems. 2nd credit - Where all security lighting is designed for energy efficiency and All burglar security lights have a maximum wattage of 150 W and Movemen sensors All other security lighting is provided by dedicated energy efficient fittings an Default cases: - If no security lighting is installed credit is awarded by defaul providing requ - Dual lamp luminaires with both space and security lamps can be awarded efficiency

onstruction Details, Airtightness ranges from 1.5 to irmed by the Architects.

rrs of energy demand per square metre per year d in Section 11 of SAP.

and credit scale.

he area weighted average FEE performance of all ordance with methodology defined in clause 4.6 of AD L1A. todelled dwellings.

data are displayed to occupants by a correctly specified on data are displayed to occupants by a correctly specified current electricity consumption data are displayed to

overall change in species per hectare is:

ated washer-dryer or tubledryer OR info on dryers

abelling Scheme Information is provided to each dwelling

n areas, is provided by dedicated energy efficient fittings

and is adequately controlled such that: ment detecting control devices (PIR) and Daylight cut-off

s and is fitted with daylight cut-off sensors / time switch

requirements related to space lighting have been met ded both credits provided they meet the criteria for energy

Indicative Section Score			19.89%	0.00%	0.00%				
Total Credits for Section		31	17	0	0	_			
Ene 9 Home Office	he provision of space for a home office. The location, i/ded must meet the Code requirements.	1	1	0	0			Architect / M+E Engineer	See requirements for ventilation, daylight, services, space and proposed room dim Note. each flat requires individual assessment - is considered a low cost option for Documentry evidence required of the following: - socket location, telepehone points, ventilation and average daylight factor of min One of the following: - cable connection, Broadband connection and double telephone points. SPACE REQUIREMENT: Min size 1.8 m wall length to allow space for, desk, chair flat, suitable room is the living area. 3+ bedroom, a suitable room is other than the bedroom, bathroom, living and kitch Confirmed by the design team. Will be progressed further in next design stage.
Ene 8 Cycle Storage	ere adequate, safe, secure and weather proof d according to the Code requirements.	2	1	0	0				Where individual or communal cycle storage is provided, that is adequately sized, s of cycles: 1 credit requirement: Studios or 1 bedroom dwellings – storage for 1 cycle for every two dwellings 2 and 3 bedroom dwellings – storage for 1 cycle per dwelling 4 bedrooms and above – storage for 2 cycles per dwelling 2 credits requirement: Studios or 1 bedroom dwellings – storage for 1 cycle per dwelling 2 and 3 bedroom dwellings – storage for 2 cycles per dwelling 4 bedrooms and above – storage for 2 cycles per dwelling 2 and 3 bedroom dwellings – storage for 2 cycles per dwelling 4 bedrooms and above – storage for 4 cycles per dwelling Communal storage should be located within 100 m of the front door or the main er Lighting should comply with ENE 6 Credit. Entrance must be secure door set and have no windows. To be Confirmed. Few flats might not achieve this credit. Architect will confirm.
Ene 7 Low or Zero Carbon Ene 7 Energy Technologies	ere there is a 10% or 15% reduction in CO2 the use of low or zero carbon technologies.	2	0	0	0			Accredited Energy Assessor / M&E Engineer	1 credit - 10% of demand or greater 2 credits - 15% of demand or greater A copy of calculations required to determine compliance - based on design stage S Accredited External Renewables (off site) will comply with these credits which: • Are Renewable Energy Guarantee of Origin (REGO) certified • Create new installed generation capacity designed to meet the demand of the dw • Are additional to capacity already required under the Renewables Obligation SAP modelling was undertaken. The development achive the 26% onsite savings passive and active design improvements. Some dwelling requirer renewbale technol Code level 4 (2010). The dwellings on Site 3, 4 and 5 requires PV and the total no onsite savings from this technology. Thus this credit is not achievable.

ign stage SAP outputs

d of the dwelling gation

te savings from Energy efficiency measures based on bale technology eg: PV to obtain the 25% reduction for the total no required is 24kWp which equates to a 3%

tely sized, secure and convenient, for the following number

the main entrance to the block of flats.

nfirm.

d room dimensions. t option for those that can achieve it.

ctor of min 1.5%.

esk, chair and filing cabinet. For a studio, 1 or 2 bed room and kitchen.

