

mechanical ventilation - balanced, extra	act or positive input from outside	83.	1 (230a)
central heating pump:		30	(230c)
boiler with a fan-assisted flue		45	(230e)
Total electricity for the above, kWh/year	sum of	(230a)(230g) =	158.1 (231)
Electricity for lighting			394.57 (232)
10a. Fuel costs - individual heating sys	tems:		
	<b>Fuel</b> kWh/year	Fuel Price (Table 12)	<b>Fuel Cost</b> £/year
Space heating - main system 1	(211) x	3.48 × 0.01	= 59.39 (240)
Space heating - main system 2	(213) x	0 × 0.01	= 0 (241)
Space heating - secondary	(215) x	13.19 × 0.01	= 0 (242)
Water heating cost (other fuel)	(219)	3.48 × 0.01	= 60.39 (247)
Pumps, fans and electric keep-hot	(231)	13.19 × 0.01	= 20.85 (249)
(if off-peak tariff, list each of (230a) to (2 Energy for lighting	30g) separately as applicable and (232)	apply fuel price according 13.19 × 0.01	
Additional standing charges (Table 12)			120 (251)
	one of (233) to (235) x)	13.19 × 0.01	= 0 (252)
Appendix Q items: repeat lines (253) an	d (254) as needed		
Total energy cost	(245)(247) + (250)(254) =		312.68 (255)
11a. SAP rating - individual heating sys	stems		
Energy cost deflator (Table 12)			0.42 (256)
Energy cost factor (ECF)	[(255) x (256)] ÷ [(4) + 45.0] =		0.93 (257)
SAP rating (Section 12)			87.06 (258)
12a. CO2 emissions – Individual heatir	ng systems including micro-CHP		
	<b>Energy</b> kWh/year	Emission factor kg CO2/kWh	<b>Emissions</b> kg CO2/year
Space heating (main system 1)	(211) x	0.216 =	368.64 (261)
Space heating (secondary)	(215) x	0.519 =	0 (263)
Water heating	(219) x	0.216 =	374.83 (264)
Space and water heating	(261) + (262) + (263) + (26	(4) =	743.47 (265)
Electricity for pumps, fans and electric k	eep-hot (231) x	0.519 =	82.06 (267)
Electricity for lighting	(232) x	0.519 =	204.78 (268)
Energy saving/generation technologies			
Total CO2, kg/year		$a_{\mu\nu} = a_{\mu} \left( 26E \right) \left( 274 \right)$	
		sum of (265)(271) =	1030.31 (272)
CO2 emissions per m <sup>2</sup> El rating (section 14)		sum of (265)(271) = (272) ÷ (4) =	1030.31 (272) 10.67 (273) 90 (274)





13a. Primary Energy			
	<b>Energy</b> kWh/year	<b>Primary</b> factor	<b>P. Energy</b> kWh/year
Space heating (main system 1)	(211) x	1.22 =	2082.12 (261)
Space heating (secondary)	(215) x	3.07 =	0 (263)
Energy for water heating	(219) x	1.22 =	2117.12 (264)
Space and water heating	(261) + (262) + (263) + (264) =		4199.24 (265)
Electricity for pumps, fans and electric keep-hot	(231) x	3.07 =	485.38 (267)
Electricity for lighting	(232) x	0 =	1211.32 (268)
Energy saving/generation technologies 'Total Primary Energy	sum	of (265)(271) =	5895.95 (272)
Primary energy kWh/m²/year	(272)	) ÷ (4) =	61.07 (273)



			l	Jser D	etails:						
Assessor Name:	Peter Mitcl	nell			Stroma	a Numl	ber:		STRO	007945	
Software Name:	Stroma FS	AP 2012			Softwa					n: 1.0.4.5	
			Pro	perty /	Address:	Unit 6 (	GFEND	) CLEAN	J		
Address :	New Dwellin	ng at:, Gor	don Hou	use, 6	Lissende	en Garde	ens, LON	NDON, N	W5 1LX	(	
1. Overall dwelling dime	ensions:										
				Area	a(m²)		Av. Hei	ight(m)		Volume(m <sup>3</sup> )	_
Ground floor				9	6.54	(1a) x	2	4	(2a) =	231.7	(3a)
Total floor area TFA = (1	la)+(1b)+(1c)+	(1d)+(1e)+	(1n)	9	6.54	(4)					
Dwelling volume						(3a)+(3b)	+(3c)+(3d	)+(3e)+	.(3n) =	231.7	(5)
2. Ventilation rate:										<u>, , , , , , , , , , , , , , , , , , , </u>	
	main heating		ondary ating		other		total			m <sup>3</sup> per hour	,
Number of chimneys	0	+	0	+	0	] = [	0	x 4	= 0	0	(6a)
Number of open flues	0	+	0	+	0	] = [	0	x 2	20 =	0	(6b)
Number of intermittent fa	ans					'	0	x 1	0 =	0	(7a)
Number of passive vents	3					F	0	x 1	0 =	0	 _(7b)
Number of flueless gas f								×4	l0 = 0	0	]( <sup>7</sup> c)
number of fideless gas i	1105						0			0	(70)
									Air ch	anges per ho	ur
Infiltration due to chimne	eys, flues and f	ans = (6a)+	-(6b)+(7a)	+(7b)+(	7c) =	Г	0		+ (5) =	0	(8)
If a pressurisation test has	been carried out o	r is intended,	proceed t	o (17), c	otherwise c	ontinue fro	om (9) to (				
Number of storeys in t	he dwelling (n	s)								0	(9)
Additional infiltration			_					[(9)-	1]x0.1 =	0	(10)
Structural infiltration: (						•	uction			0	(11)
if both types of wall are p deducting areas of open			nung to th	le great		a (allei					
If suspended wooden	floor, enter 0.2	(unsealed	l) or 0.1	(seale	ed), else	enter 0			[	0	(12)
lf no draught lobby, er	nter 0.05, else	enter 0								0	(13)
Percentage of window	s and doors dr	aught strip	ped							0	(14)
Window infiltration					0.25 - [0.2		-			0	(15)
Infiltration rate					(8) + (10) ·		· · · ·			0	(16)
Air permeability value, If based on air permeabi	• • •			•	•	•	etre of e	nvelope	area	4	(17)
Air permeability value applie	•						s beina us	sed	l	0.2	(18)
Number of sides shelter					,,	, , , , , , , , , , , , , , , , , , .			[	3	(19)
Shelter factor					(20) = 1 - [	0.075 x (1	9)] =			0.78	(20)
Infiltration rate incorpora	ting shelter fac	tor			(21) = (18)	x (20) =			[	0.16	(21)
Infiltration rate modified	for monthly wir	nd speed									
Jan Feb	Mar Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind s	beed from Tabl	e 7									
(22)m= 5.1 5	4.9 4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (2	22)m ÷ 4										
(22a)m= 1.27 1.25	, 1.23 1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		
		· · · · ·				Į					