Water	1								1		1					
vvatel									1-		-					
Wat 1 Internal Potable V Use	Water	water consumptio		cted average household e Code Water Calculator level apply.	5	4	o	0	1	1	3	3	5	5	Architect / M+E Engineer	 \$ 120 l/p/day 1 credit (Levels 1 and 2) \$ 110 l/p/day 2 credits \$ 105 l/p/day 3 credits (Levels 3 and 4) \$ 90 l/p/day 4 credits \$ 80 l/p/day 5 credits (Levels 5 and 6) London Plan 2011, Policy 5.15 water use and Supplies: Minimum water usage would meet a target of 105/l/p/day or less. Need to specify flow rate for WCs, bathroom and kitchen taps, bath, showed Note. Rainwater / Greywater recycling systems will improve score but are reconfirmed by the architect at Code workshop at Ramboll offices on 1010/2
Wat 2 External Water U	lse		ion purposes. Where n	ystem is specified for collecting rainwater to outdoor space is provided the credit	1	1	0	0				-			Architect / M+E Engineer	I credit - where a correctly specified and sufficient sized system to collect provided to a dwelling with a garden, patio or communal garden space. Examples of such systems include rainwater butts and central rainwater constrained and such systems include rainwater butts and central rainwater constrained and such systems include rainwater of the system sector of the systems include rainwater constrained and such systems include rainwater constrained and sector s
Total Credits for Secti	ion				6	5	0	0								
Indicative Section Score												-				
Matariala						7.50%	0.00%	0.00%								
Materials					1											
Mat 1 Environmental Im of Materials	npact	achieve a Green (Tradable Credits:	Guide 2008 Rating of A Points are awarded or cifications. The Code M	of the five key building elements must 4+ to D. n a scale based on the Green Guide laterials Calculator can be used to	15	8	0	0	3+	3+	3+	3+	3+	3+	Architect / Structural Engineer	Building elements assessed using 2008 Green Guide. CfSH materials calc Where at least three of the following five key elements of the building enve • Roof • External walls • Internal walls (including separating walls) • Upper and ground floors (including separating floors) • Windows Mixed use development: - Dwelling located over non domestic accomodation(eg. retail, parking), the - If external wall, windows, internal walls are located above non domestic, or assessed. - Where a non domestic is located between the dwellings and the roof, the below. If the roof is directly above a commercial use property, the equivaler opposed to the ratings of a domestic roofs.Roof areas to the part of the dw Note. Developer can specify requirement when procuring Contractors servi architects. Camden Material Policy: Policy 8.16, Pg 63: 8.16 In new-build and development projects with either - 500sq m of any floorspace or more or 5 dwellings or more - you should seek to achieve an area weighted average of A+ to B for the major building elements (roof, external walls, floor finishes, internal partitions and windows) in accordance with the BRE Green Guide to Specification.

wer, washing machine, dishwasher and water softener. re not required for Code Level 4 compliance. 0/2013 , that 4 credit would be achievable.

ct rainwater for external/internal irrigation/use has been

rger garden, but must meet the capacity requirement

per communal garden. Where the communal garden is can be applied.

onies are provided, the credit can be awarded by default

alculator used to estimate credits.

velope achieve a rating of A+ to D :

the lowest residential floor is considered as ground floor. ic, only those related to the dwellings needs to be

the roof is assessed as it is protecting the dwellings alent commercial rating for the roof must be used as dwelling,not containing a dwelling should be omitted.

ervices. May push up price. To be confirmed by the

Indicativ	e Section Score			4.20%	0.00%	0.00%	1			
	Credits for Section		24	14	0	0		_		
Mat 3	Responsible Sourcing of Materials - Finishing Elements	Credits are awarded where materials u responsibly sourced. The Code Materia potential score.	3	2	0	0			Architect	3 credits available where 80% of the following materials are responsibly so a) Stair b) Window c) External & internal door d) Skirting (timber) e) Panelling (very difficult) f) Furniture - (might not be provided) g) Fascias (very difficult) h) Any other significant use Additionally, 100% of any timber in these elements must be legally sourced Has been confirmed by the architect.
Mat 2	Responsible Sourcing of Materials - Basic Building Elements	Credits are awarded where materials u responsibly sourced. The Code Materia potential score.	6	4	0	0			Archiytect	6 credits available where 80% of the following Building Elements are respond a) Frame b) Ground floor c) Upper floors (including separating floors) d) Roof e) External walls (including separating walls) f) Internal walls (including separating walls) g) Foundation/substructure (excluding sub-base materials) h) Staircase Additionally, 100% of any timber in these elements must be legally sourced These credits are difficult to achieve as limits suppliers which can have kno Note. Developer can specify requirement when procuring Contractors servi- Policy 8.17, Pg 63: Responsible Sourcing Responsible Sourcing 8.17 You should specify materials from suppliers who participate in responsible Sourcing Standard. All timber specified should be sourced from schemes supported by the Central Point of Expertise for Timber Procurement such as Forest Stewardship Council (FSC) accreditation (which ensures that the harvest of timber and non-timber products maintains the forest's ecology and its long-term viability). The use of Camden Planning Guidance Sustainability Materials 64 responsible sourcing can contribute towards attaining the BREEEAM/Code credits but a clear audit trail will need to be provided to gain these credits. For further guidance on responsible sourcing of materials: http://www.bre.co.uk/