Adjuste	ed infiltra	ation rat	e (allowi	ng for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m				_	
	0.2	0.19	0.19	0.17	0.17	0.15	0.15	0.14	0.16	0.17	0.17	0.18		
		al ventila	-	rate for t	he appli	cable ca	se						0.5	(23a)
				endix N, (2	3b) = (23a	a) × Fmv (e	equation (N	N5)) othe	rwise (23b	) = (23a)			0.5	(23a)
				iency in %					-	) (200)			0.5	
					U		,		,	$(b)m \pm (b)$	22P) ^ L	1 – (23c)	0 ÷ 1001	(23c)
(24a)m=	r							0	$\frac{1}{0}$		230) ^ [	$\frac{1-(230)}{0}$	 	(24a)
		-	_	ntilation	-			-	-	-	-	ů	l	()
(24b)m=								0	0	0	230)	0	1	(24b)
	-	-		-	-	-	-		-	0	0	Ū	J	(210)
,				ntilation o then (24o	•	•				5 × (23h	)			
(24c)m=	<u> </u>	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	]	(24c)
· · ·		ventilatio	n or wh	ole hous		l /e input	ventilatio	n from	oft				l	
				m = (22k						0.5]				
(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24d)
Effec	ctive air	change	rate - er	nter (24a	) or (24t	o) or (24	c) or (24	d) in bo	(25)			•		
(25)m=	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5		(25)
2 40	atlassa	e and he		paramete	or:			•	•					
ELEN		Gros		Openin		Net Ar	22	U-val		AXU		k-value	2	AXk
		area		m		A,r		W/m2		(W/I	K)	kJ/m²·l		kJ/K
Window	ws Type	e 1				7.39	x1.	/[1/( 1.2 )+	0.04] =	8.46				(27)
Window	ws Type	2				3.5		/[1/( 1.2 )+	0.04] =	4.01	=			(27)
Window	ws Type	e 3				8.26		/[1/( 1.2 )+	0.04] =	9.46	=			(27)
	ws Type					8.26	<b>_</b> .	/[1/( 1.2 )+	0.04] =	9.46	=			(27)
	ws Type					5.28	่ .	/[1/( 1.2 )+	L	6.05	=			(27)
Walls		108.	14	32.69		75.45		0.16		12.07	≓ ,			(29)
	urea of e	lements		32.03	9			0.10		12.07	I			
		lemento	, 111			108.1			—		— ,			(31)
Party v						19.25		0		0			$\dashv$	(32)
Party v				<b>.</b>		15.26		0	= [	0	I			(32)
				affective wi Internal wall			ated using	i formula 1	/[(1/U-valu	ie)+0.04] a	is given in	n paragraph	1 3.2	
			= S (A x		,			(26)(30	) + (32) =				49.5	(33)
		Cm = S(	·	,					((28)	(30) + (32	2) + (32a)	(32e) =	0	(34)
				⊃ = Cm ÷	- TFA) ir	ו kJ/m²K			Indica	tive Value	: Medium		250	(35)
		•	•	tails of the	,			ecisely the	e indicative	values of	TMP in T	able 1f		
			tailed calc											
	-	•		culated ı	• •	-	K						6.79	(36)
			are not kn	own (36) =	= 0.15 x (3	1)			(22)	(26) =				
	abric he		alaulataa	الماميم						(36) =	OC)	<b>、</b>	56.29	(37)
ventila			r	monthly		1	11	A	r	= 0.33 × (		T	1	
(20)-	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(38)
(38)m=	38.23	38.23	38.23	38.23	38.23	38.23	38.23	38.23	38.23	38.23	38.23	38.23	l	(00)
		coefficie	1		a				1	= (37) + (3			1	
(39)m=	94.52	94.52	94.52	94.52	94.52	94.52	94.52	94.52	94.52	94.52	94.52	94.52		

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Average = Sum(39)<sub>1...12</sub> /12=  $94.5p_{age 2}$ 



Average = Sum(41):,1220.38(40)Number of days in month (Table 1a)JuiJuiAugSepOctNovDec(41)::::::::::::::::::::::::::::::::::::	Heat lo	oss para	ameter (I	HLP), W	/m²K					(40)m	= (39)m ÷	(4)			
Number of days in month (Table 1a) (4) $an$ Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec 31 28 31 30 31 30 31 30 31 30 31 30 31 (41) (41) $an$ Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (41) $an$ Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (42) (11 TFA 13.9, N = 1 Assumed occupancy, N (42) (11 TFA 13.9, N = 1 Annual average hot water usage in litres per day Vd, average = (25 x N) + 35 Reduct be annual wrange hot water usage by 5% (If the dwelling is designed to achieve a water use target of and more that 125 litres per garped by 30, If the dwelling is designed to achieve a water use target of and more that 125 litres per garped by 30, If the dwelling is designed to achieve a water use target of and more that 125 litres per day cal water usage in factor from Table Table Table 32, If the dwelling is designed to achieve a water use target of the water usage in these red water each month Vd in factor from Table Table 12, If 13, If 143, If 144, If 16, 36, If 21, 24, If 146, 36, If 21, 24, If 146, 36, If 144, If 16, 36, If 144, If 14, If 144, If	(40)m=	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98		
(41)m:       31       28       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31        <	Numbe	er of day	ys in mo	nth (Tab	le 1a)					,	Average =	Sum(40) <sub>1.</sub>	12 /12=	0.98	(40)
4. Water healing energy requirement:         Whityear:           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)         2.71         (42)           Annual average hot water usage in litres per day Vd, average = (25 x N) + 36 Reduce the annual average hot water usage b f5 with evables its designed to achieve a water use larget of not more that 125 litres per parson per day (all water use, hot and cold)         98.45         (43)           Jan         Feb         Mar         Apr.         May         Jun         Jul         Aug         Sep         Oct         Nov         Dec           Hot water usage in litres 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, if m factor from Table 1c x (43)         Total = Sum(41) =         Total = Sum(42) =         Total = Sum(44) =         1181.35         (44)           (45) me (100.59         140.45         121.24         104.63         96.95         111.25         132.8         131.2         132.9         132.9         143.21         158.92         Total = Sum(45) =         Total = Sum(45) =         Total = Sum(45) =         Total = Sum(42) =         Total = Sum(42) =		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
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 E 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA - 13.9)2)] + 0.0013 x (TFA - 13.9) if TFA E 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA - 13.9)2)] + 0.0013 x (TFA - 13.9) if TFA E 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA - 13.9)2)] + 0.0013 x (TFA - 13.9) if TFA E 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA - 13.9)2)] + 0.0013 x (TFA - 13.9) if TFA E 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA - 13.9)2)] + 0.0013 x (TFA - 13.9) if TFA E 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA - 13.9)2)] + 0.0013 x (TFA - 13.9) if TFA E 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA - 13.9)2)] + 0.0013 x (TFA - 13.9) if TFA E 13.9, N = 1 + 1.76 x [1 - exp(-10.001349 x (TFA - 13.9)2)] + 0.0013 x (TFA - 13.9) if TFA = 10.59 140.45 144.94 128.36 12.24 134.1 Jul Aug Sep Oct Nov Dec if 0.000 140.45 144.94 128.38 121.24 104.83 96.95 111.25 112.58 131.2 143.22 155.52 Total = Sum(45)= 1548.94 (45) if 1.0012 140.45 144.94 128.38 121.24 104.83 96.95 111.25 112.58 131.2 143.22 155.52 Total = Sum(45)= 1548.94 (45) if 1.0012 12.17 21.74 18.95 18.19 15.69 14.54 16.69 16.89 19.68 21.48 23.33 (46) Water storage loss: 0 (47) if community heating and no tank in dwelling, enter 10 in boxes (46) to (67) Charwas if no stored hot water (this includes instantaneous combi bioliers) enter '0' in (47) Water storage loss: 10 formunity heating and no tank in dwelling, enter 110 litres in (47) Otherwise if no stored hot water (this includes instantaneous combi bioliers) enter '0' in (47) Water storage loss factor from Table 2b 0 (61) if community heating see section 4.3 Volume factor from Table 2b 0 (62) 10 mandacturer's declared loss factor is known (kWh/day): 10 (47) x (51) x (52) x (52) = 0 (53) 10 (54) in (55) (55) 10 (55) 10 (55) 10 (56) 10 (56) 10 (56) (56) 10 (56) 10 (57) (56) (56) (56) 10 (57) (57) (57) (57) (57) = (56) m whate (H11) is from Appendix H (57)m 0 0 0	(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
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 E 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA - 13.9)2)] + 0.0013 x (TFA - 13.9) if TFA E 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA - 13.9)2)] + 0.0013 x (TFA - 13.9) if TFA E 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA - 13.9)2)] + 0.0013 x (TFA - 13.9) if TFA E 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA - 13.9)2)] + 0.0013 x (TFA - 13.9) if TFA E 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA - 13.9)2)] + 0.0013 x (TFA - 13.9) if TFA E 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA - 13.9)2)] + 0.0013 x (TFA - 13.9) if TFA E 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA - 13.9)2)] + 0.0013 x (TFA - 13.9) if TFA E 13.9, N = 1 + 1.76 x [1 - exp(-10.001349 x (TFA - 13.9)2)] + 0.0013 x (TFA - 13.9) if TFA = 10.59 140.45 144.94 128.36 12.24 134.1 Jul Aug Sep Oct Nov Dec if 0.000 140.45 144.94 128.38 121.24 104.83 96.95 111.25 112.58 131.2 143.22 155.52 Total = Sum(45)= 1548.94 (45) if 1.0012 140.45 144.94 128.38 121.24 104.83 96.95 111.25 112.58 131.2 143.22 155.52 Total = Sum(45)= 1548.94 (45) if 1.0012 12.17 21.74 18.95 18.19 15.69 14.54 16.69 16.89 19.68 21.48 23.33 (46) Water storage loss: 0 (47) if community heating and no tank in dwelling, enter 10 in boxes (46) to (67) Charwas if no stored hot water (this includes instantaneous combi bioliers) enter '0' in (47) Water storage loss: 10 formunity heating and no tank in dwelling, enter 110 litres in (47) Otherwise if no stored hot water (this includes instantaneous combi bioliers) enter '0' in (47) Water storage loss factor from Table 2b 0 (61) if community heating see section 4.3 Volume factor from Table 2b 0 (62) 10 mandacturer's declared loss factor is known (kWh/day): 10 (47) x (51) x (52) x (52) = 0 (53) 10 (54) in (55) (55) 10 (55) 10 (55) 10 (56) 10 (56) 10 (56) (56) 10 (56) 10 (57) (56) (56) (56) 10 (57) (57) (57) (57) (57) = (56) m whate (H11) is from Appendix H (57)m 0 0 0															
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 Reduce the annual average hot water usage in litres per day Vd,average = (25 x N) + 36 Reduce the annual average hot water usage in litres per day Ud,average = (25 x N) + 36 Reduce the annual average hot water usage in litres per day Ud,average = (25 x N) + 36 Reduce the annual average hot water usage in litres per day Ud,average = (25 x N) + 36 (43) Total = Sum(44), = (44) If (44) <sup>me</sup> 106.29 104.35 100.42 96.48 92.54 98.6 86 92.54 96.48 100.42 104.35 108.29 Total = Sum(44), = (1181.35 (44) If (44) <sup>me</sup> 106.29 104.05 104.42 106.48 92.54 98.6 86 92.54 96.48 100.42 104.35 108.29 Total = Sum(44), = (1181.35 (44) If (45) <sup>me</sup> 100.59 140.45 144.94 126.36 121.24 104.63 96.95 111.25 112.58 131.2 143.22 155.52 If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61) If (49) <sup>me</sup> 24.09 21.07 21.74 18.95 18.19 15.69 144.54 16.69 16.89 19.68 21.48 23.33 (46) Water storage loss: a) If manufacturer's declared loss factor is known (kWh/day): 0 (47) Water storage loss: a) If manufacturer's declared loss factor is known (kWh/day): 0 (48) Temperature factor from Table 2b (49) = 0 (49) If community heating and no tank in dwelling, enter 110 litres in (47) Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47) Water storage loss: factor from Table 2 (kWh/litre/day) 0 (51) If community heating see section 4.3 Volume factor from Table 2A (47) x (51) x (52) x (53) = 0 (52) Temperature factor from Table 2A (47) x (51) x (52) x (53) = 0 (53) Temperature factor from Table 2A (47) x (51) x (52) x (53) = 0 (53) Temperature factor from Table 2A (52) (53) = 0 (53) Temperature factor from Table 2A (52) (53) = 0 (53) Temperature factor from Table 2A (52) (53) = 0 (53) Temperature factor from Table 2A (53) (55) (55) (55) (55) (55) (55)	4. Wa	iter hea	ting ene	rgy requ	irement:								kWh/ye	ear:	
Reduce the annual average hot water usage by 5% if the divelling is designed to achieve a water use target of not more that 125 litres per person per day (all water usa, hot and cold)       Image: Ima	if TF	A > 13.	9, N = 1		[1 - exp	(-0.0003	349 x (TF	-A -13.9	)2)] + 0.(	0013 x ( <sup>-</sup>	TFA -13.		71		(42)
Hot water usage in littes per day for each month Vd.m = factor from Table 1c x [43]       Total = Sum(4), =         (44)m=       108.29       104.35       100.42       96.48       92.54       88.6       92.54       96.48       100.42       104.35       108.29         Total = Sum(4), =       1181.35       (44)         # 100.59       140.45       144.94       126.36       121.24       104.63       96.95       111.25       112.58       131.2       143.32       155.52         If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)       Total = Sum(45), =       1548.94       (45)         Water Storage loss:       100.42       10.4.8       131.2       143.32       155.52         Storage volume (litres) including any solar or WWHRS storage within same vessel       0       (47)         Hot water storage loss:       0       (47)         Water storage loss:       0       (47)         Water storage loss:       0       (48)       (49) =       0       (47)         Water storage loss:       0       (47)       (48) x (49) =       0       (47)         Water storage loss:       0       (47)       (48) x (49) =       0       (50)         b) If manufacturer's de	Reduce	the annua	al average	hot water	usage by	5% if the a	lwelling is	designed			se target o		.45		(43)
(44)me       108 29       104 35       100 42       96 48       92 54       88.6       89.6       92 54       96.48       100 42       104 35       108 29         Total = Sum(44) =       1181.35       (44)         Energy content of hot water used - calculated monthly = 4.190 x Vd.m x nm x DTm / 3600 kWMmonth (see Tables 1b. 1c. 1d)         (44)         (45)         Total = Sum(41) =       1181.35       (44)         (44)         (44)         (45)         Total = Sum(45) =         (181.35       111.25       112.58       131.22       155.52         Total = Sum(45) =       1548.94       (45)         (46)         (46)         (47)         (48)       12.63       19.68       14.54       16.69       16.89       19.68       21.48       23.33       (46)         Water storage loss:       (47)         O       (47)         (48) × (49)        0       (47)         Manufacture's declared loss factor is known (kWh/day):       0		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Total = Sum(44)	Hot wate	er usage i	n litres per	day for ea	ach month	Vd,m = fa	ctor from T	Table 1c x	(43)						
Energy content of hot water used - calculated monthly = 4.190 x Vd, m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d) $\begin{aligned} (45)m = 160.59 140.45 144.94 126.36 121.24 104.63 96.95 111.25 112.58 131.2 143.22 155.52 Total = Sum(45)$	(44)m=	108.29	104.35	100.42	96.48	92.54	88.6	88.6	92.54	96.48	100.42	104.35	108.29		