sponsibly sourced:

ced
knock on effect to cost.
ervices. May push up price. Camden Material Policy:

sourced:
ced

Surface Wa	ter Run-off											
Sur 1	Reduction of Surface Water Run-off from Site	Mandatory Requirement: Peak rate of run-off into watercourses is no greater for the developed site than it was for the predevelopment site and that the additional predicted volume of rainwater discharge caused by the new development is entirely reduced as far as possible in accordance with the assessment criteria. Desiging the drainage system to be able to cope with local drainage system failure. Tradable Credits: Where SUDS are used to improve water quality of the rainwater discharged or for protecting the quality of the receiving waters.	2	1	0	0					Environmental Scientist	Credits are available where SUDS are used to improve the water quality of 1st credit - ensuring there is no discharge from the developed site for rainfa 2nd credit - the run-off from all hard surfaces shall receive an appropriate le to minimise the risk of pollution. Default Cases: The mandatory criteria can be deemed to be met by default if the site disch Credits cannot be awarded unless the relevant water quality criteria are me Note: This section will be revised when the National Standards for Sustaina force.
Sur 2	Flood Risk	Credits are awarded where developments are located in areas of low flood risk or where in areas of medium or high flood risk appropriate measures are taken to prevent damage to the property and its contents in accordance with the Code criteria in the technical guide.	2	2	0	0					Environmental Scientist	2 credits: for developments situated in Zone 1 – low annual probability of flo Risk) and where the site-specific Flood Risk Assessment (FRA) indicates th 1 credit: for developments situated in Zones 2 and 3a – medium and high ar floor level of all habitable parts of dwellings and access routes to the ground the design flood level of the flood zone. The Flood Risk Assessment accompanying the planning application must d authority and statutory body that the development is appropriately flood resi routes where required, and that any residual risk can be safely managed.
SUR 1 Mandatory Requirement	Peak Rate of Run-off is No Greater for the Developed Site than the Pre-Development Site		YES = 1	1	0	0	1 1 1	1	1	1	Environmental Scientist	Mandatory requirements for peak rate of run-off and additional volume of ru
Total Credits for Section			4	3	0	0						
Indicative Se	ction Score			4.05%	0.000/	0.00%						
			1.65%	0.00%	0.00%							

y of discharged water: infall depths up to 5 mm (see Calculation Procedures). te level of treatment in accordance with The SuDS Manual

scharges rainwater directly to a tidal estuary or the sea. met.

ainable Drainage and associated regulations come into

of flooding (as defined in PPS25 Development and Flood es that there is low risk of flooding from all sources.

gh annual probability of flooding where the finished ground bund level and the site, are placed at least 600 mm above

st demonstrate to the satisfaction of the local planning resilient and resistant, including safe access and escape

of run-off.

Waste													
Was 1	Household Waste Storage and Recycling Facilities	to hold the larger of either all external of or the min capacity calculated from BS 5906.	rovided for waste storage should be sized containers provided by the Local Authority quate internal and/ or external recycling	4	4	0	0					Architect & Camden	Mandatory standard: An adequate external space should be allocated for waste storage and sized to ac of the following two volumes: The minimum volume recommended by British Standard 5906 (British Standards collection frequency of once per week. This volume is 100 litres for a single bedrox additional bedroom (e.g. 1bed – 100l, 2bed – 170l, 3bed – 240l, 4bed – 310l) The total volume of the external waste containers provided by the Local Authority Storage space must provide inclusive access and usability (Checklist IDP). Contai Credits available for the provision of recycling facilities. 2 credits - dedicated internal storage for recyclable household waste where there i capacity for recyclable material and no Local Authority collection scheme. 4 credits - a combination of internal storage capacity scheme or adequate external storage capacity. For flats, a private recycling scheme operator must be appointed to maintain bins no LA collection scheme. Be located in an adequate extrenal soace, sized accordif from the recycling scheme operator and store at least three types of recyclable wa Note: 4 credits awarded based on confirmation by Camden Council and the Archi
Was 2	Construction Site Waste Management	A credit is awarded where a compliant procedures to minimise construction w SWMP include procedures and commit waste generated from landfill.		3	2	0	0			-		Contractor / Environmental Scientis	1 credit: SWMP with targets and procedures to minimise waste 2 credits: SWMP with procedures to divert 50% of waste 3 credits: SWMP with procedures to divert 85% of waste Note: 2 Credits awarded based on confirmation by Camden Council and the Arch
Was 3	Composting	A credit is awarded where individual ho where a community' communal compo Authority or overseen by a managemen		1	1	0	0					Architect / Developer	Individual home composting facilities. OR A local communal or community composting service, which the Local Authority n place. OR A Local Authority green/kitchen waste collection system (this can include an autor All facilities must also: * be in a dedicated position * provide inclusive access and usability (Checklist IDP) * have a supporting information leaflet provided to each dwelling
WAS 1 Mandatory Requirement	Space Provided for Waste Storage Should be Sized to Hold the Larger of a) All External Storage Containers Provided by the LA or b) The Minimum Capacity of Waste Storage as Calculated from BS 5906			YES = 1	1	0	0	1 1	1	1	1 1		
Total Cree	dits for Section			8	7	0	0						
Indicative Se Pollution	ection Score				5.60%	0.00%	0.00%			-			
Pol 1	Global Warming Potential of Insulants	A credit is awarded where all insulating manufacture AND installation) that hav		1	1	0	0					Architect / M+E Engineer	Credits are awarded where all insulating materials in the elements of the dwelling GWP < 5 (in manufacture AND installation): • Roofs: including loft access • Walls: internal and external including lintels and all acoustic insulation • Floors: including ground and upper floors • Hot water cylinder: pipe insulation and other thermal stores • Cold water storage tanks: where provided • External doors Note. Non-foamed insulation such as mineral wool, recycled newspaper or cork of
Pol 2	NOx emissions from heating source	Credits are awarded on the basis of NC the space and water heating system wi	Ox emissions arising from the operation of ithin the dwelling.	3	3	0	0					M+E Engineer	Dry NOX levels (mg/kWh) 1 credit - NOX levels <100 / boiler class 4 2 credits - NOX levels <70 / boiler class 5 3 credits - NOX levels <40 Note. Can depend on renewable solution e.g. CHP scores well, GSHP scores poor Default case: Where all space heating and hot water energy requirements are fully emissions.
Total Cree	dits for Section			4	4	0	0						
1			1										

zed to accommodate containers according to the largest

- Standards Institution, 2005) based on a maximum gle bedroom dwelling, with a further 70 litres for each (101) Authority. 2). Containers must not be stacked.

re there is no (or insufficient) dedicated external storage

uate internal space, with either a Local Authority collection

tain bins and collect recyclable waste regularly if there is d according to frequency of collection, based on guidance clable waste in identifiabley dfferent bins. the Architect.

the Architect.

thority runs or where there is a management plan in

e an automated waste collection system).

dwelling listed below only use substances that have a

or cork complies.