160.59       140.45       144.94       126.36       121.24       104.63       96.95       111.25       112.58       131.2       143.22       155.52         Total = Sum(45) =       1548.94       (45)         trinstantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)         (46)         (47)         formation of the set of the se	Energy	content of	f hot water	used - cal	culated m	onthly = 4	190 v Vd r	n v nm v F	)Tm / 360(			· · ·		1181.35	(44)
Total = Sum(45)			i	i					i			i	,	l	
<i>if instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)</i> (46)me       24.09       21.07       21.74       18.95       18.19       15.69       14.54       16.69       16.89       19.68       21.48       23.33       (46)         Water storage loss:       0       0       0       0       (47)       0       (47)         Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)       0       (47)         Water storage loss:       0       0       0       (48)         Year storage loss:       0       (47)         a) If manufacturer's declared loss factor is known (kWh/day):       0       (48)         Temperature factor from Table 2b       0       (49)         Energy lost from water storage, kWh/year       (48) × (49) =       0       (50)         b) If manufacturer's declared cylinder loss factor is not known:       0       (51)       (52) × (52) × (53) =       0       (51)         How water storage loss factor from Table 2b       0       0       (61)       (61)       (62)       (63)         Energy lost from water storage, kWh/year       (47) × (51) × (52) × (52) =       0       (62)       (63)         Energy lost from water storage, kWh/year       (47) × (51) × (52) × (53) =<	(43)11-	100.59	140.43	144.94	120.30	121.24	104.05	90.95	111.25					1548 94	(45)
Water storage loss:Storage volume (litres) including any solar or WWHRS storage within same vessel0(47)If community heating and no tank in dwelling, enter 110 litres in (47)Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)Water storage loss:a) If manufacturer's declared loss factor is known (kWh/day): $0$ (48)Temperature factor from Table 2bColspan="2">Colspan="2"Colspan	lf instant	taneous v	vater heati	ng at point	of use (no	o hot water	r storage),	enter 0 in	boxes (46			111(-10)112		1040.04	()
Storage volume (litres) including any solar or WWHRS storage within same vessel       0       (47)         If community heating and no tank in dwelling, enter 110 litres in (47)       0       (47)         Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)       Water storage loss:       0       (48)         a) If manufacturer's declared loss factor is known (kWh/day):       0       (48)       (49)       (49)         Temperature factor from Table 2b       0       (49)       (49)       (49)       (49)         Energy lost from water storage, kWh/year       (48) x (49) =       0       (50)       (51)         If community heating see section 4.3       0       (51)       (52)       (53)       (53)         Volume factor from Table 2a       0       (52)       (53)       (53)       (53)       (54)         Energy lost from water storage, kWh/year       (47) x (51) x (52) x (53) =       0       (53)       (55)         Water storage loss calculated for each month       ((56)m = (55) × (41)m       (56)m = (56) × (41)m       (56)m       (56)         (57)m 0       0       0       0       0       0       0       (57)         Primary circuit loss (annual) from Table 3       0       (57)       (58)       (58)       (58)	(46)m=	24.09	21.07	21.74	18.95	18.19	15.69	14.54	16.69	16.89	19.68	21.48	23.33		(46)
If community heating and no tank in dwelling, enter 110 litres in (47) Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47) Water storage loss: a) If manufacturer's declared loss factor is known (kWh/day): 0 (48) Temperature factor from Table 2b $0$ (49) Energy lost from water storage, kWh/year (48) x (49) = $0$ (50) b) If manufacturer's declared cylinder loss factor is not known: Hot water storage loss factor from Table 2 (kWh/litre/day) $0$ (51) If community heating see section 4.3 Volume factor from Table 2b $0$ (52) Temperature factor from Table 2b $0$ (52) Temperature factor from Table 2b (53) Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = $0$ (54) Enter (50) or (54) in (55) $0$ (55) Water storage loss calculated for each month ((56)m = (55) × (41)m (56)m where (H11) is from Appendix H (57)m $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$		•		) in alvelie		- 		-	itleine er					I	
Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)Water storage loss:0(48)a) If manufacturer's declared loss factor is known (kWh/day):0(48)Temperature factor from Table 2b0(49)Energy lost from water storage, kWh/year(48) x (49) =0b) If manufacturer's declared cylinder loss factor is not known:0(50)Hot water storage loss factor from Table 2 (kWh/litre/day)0(51)If community heating see section 4.30(52)Volume factor from Table 2a0(52)Temperature factor from Table 2b0(53)Energy lost from water storage, kWh/year(47) x (51) x (52) x (53) =0Energy lost from water storage, kWh/year(47) x (51) x (52) x (53) =0Energy lost from water storage, kWh/year(47) x (51) x (52) x (53) =0Energy lost from water storage, kWh/year(47) x (51) x (52) x (53) =0(56)me00000(56)me00000(56)me00000(57)me00000(57)me00000(57)me00000(57)me00000(57)me00000(57)me00000(57)me00000(5	•				0,			•		ame ves	sei		0		(47)
Water storage loss:0(48)a) If manufacturer's declared loss factor is known (kWh/day):0(48)Temperature factor from Table 2b0(49)Energy lost from water storage, kWh/year(48) × (49) =0b) If manufacturer's declared cylinder loss factor is not known:0(50)Hot water storage loss factor from Table 2 (kWh/litre/day)0(51)If community heating see section 4.30(52)Volume factor from Table 2a0(52)Temperature factor from Table 2b0(53)Energy lost from water storage, kWh/year(47) × (51) × (52) × (53) =0Energy lost from water storage, kWh/year(47) × (51) × (52) × (53) =0Energy lost from water storage, kWh/year(47) × (51) × (52) × (53) =0(56) me [50) or (54) in (55)000(56) me [000000(56) me [000000(57) me [000000(57) me [000000Primary circuit loss (annual) from Table 30(57)Primary circuit loss calculated for each month (59) m = (58) + 365 × (41) m(58)Primary circuit loss calculated for each month (59) m = (58) + 365 × (41) m(58)Primary circuit loss calculated for each month (59) m = (58) + 365 × (41) m(58)		•	•			•			• •	ers) ente	er '0' in (	47)			
Temperature factor from Table 2b (49) Energy lost from water storage, kWh/year (48) × (49) = 0 (50) b) If manufacturer's declared cylinder loss factor is not known: Hot water storage loss factor from Table 2 (kWh/litre/day) 0 (51) If community heating see section 4.3 Volume factor from Table 2a 0 (52) Temperature factor from Table 2b 0 (53) Energy lost from water storage, kWh/year (47) × (51) × (52) × (53) = 0 (54) Enter (50) or (54) in (55) 0 (56) (56) (56) (56) (56) (56) (56) (56)					,					,	,				
Energy lost from water storage, kWh/year (48) x (49) = 0 (50) b) If manufacturer's declared cylinder loss factor is not known: Hot water storage loss factor from Table 2 (kWh/litre/day) 0 (51) If community heating see section 4.3 Volume factor from Table 2a 0 (52) Temperature factor from Table 2b (53) Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54) Enter (50) or (54) in (55) (55) Water storage loss calculated for each month ((56)m = (55) × (41)m (56)m $0$ 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	a) If m	anufact	turer's d	eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)
b) If manufacturer's declared cylinder loss factor is not known: Hot water storage loss factor from Table 2 (kWh/litre/day) 0 (51) If community heating see section 4.3 Volume factor from Table 2a 0 (52) Temperature factor from Table 2b 0 (53) Energy lost from water storage, kWh/year (47) $\times$ (51) $\times$ (52) $\times$ (53) = 0 (54) Enter (50) or (54) in (55) 0 (55) (55) 0 (56) 0 (56) Water storage loss calculated for each month ((56)m = (55) $\times$ (41)m (56)m 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 (56)) If cylinder contains dedicated solar storage, (57)m = (56)m $\times$ [(50) – (H11)] + (50), else (57)m = (56)m where (H11) is from Appendix H (57)m 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 (57) Primary circuit loss (annual) from Table 3 0 (58) Primary circuit loss calculated for each month (59)m = (58) $\div$ 365 $\times$ (41)m (modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)	•												0		(49)
Hot water storage loss factor from Table 2 (kWh/litre/day) If community heating see section 4.3 Volume factor from Table 2a Temperature factor from Table 2b Energy lost from water storage, kWh/year Enter (50) or (54) in (55) Water storage loss calculated for each month ( $(56)m = 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0$				-	-		or is not		(48) x (49	) =			0		(50)
If community heating see section 4.3 Volume factor from Table 2a Temperature factor from Table 2b Energy lost from water storage, kWh/year Enter (50) or (54) in (55) Water storage loss calculated for each month ( $(56)m = 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 $	,												0		(51)
Temperature factor from Table 2b(53)Energy lost from water storage, kWh/year $(47) \times (51) \times (52) \times (53) =$ 0(54)Enter (50) or (54) in (55)Water storage loss calculated for each month $((56)m = (55) \times (41)m$ (56)m $=$ 00000(56)m $=$ 00000(57)m $=$ 00000(56)If cylinder contains dedicated solar storage, (57)m $=$ (56)m $\times$ [(50) - (H11)] $+$ (50), else (57)m $=$ (56)m where (H11) is from Appendix H(57)m $=$ 0000000(57)m $=$ 000000(57)m $=$ 000000(58) $\times$ 365 $\times$ (41)m(c		•	-		on 4.3										
Energy lost from water storage, kWh/year $(47) \times (51) \times (52) \times (53) = 0$ (54) Enter (50) or (54) in (55) 0 (55) (41)m (56)m = (56) m x [(50) - (H11)] + (50), else (57)m = (56)m where (H11) is from Appendix H (57)m = 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0					0										
Enter (50) or (54) in (55) Water storage loss calculated for each month $(56)m = (55) \times (41)m$ (56)m = 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0													0		
Water storage loss calculated for each month $((56)m = (55) \times (41)m$ $(56)m = 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 $				-	e, KVVh/ye	ear			(47) x (51	) x (52) x (	53) =		-		
$(56)m = \boxed{0}  0  0  0  0  0  0  0  0  0 $		. ,	. , .	,	for each	month			((56)m = (	55) × (41)	m		0		(55)
If cylinder contains dedicated solar storage, $(57)m = (56)m \times [(50) - (H11)] + (50)$ , else $(57)m = (56)m$ where $(H11)$ is from Appendix H (57)m = 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0			-			i	0				i	0	0		(56)
Primary circuit loss (annual) from Table 3 Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m (modified by factor from Table H5 if there is solar water heating and a cylinder thermostat) (58)	1.												-	ix H	(00)
Primary circuit loss (annual) from Table 3 Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m (modified by factor from Table H5 if there is solar water heating and a cylinder thermostat) (58)	(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m (modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)															
(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)		•					59)m = (	(58) ÷ 36	65 × (41)	m			U		(00)
		•				•	,		• •		r thermo	stat)			
	(59)m=	0	0	0	0	0	0	0	0	0	0	0	0		(59)