ores poorly

s are fully met by systems which do not produce NOX

Health and Wellbeing													
Hea 1 Daylighting	Credits are awarded for ensuring key ro high daylight factors (DF) and a view of		3	0	0	0				-		M+E Engineer / Architect	1 credit - Kitchens must achieve a minimum average daylight factor of at le 1 credit - All living rooms, dining rooms and studies (including any room de: must achieve a minimum average daylight factor of at least 1.5% 1 credit - 80% of the working plane in each kitchen, living room, dining room offi ce under Ene 9 – Home Office) must receive direct light fromthe sky. Note: This credit is not targetted.
Hea 2 Sound Insulation	Credits are awarded where performanc Building Regulations Part E. This can b completion testing or through the use of	e demonstrated by carrying out pre-	4	3	0	0						Acoustician	Credits available where sound insulation achieves higher performance thar approved for England and Wales, Approved Document E (2003 Edition, wil 1 credit • airborne sound insulation values are at least 3dB higher • impact sound insulation values are at least 3dB lower 3 credits • airborne sound insulation values are at least 5dB higher • impact sound insulation values are at least 5dB lower 4 credits • airborne sound insulation values are at least 5dB lower 4 credits • airborne sound insulation values are at least 8dB higher • impact sound insulation values are at least 8dB lower 7 This must be demonstrated through either a programme of pre-completion dwellings must be registered with RDL. Default cases: Detached dwellings (4 credits) Attached dwellings where se habitable rooms (3 credits) Note. Part E is already challenging, higher levels of sound insulation will re available floor area. See default case for flats for 3 credits. Note: Provisionally confirmed by the design team. Will be developed furthe
Hea 3 Private Space	A credit is awarded for the provision of a private. The space must allow easy acc	an outdoor space that is at least partially ess to all occupants.	1	1	0	0						Architect	Where outdoor space (private or semi-private) has been provided that is: • Of a minimum size that allows all occupants to use the space. • Provided with inclusive access and usability • Accessible only to occupants of designated dwellings. Minimum space requirements: • Private space: 1.5 m2 per bedroom • Shared space: minimum 1 m2 per bedroom. Note. Balconies easy way to achieve credit. Juliet balcony, conservatory ar Winter Gradens will comply with the criteria only if at least one side can be or terraced doors) Without this feaure, winter gardens are regarded as conservatory.
Hea 4 Lifetime Homes	Mandatory Requirement: Lifetime Home achieve Code Level 6. Tradable credits: Credits are awarded v of the principles of the Lifetime Homes :	where the developer has implemented all	4	4	0	0	0	0	0	0	0 4	Developer / Architect	4 credits - where all principles of Lifetime Homes, applicable to the dwelling 3 credits - where an exemption from Lifetime Homes criteria 2 and/or 3 is a plot gradient, but all other principles of Lifetime Homes, applicable to the dw Note:Confirmed by Architects.
Total Credits for Section		12	8	0	0								
Indicative Section Score				9.36%	0.00%	0.00%				-			

tt least 2% designated as a home office under Ene 9 – Home Office) oom and study (including any room designated as a home

than the standards set out in the Building Regulations with amendments 2004).

on testing, or specifying Robust Details. All relevant

separating walls or floors occur only between non-

I require larger build up of walls therefore impact on

ther in next design stage.

y and other encosed spaces donot comply. be fully opened to the exterior (shutters, sliding wall, wings conservatories and donot comply with the criteria)

lling being assessed, have been complied with. is applied to selected pathways subject to a steeply sloping e dwelling being assessed, have been complied with.

			1					_		
Management									 	
Man 1	Home User Guide	Credits are awarded where a simple guide is provided to each dwelling covering information relevant to the 'non-technical' home occupier, in accordance with the Code requirements.	3	3	0	0			Developer / Architect / M+E Engineer	2 credits: A Home User Guide, compiled using Checklist Man 1 Part 1 together alternative accessible formats Extra credit: Where the guide also covers information relating to the site and its 2 Confirmed by the Architect.
Man 2	Considerate Constructors Scheme	Credits are awarded where there is a commitment to comply with best practice site management principles using either the Considerate Constructors Scheme or an alternative locally/ nationally recognised scheme.	2	2	0	0			Contractor / Developer	1 credit: commitment to meet Best Practice under a nationally or locally recogn Constructors Scheme (score 24 - 31.5) 2 credits: commitment to go significantly beyond Best Practice (score 32 - 40) scheme such as , considerate constructors scheme. Note. Developer can specify requirement when procuring Contractors services.
Man 3	Construction Site Impacts	Credits are awarded where there is a commitment and strategy to operate site management procedures on site	2	2	0	0			Contractor / Developer	tredit where there are procedures that cover 2 or more of the following items: 2 credits where there are procedures that cover 4 or more of the following items: Monitor, report and set targets for CO2 production or energy use arising from Monitor and report CO2 or energy use arising from commercial transport to at Monitor, report and set targets for water consumption from site activities Adopt best practice policies in respect of air (dust) pollution arising from site a Adopt best practice policies in respect of air (dust) pollution arising from site a Adopt best practice policies in respect of air (dust) pollution arising from site a Adopt best practice policies in respect of arised policy pollution - 80% of site timber is reclaimed, re-used or responsibly sourced Note. As above. }
Man 4	Security	Credits are awarded for complying with Section 2 - Physical Security from Secured by Design - New Homes. An Architectural Liaison Officer (ALO), or alternative, needs to be appointed early in the design process and their recommendations incorporated.	2	2	0	0			Architect	Credits awarded where an Architectural Liaison Officer (ALO) or Crime Preven force is consulted at the design stage and their recommendations are incorpora AND Section 2 – Physical Security from 'Secured by Design – New Homes' is compl required).
Total Credits for Section			9	9	0	0				

ogether with information that the guide is available in

and its surroundings, compiled using Checklist Man 1 Part

recognised certification scheme such as the Considerate

2 - 40) under nationally or localy recognised certification

ervices. May push up price.