Combi	loss cal	lculated	for each	n month (	61)m =	(60) ÷ 36	65 × (41)	)m						
(61)m=	50.96	46.03	50.96	47.58	47.16	43.69	45.15	47.16	47.58	50.96	49.32	50.96		(61)
Total h	eat requ	uired for	water h	eating ca	alculated	for each	n month	(62)m =	0.85 ×	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	211.55	186.48	195.9	173.94	168.4	148.32	142.1	158.41	160.16	182.16	192.53	206.48		(62)
Solar DH	IW input o	calculated	using App	endix G or	Appendix	H (negativ	ve quantity	/) (enter '0	' if no sola	r contribut	ion to wate	er heating)		
(add a	dditiona	l lines if	FGHRS	and/or V	VWHRS	applies,	, see Ap	pendix (	G)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
FHRS	36.49	26.88	20.95	11.7	9.16	7.72	7.39	8.33	8.37	14.85	27.67	37.7		(63) (G2)
WWHRS	-51.74	-45.53	-46.47	-38.23	-35.5	-29.28	-24.78	-30.01	-30.88	-38.18	-44.22	-50.01		(63) (G10
Output	from wa	ater hea	ter											
(64)m=	121.48	112.41	126.64	122.3	122.05	109.75	108.3	118.38	119.19	127.3	118.86	116.94		
			•	•				Outp	out from w	ater heate	r (annual)₁	12	1423.6	(64)
Heat g	ains froi	m water	heating,	, kWh/mo	onth 0.2	5 ´ [0.85	× (45)m	+ (61)m	n] + 0.8 x	x [(46)m	+ (57)m	+ (59)m	]	
(65)m=	66.14	58.21	60.93	53.91	52.1	45.71	43.52	48.78	49.33	56.36	59.95	64.45		(65)
inclu	de (57)ı	m in calo	culation	of (65)m	only if c	ylinder is	s in the c	dwelling	or hot w	vater is fr	om com	munity h	eating	
5. Int	ernal ga	ains (see	e Table 5	5 and 5a)	):									
			e 5), Wat	,										
motab	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	135.26	135.26	135.26	135.26	135.26	135.26	135.26	135.26	135.26	135.26	135.26	135.26		(66)
Liahtin	a aains	(calcula	ted in Ar	pendix l	equat	ion L9 or	r L9a). a	lso see <sup>-</sup>	Table 5	ļ	1			
(67)m=	22.34	19.84	16.14	12.22	9.13	7.71	8.33	10.83	14.54	18.46	21.54	22.96		(67)
	nces dai	ins (calc	ulated in	Append	lix Lea	uation L	13 or I 1	i 3a) also	) see Ta	ble 5				
(68)m=	250.61	253.21	246.66	232.71	215.09	198.54	187.49	184.89	191.44	205.39	223	239.55		(68)
				ı ppendix			or I 15a'	l ) also se	e Table	ـــــــــــــــــــــــــــــــــــــ				
(69)m=	36.53	36.53	36.53	36.53	36.53	36.53	36.53	36.53	36.53	36.53	36.53	36.53		(69)
			(Table {											
(70)m=	3	3 3 3 3		3	3	3	3	3	3	3	3	3		(70)
		-					0	0	0	5	5	ÿ		()
(71)m=	-108.2	-108.2	-108.2	tive valu -108.2	-108.2	-108.2	-108.2	-108.2	-108.2	-108.2	-108.2	-108.2		(71)
				-100.2	-100.2	-100.2	-100.2	-100.2	-100.2	-100.2	-100.2	-100.2		('')
	88.89	gains (T	able 5) 81.9	74.97	70.02	63.49	E0 E	65.57	C0 E1	75.76	02.06	96.62	1	(72)
(72)m=		86.62		74.87	70.03		58.5	65.57	68.51	75.76	83.26	86.63		(72)
		gains =			000.04			1	· ·	(70)m + (7	· · ·	i		(70)
(73)m=		426.25	411.27	386.37	360.84	336.32	320.89	327.86	341.06	366.18	394.38	415.72		(73)
	ar gains			r flux from	Table 6c		atod ogua	tions to co	nvort to th			ion		
•			•	r flux from						e applicat	FF	IUII.	Coinc	
Unenta		Access F Table 6d		Area m²		Flu: Tab	x ble 6a	Т	g_ able 6b	Т	able 6c		Gains (W)	
Northea	_	0.77	x				1.28	) × [	0.76	□ × □	0.7	=	30.74	(75)
		0.77	· · ·	1 1.3		<u>^    </u>	1.20	<b>^</b>	0.70	· ^	0.7		30.74	(,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,

х

x

8.26

7.39

11.28

22.97

х

x

0.76

0.76

Х

х

0.7

0.7

=

=

х

x

Northeast 0.9x

Northeast 0.9x

0.77

0.77

34.36

62.57

(75)

(75)

be	compliance <b>testing</b> consulting
build energy	

Northeast 0.9x	0.77	x	8.26	x	22.97	×	0.76	x	0.7	] =	69.94	(75)
Northeast 0.9x	0.77	x	7.39	×	41.38	x	0.76	x	0.7	] =	112.74	(75)
Northeast 0.9x	0.77	x	8.26	x	41.38	x	0.76	x	0.7	] =	126.01	(75)
Northeast 0.9x	0.77	x	7.39	x	67.96	×	0.76	x	0.7	] =	185.15	(75)
Northeast 0.9x	0.77	x	8.26	x	67.96	×	0.76	x	0.7	] =	206.94	(75)
Northeast 0.9x	0.77	x	7.39	x	91.35	×	0.76	x	0.7	] =	248.87	(75)
Northeast 0.9x	0.77	x	8.26	×	91.35	×	0.76	x	0.7	] =	278.17	(75)
Northeast 0.9x	0.77	x	7.39	×	97.38	×	0.76	x	0.7	] =	265.33	(75)
Northeast 0.9x	0.77	x	8.26	×	97.38	×	0.76	x	0.7	] =	296.56	(75)
Northeast 0.9x	0.77	x	7.39	×	91.1	×	0.76	x	0.7	] =	248.21	(75)
Northeast 0.9x	0.77	x	8.26	x	91.1	×	0.76	x	0.7	] =	277.43	(75)
Northeast 0.9x	0.77	x	7.39	×	72.63	×	0.76	x	0.7	] =	197.87	(75)
Northeast 0.9x	0.77	x	8.26	x	72.63	x	0.76	x	0.7	] =	221.17	(75)
Northeast 0.9x	0.77	x	7.39	x	50.42	×	0.76	x	0.7	] =	137.37	(75)
Northeast 0.9x	0.77	x	8.26	×	50.42	×	0.76	x	0.7	] =	153.54	(75)
Northeast 0.9x	0.77	x	7.39	×	28.07	×	0.76	x	0.7	] =	76.47	(75)
Northeast 0.9x	0.77	x	8.26	x	28.07	×	0.76	x	0.7	] =	85.47	(75)
Northeast 0.9x	0.77	x	7.39	x	14.2	x	0.76	x	0.7	] =	38.68	(75)
Northeast 0.9x	0.77	x	8.26	x	14.2	×	0.76	x	0.7	] =	43.23	(75)
Northeast 0.9x	0.77	x	7.39	x	9.21	x	0.76	x	0.7	] =	25.1	(75)
Northeast 0.9x	0.77	x	8.26	x	9.21	×	0.76	x	0.7	] =	28.06	(75)
Southeast 0.9x	0.77	x	3.5	x	36.79	×	0.76	x	0.7	] =	47.48	(77)
Southeast 0.9x	0.77	x	5.28	x	36.79	×	0.76	x	0.7	] =	71.62	(77)
Southeast 0.9x	0.77	x	3.5	×	62.67	x	0.76	x	0.7	] =	80.87	(77)
Southeast 0.9x	0.77	x	5.28	x	62.67	×	0.76	x	0.7	] =	122	(77)
Southeast 0.9x	0.77	x	3.5	×	85.75	×	0.76	x	0.7	] =	110.65	(77)
Southeast 0.9x	0.77	x	5.28	×	85.75	×	0.76	x	0.7	] =	166.93	(77)
Southeast 0.9x	0.77	x	3.5	x	106.25	×	0.76	x	0.7	] =	137.1	(77)
Southeast 0.9x	0.77	x	5.28	×	106.25	×	0.76	x	0.7	] =	206.83	(77)
Southeast 0.9x	0.77	x	3.5	×	119.01	×	0.76	x	0.7	=	153.57	(77)
Southeast 0.9x	0.77	x	5.28	x	119.01	X	0.76	x	0.7	=	231.67	(77)
Southeast 0.9x	0.77	x	3.5	x	118.15	X	0.76	x	0.7	=	152.46	(77)
Southeast 0.9x	0.77	x	5.28	x	118.15	×	0.76	x	0.7	=	229.99	(77)
Southeast 0.9x	0.77	x	3.5	x	113.91	X	0.76	x	0.7	=	146.98	(77)
Southeast 0.9x	0.77	x	5.28	x	113.91	X	0.76	x	0.7	=	221.74	(77)
Southeast 0.9x	0.77	x	3.5	x	104.39	X	0.76	x	0.7	=	134.7	(77)
Southeast 0.9x	0.77	x	5.28	x	104.39	X	0.76	x	0.7	=	203.21	(77)
Southeast 0.9x	0.77	x	3.5	x	92.85	X	0.76	x	0.7	=	119.81	(77)
Southeast 0.9x	0.77	x	5.28	×	92.85	×	0.76	x	0.7	] =	180.75	(77)
Southeast 0.9x	0.77	x	3.5	×	69.27	×	0.76	x	0.7	] =	89.38	(77)
Southeast 0.9x	0.77	x	5.28	×	69.27	×	0.76	x	0.7	] =	134.84	(77)