g items: ng items:

ng from site activities ort to and from site

es m site activities pollution occurring on the site

Prevention Design Advisor (CPDA) from the local police accorporated into the design of the dwelling.

s complied with (Secured by Design certification is not

Indicative	Section Score				9.99%	0.00%	0.00%			
Ecology					3.3378	0.00 /8	0.00 /8			
Eco 1	Ecological Value of Site	One credit is awarded for developing I	and of inherently low value.	1	1		o		Environmental Scientist	1 credit where the development site is confirmed as land of inherently low ecological value EITHER By meeting the criteria for low ecological value OR By being confirmed by a Suitably Qualified Ecologist OR Where an independent ecological report of the site, prepared by a Suitably Qualified Eco is of low or insignificant ecological value AND Any land of ecological value outside the construction zone but within the development sit construction works. Note: Suitably Qualified Ecologist have been appointed. The site has been identified as a
Eco 2	Ecological Enhancement	A credit is awarded where there is a c of the development site.	ommitment to enhance the ecological value	1	0	0	0		Suitably Qualified Ecologist / Developer	1 credit where a Suitably Qualified Ecologist has been appointed to recommend appropri enhance the ecology of the site. AND Where the developer adopts all key recommendations and 30% of additional recommend It is recommended the Ecologit's report is prepared using the 'Code for Sustainable Hom carried out at RIBA Stage B Note: Recommandations have been made for mitigation but enhancement, so credit can
Есо 3	Protection of Ecological Features	A credit is awarded where there is a c protect features of ecological value.	ommitment to maintain and adequately	1	1	0	0		Suitably Qualified Ecologist / Contractor	1 credit - where all existing features of ecological value potentially affected by the works a during site clearance, preparation and construction works. Default Cases The credit can be awarded by default where the site has been classified as having low ec and no features of ecological value have been identified. If a suitably qualified ecologist has confirmed a feature can be removed because of its ins arboriculturalist has confirmed a feature can be removed owing to poor health/condition (for health and safety and/or conservation reasons), the credit can be achieved provided a in accordance with the ecologist's recommendations. Note: Credit has been confirmed by the qualified ecologist.
Eco 4	Change of Ecological Value of Site	Credits are awarded where the chang accordance with the Code requiremen	e in ecological value has been calculated in ts	4	4	0	0		Environmental Scientist / Developer	The ecological value before and after development is measured, and the overall change 1 credit: Minor negative change: between -9 and less than or equal to -3 2 credits: Neutral: greater than -3 and less than or equal to $+3$ 3 credits: Minor enhancement: greater than 3 and less than or equal to 9 4 credits: Major enhancement: greater than $+9$ Note: Credit has been confirmed by the qualified ecologist based on the information to dastage.
Eco 5	Building Footprint	Credits are awarded depending on the dwellings on the site to their footprint	e ratio of combined floor area of all	2	0	0	0		Architect	1 credit - For blocks of flats, where the Net Internal Floor Area: Net Internal Ground Floo 2 credits - For block of flats, where the Net Internal Floor Area: Net Internal Ground Floor Has been confirmed by the Architects.
Total Cr	redits for Section			9	6	0	0			
Indicative	Section Score									
					7.98%	0.00%	0.00%			

by ecological value by Qualified Ecologist confirms that the construction zone a development site will remain undisturbed by the een identified as a low ecological value. commend appropriate ecological features that will positively tional recommendations. Sustainable Homes Ecology Report Template', and it is ent, so credit cannot be targetted. ted by the works are maintained and adequately protected d as having low ecological value in accordance with Eco 1 because of its insignificant ecological value or where an health/condition (e.g. diseased trees which require felling hieved provided all other features are adequately protected e overall change in species per hectare is: -3

information to date. Wiil be confirmed in the next design

ernal Ground Floor Area is greater than or equal to 3:1 rnal Ground Floor Area is greater than or equal to 4:1