Southeast 0.9x	0.77	X	3.5	5	X	44	.07	×	0.76	×	0.7	=		56.87	(77)
Southeast 0.9x	0.77	x	5.28	8	x	44	.07	x	0.76	x	0.7	=		85.79	(77)
Southeast 0.9x	0.77	x	3.5	5	x	31	.49	x	0.76	×	0.7	=		40.63	(77)
Southeast 0.9x	0.77	x	5.28	8	x	31	.49	<b>x</b>	0.76	×	0.7	=		61.29	(77)
Southwest <sub>0.9x</sub>	0.77	x	8.26	6	x	36	6.79	] [	0.76	×	0.7	=		112.05	(79)
Southwest <sub>0.9x</sub>	0.77	x	8.26	6	x	62	2.67	] [	0.76	×	0.7	=		190.86	(79)
Southwest0.9x	0.77	x	8.26	6	x	85	5.75	] [	0.76	×	0.7	=		261.14	(79)
Southwest <sub>0.9x</sub>	0.77	x	8.26	6	x	10	6.25	] [	0.76	×	0.7	=		323.56	(79)
Southwest <sub>0.9x</sub>	0.77	x	8.26	6	x	11	9.01	] [	0.76	×	0.7	=		362.42	(79)
Southwest <sub>0.9x</sub>	0.77	x	8.26	6	x	11	8.15	] [	0.76	×	0.7	=		359.8	(79)
Southwest <sub>0.9x</sub>	0.77	x	8.26	6	x	11	3.91	] [	0.76	x	0.7	=		346.88	(79)
Southwest <sub>0.9x</sub>	0.77	x	8.26	6	x	10	4.39	] [	0.76	×	0.7	=		317.9	(79)
Southwest <sub>0.9x</sub>	0.77	x	8.26	6	x	92	2.85	] [	0.76	×	0.7	=		282.76	(79)
Southwest <sub>0.9x</sub>	0.77	x	8.26	6	x	69	9.27	] [	0.76	×	0.7	=		210.94	(79)
Southwest <sub>0.9x</sub>	0.77	x	8.26	6	x	44	l.07	] [	0.76	×	0.7	=		134.21	(79)
Southwest <sub>0.9x</sub>	0.77	x	8.26	6	x	31	.49	Ì	0.76	×	0.7	=		95.89	(79)
		-													
Solar gains in wa	itts, calcula	ated	for each	n mont	h			(83)m	= Sum(74)m .	(82)m			_		
(83)m= 296.25 5	26.24 777	.46	1059.59	1274.7	7 13	04.13	1241.24	1074.	85 874.23	597.1	358.77	250.98			(83)
Total gains – inte	ernal and s	olar	(84)m =	(73)m	ו + (מ	33)m ,	watts						_		
			4445 00	4005 5							750 45	000 7			(84)
(84)m= 724.67 9	52.49 1188	3.73	1445.96	1635.5	4 16	40.45	1562.13	1402	.7 1215.29	963.28	753.15	666.7			(04)
(84)m= 724.67 9 7. Mean interna	I					640.45	1562.13	1402	.7 1215.29	963.28	753.15	000.7			(04)
	l temperat	ure (	heating	seaso	on)					963.28	753.15	000.7		21	(85)
7. Mean interna	l temperat Iring heatir	ure ( ng pe	heating eriods in	seaso the liv	n) /ing	area fr	om Tab			963.28	753.15	000.7		21	
7. Mean interna Temperature du Utilisation factor	l temperat Iring heatin	ure ( ng pe	heating eriods in	seaso the liv	on) /ing m (s	area fr	om Tab		Th1 (°C)	963.28 Oct	753.15 Nov	Dec		21	
7. Mean interna Temperature du Utilisation factor Jan	l temperat Iring heatir for gains	ure ( ng pe for li ar	heating eriods in ving area	seaso the liv a, h1,i	on) /ing m (s /	area fr ee Tab	om Tab ble 9a)	ble 9,	Th1 (°C) g Sep					21	
7. Mean interna Temperature du Utilisation factor Jan (86)m= 0.99	l temperat Iring heatin for gains Feb M 0.97 0.	ure ( ng pe for li ar	heating eriods in ving area Apr 0.74	seaso the liv a, h1,i May 0.53	on) /ing m (s /	area fr ee Tat Jun 0.37	rom Tab ble 9a) Jul 0.27	Die 9, Au 0.31	Th1 (°C) g Sep 0.53	Oct	Nov	Dec		21	(85)
7. Mean interna Temperature du Utilisation factor Jan (86)m= 0.99 0 Mean internal te	l temperat Iring heatin for gains Feb M 0.97 0.	ure ( ng pe for li ar 9 e in li	heating eriods in ving area Apr 0.74	seaso the liv a, h1,i May 0.53	ving m (s /	area fr ee Tat Jun 0.37	rom Tab ble 9a) Jul 0.27	Die 9, Au 0.31	Th1 (°C) g Sep 0.53	Oct	Nov	Dec	」 【二 】 】	21	(85)
7. Mean interna         Temperature du         Utilisation factor         Jan         (86)m=       0.99         Mean internal te         (87)m=       20.14	I temperatIring heatingfor gainsFebM0.970.emperature20.420	ure ( ng pe for li ar 9 e in li .7	heating eriods in ving area Apr 0.74 iving are 20.92	seaso the liv a, h1,i <u>May</u> 0.53 ea T1 ( 20.99	n) /ing m (s /	area fr ee Tak Jun D.37 w step 21	rom Tab ble 9a) Jul 0.27 bs 3 to 7 21	ole 9, Au 0.31 7 in Ta 21	Th1 (°C) g Sep 0.53 able 9c) 20.99	Oct 0.86	Nov 0.98	Dec 1		21	(85)
7. Mean interna Temperature du Utilisation factor (86)m= 0.99 ( Mean internal te (87)m= 20.14 ( Temperature du	I temperat       uring heatin       for gains       Feb     M       0.97     0.1       emperature       20.4     20       uring heatin	ure ( ng pe for li ar 9 e in li .7	heating eriods in ving area Apr 0.74 iving are 20.92 eriods in	seaso the liv a, h1,i May 0.53 ea T1 ( 20.99	(follo	area fr ee Tab Jun 0.37 w step 21 'elling	rom Tab ble 9a) Jul 0.27 bs 3 to 7 21 from Ta	ole 9, Au 0.31 7 in Ta 21 able 9	Th1 (°C) g Sep 0.53 able 9c) 20.99 , Th2 (°C)	Oct 0.86 20.84	Nov 0.98 20.42	Dec 1 20.07		21	(85) (86) (87)
7. Mean interna Temperature du Utilisation factor (86)m= 0.99 0 Mean internal te (87)m= 20.14 2 Temperature du (88)m= 20.1 2	I temperaturing heatinfor gainsFebM0.970.1emperature20.420uring heatin20.120	ure ( ng pe for li ar 9 e in li .7 ng pe .1	heating eriods in ving area Apr 0.74 iving are 20.92 eriods in 20.1	seaso the liv a, h1,i May 0.53 ea T1 ( 20.99 rest o 20.1	on) ving m (s / (follo of dw	area fr ee Tab Jun 0.37 w step 21 velling	rom Tab ble 9a) Jul 0.27 bs 3 to 7 21 from Ta 20.1	ole 9, Au 0.31 7 in Ta 21 able 9 20.1	Th1 (°C) g Sep 0.53 able 9c) 20.99 , Th2 (°C)	Oct 0.86	Nov 0.98	Dec 1		21	(85)
7. Mean interna Temperature du Utilisation factor Jan (86)m= 0.99 0 Mean internal te (87)m= 20.14 2 Temperature du (88)m= 20.1 2	I temperaturing heatingfor gainsFebM0.970.emperature20.420uring heating20.120for gains	ure ( ng pe for li ar 9 9 2 9 1 7 1 1 1	heating eriods in ving area Apr 0.74 iving are 20.92 eriods in 20.1 est of dw	seaso the liv a, h1,1 May 0.53 ea T1 ( 20.99 rest o 20.1 velling	n) m (s /(follo	area fr ee Tab Jun 0.37 w step 21 velling 20.1 m (see	rom Tab ble 9a) Jul 0.27 bs 3 to 7 21 from Ta 20.1 e Table	Die 9, Au 0.31 7 in Ta 21 able 9 20.1 9a)	Th1 (°C) g Sep 0.53 able 9c) 20.99 , Th2 (°C) 20.1	Oct 0.86 20.84 20.1	Nov 0.98 20.42 20.1	Dec 1 20.07 20.1		21	(85) (86) (87) (88)
7. Mean interna Temperature du Utilisation factor (86)m= 0.99 ( Mean internal te (87)m= 20.14 ( Temperature du (88)m= 20.1 ( Utilisation factor	I temperaturing heatinfor gainsFebM0.970.1emperature20.420uring heatin20.120	ure ( ng pe for li ar 9 9 2 9 1 7 1 1 1	heating eriods in ving area Apr 0.74 iving are 20.92 eriods in 20.1	seaso the liv a, h1,i May 0.53 ea T1 ( 20.99 rest o 20.1	n) m (s /(follo	area fr ee Tab Jun 0.37 w step 21 velling	rom Tab ble 9a) Jul 0.27 bs 3 to 7 21 from Ta 20.1	ole 9, Au 0.31 7 in Ta 21 able 9 20.1	Th1 (°C) g Sep 0.53 able 9c) 20.99 , Th2 (°C) 20.1	Oct 0.86 20.84	Nov 0.98 20.42	Dec 1 20.07		21	(85) (86) (87)
7. Mean interna         Temperature du         Utilisation factor         Jan         (86)m=       0.99         Mean internal te         (87)m=       20.14         Temperature du         (88)m=       20.1         Utilisation factor         (88)m=       0.99         Mean internal te         (89)m=       0.99         Mean internal te	I temperat         uring heatin         for gains         Feb       M         0.97       0.         emperature         20.4       20         uring heatin         20.1       20         ring heatin         20.1       20         of for gains       0.97         0.97       0.8         emperature       0.97	ure ( ng pe for li ar 9 9 9 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	heating eriods in ving area Apr 0.74 iving are 20.92 eriods in 20.1 est of dw 0.69 he rest c	seaso the liv a, h1,1 May 0.53 ea T1 ( 20.99 rest o 20.1 velling 0.48 of dwe	n) ving m (s / (follo of dw , h2, ( ulling	area fr ee Tab Jun 0.37 w step 21 velling 20.1 m (see 0.32	rom Tab ole 9a) Jul 0.27 os 3 to 7 21 from Ta 20.1 e Table 0.21 llow ste	ole 9, Au 0.31 7 in Ta 21 able 9 20.1 9a) 0.25	Th1 (°C) g Sep 0.53 able 9c) 20.99 , Th2 (°C) 20.1 5 0.46	Oct 0.86 20.84 20.1 0.82	Nov 0.98 20.42 20.1	Dec 1 20.07 20.1		21	(85) (86) (87) (88) (89)
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7. Mean interna         Temperature du         Utilisation factor         Jan         (86)m=       0.99         Mean internal temperature du         (87)m=       20.14         Temperature du         (88)m=       20.1         Utilisation factor         (88)m=       0.99         Mean internal temperature du         (88)m=       0.99         Utilisation factor         (89)m=       0.99         Mean internal temperature	I temperat         uring heatin         for gains         Feb       M         0.97       0.         emperature         20.4       20         uring heatin         20.1       20         ring heatin         20.1       20         of for gains       0.97         0.97       0.8         emperature       0.97	ure ( ng pe for li ar 9 9 9 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	heating eriods in ving area Apr 0.74 iving are 20.92 eriods in 20.1 est of dw 0.69 he rest c	seaso the liv a, h1,1 May 0.53 ea T1 ( 20.99 rest o 20.1 velling 0.48 of dwe	n) ving m (s / (follo of dw , h2, ( ulling	area fr ee Tab Jun 0.37 w step 21 velling 20.1 m (see 0.32 T2 (fo	rom Tab ole 9a) Jul 0.27 os 3 to 7 21 from Ta 20.1 e Table 0.21 llow ste	ole 9, Au 0.31 7 in Ta 21 able 9 20.1 9a) 0.25 eps 3 f	Th1 (°C) g Sep 0.53 able 9c) 20.99 , Th2 (°C) 20.1 5 0.46 to 7 in Tabl 20.1	Oct 0.86 20.84 20.1 0.82 e 9c) 19.94	Nov           0.98           20.42           20.1           0.98	Dec 1 20.07 20.1 0.99 18.87		21	(85) (86) (87) (88) (89)
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7. Mean internaTemperature duUtilisation factorJan(86)m=0.99Mean internal te(87)m=20.14Temperature du(88)m=20.1Utilisation factor(89)m=0.99Mean internal te(90)m=18.961Mean internal te(92)m=19.571Apply adjustment	ItemperatureIring heatingfor gainsFebM0.970.emperature20.420uring heating20.120for gains0.970.8emperature19.3419.emperature19.8920.	ure ( ng pe for li ar 9 e in li 7 ng pe 1 for re 38 e in ti 75 e (for 24 ean	heating eriods in ving area Apr 0.74 iving are 20.92 eriods in 20.1 est of dw 0.69 he rest of 20.02	seaso the liv a, h1,1 May 0.53 ea T1 ( 20.99 rest o 20.1 velling 0.48 of dwe 20.09	n) ving m (s / (follo (follo f dw i, h2, ( velling 2 vellin 2 veratu	area fr ee Tab Jun 0.37 w step 21 20.1 m (see 0.32 T2 (fo 20.1 T2 (fo 20.1 T2 (fo 20.1	rom Tab ole 9a) Jul 0.27 os 3 to 7 21 from Ta 20.1 e Table 0.21 llow ste 20.1 A × T1 20.56	ble 9, Au 0.31 7 in Ta 21 able 9 20.1 9a) 0.25 20.1 + (1 - 20.5	Th1 (°C) g Sep 0.53 able 9c) 20.99 , Th2 (°C) 20.1 5 0.46 to 7 in Tabl 20.1 f - fLA) × T2 6 20.56 /here approx	Oct 0.86 20.84 20.1 0.82 e 9c) 19.94 LA = Livi 20.41	Nov           0.98           20.42           20.1           0.98           19.37           ng area + (4)	Dec 1 20.07 20.1 0.99 18.87 1) =			(85) (86) (87) (88) (89) (90) (91)
7. Mean internaTemperature duUtilisation factorJan(86)m=0.99Mean internal te(87)m=20.14Temperature du(88)m=20.1Utilisation factor(89)m=0.99Mean internal te(90)m=18.961Mean internal te(92)m=19.571Apply adjustment	Itemperatureiring heatingfor gainsFebM0.970.emperature20.420iring heating20.120for gains0.970.8emperature19.3419.emperature19.8920.nt to the m19.7420.	ure (         ng pe         for li         ar         9         ar         9         ar         ng pe         1         for re         8         ar         75         ean         09         09	heating eriods in ving area Apr 0.74 iving are 20.92 eriods in 20.1 est of dw 0.69 he rest of 20.02 the who 20.02	seaso the liv a, h1,1 May 0.53 ea T1 ( 20.99 rest o 20.1 velling 0.48 of dwe 20.09 ole dw 20.55 tempe	n) ving m (s / (follo (follo f dw i, h2, ( velling 2 vellin 2 veratu	area fr ee Tab Jun 0.37 w step 21 elling 20.1 m (see 0.32 T2 (fo 20.1 T2 (fo 20.1 T2 (fo 20.1	rom Tab ole 9a) Jul 0.27 os 3 to 7 21 from Ta 20.1 e Table 0.21 llow ste 20.1 A × T1 20.56 n Table	Au         0.31         7 in Ta         21         able 9         20.1         9a)         0.25         eps 3 f         20.1         + (1 -         20.5         44e, w	Th1 (°C) g Sep 0.53 able 9c) 20.99 , Th2 (°C) 20.1 5 0.46 to 7 in Tabl 20.1 f - fLA) × T2 6 20.56 /here approx	Oct 0.86 20.84 20.1 0.82 e 9c) 19.94 LA = Livi 20.41 ppriate	Nov           0.98           20.42           20.1           0.98           19.37           ng area + (4           19.92	Dec 1 20.07 20.1 0.99 18.87 1) = 19.49			(85) (86) (87) (88) (89) (90) (91) (92)
7. Mean interna Temperature du Utilisation factor $\begin{bmatrix} Jan \\ 0.99 \end{bmatrix}$ Mean internal te (86)m= 0.99 0 Mean internal te (87)m= 20.14 2 Temperature du (88)m= 20.1 2 Utilisation factor (89)m= 0.99 0 Mean internal te (90)m= 18.96 1 Mean internal te (92)m= 19.57 1 Apply adjustment (93)m= 19.42 1 8. Space heatin Set Ti to the me	I temperatureiring heatingfor gainsFebM0.970.emperature20.420iring heating20.120r for gains0.970.80.970.8emperature19.3419.i9.8920.nt to the m19.7420.g requireman interna	ure ( ng pe for li ar 9 e in li 7 ng pe 1 for re 88 e in ti 75 e (for 24 ean 09 nent l tem	heating eriods in ving are Apr 0.74 iving are 20.92 eriods in 20.1 est of dw 0.69 he rest of 20.02 the who 20.49 internal 20.34	seaso the liv a, h1,1 May 0.53 ea T1 ( 20.99 rest o 20.1 velling 0.48 of dwe 20.09 ole dw 20.55 tempe 20.4	n) ving m (s / (follo f dw f dw f dw f dw f dw f 2 cellin 2 ceratu 2 ined	area fr ee Tab Jun 0.37 w step 21 celling 20.1 m (see 0.32 T2 (fo 0.32 T2 (fo 0.34 T2 (fo 0.34	rom Tab ble 9a) Jul 0.27 bs 3 to 7 21 from Ta 20.1 e Table 0.21 llow ste 20.1 A × T1 20.56 n Table 20.41	Die 9,         Au         0.31         7 in Ta         21         able 9         20.1         9a)         0.25         20.1         9a)         0.25         20.1         + (1 -         20.5         4e, w         20.4	Th1 (°C) g Sep 0.53 able 9c) 20.99 , Th2 (°C) 20.1 5 0.46 to 7 in Tabl 20.1 f - fLA) × T2 6 20.56 /here approx 1 20.41	Oct 0.86 20.84 20.1 0.82 e 9c) 19.94 LA = Livi 20.41 ppriate 20.26	Nov           0.98           20.42           20.1           0.98           19.37           ng area ÷ (4           19.92           19.77	Dec 1 20.07 20.1 0.99 18.87 1) = 19.49 19.34		0.52	(85) (86) (87) (88) (89) (90) (91) (92)
7. Mean interna Temperature du Utilisation factor $\begin{bmatrix} Jan \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\$	Itemperaturering heatingfor gainsFebM0.970.emperature20.420uring heating20.120ring heating20.120of or gains0.970.8emperature19.3419.emperature19.8920.nt to the m19.7420.g requireman internactor for gains	ure ( ng pe for li ar 9 e in li 7 ng pe 1 for re 8 e (for 75 e (for 24 ean 09 nent l tem	heating eriods in ving are Apr 0.74 iving are 20.92 eriods in 20.1 est of dw 0.69 he rest of 20.02 the who 20.49 internal 20.34	seaso the liv a, h1,1 May 0.53 ea T1 ( 20.99 rest o 20.1 velling 0.48 of dwe 20.09 ole dw 20.55 tempe 20.4	n) ving m (s / (follo of dw (follo of dw (follo (foll	area fr ee Tab Jun 0.37 w step 21 celling 20.1 m (see 0.32 T2 (fo 0.32 T2 (fo 0.34 T2 (fo 0.34	rom Tab ble 9a) Jul 0.27 bs 3 to 7 21 from Ta 20.1 e Table 0.21 llow ste 20.1 A × T1 20.56 n Table 20.41	Die 9,         Au         0.31         7 in Ta         21         able 9         20.1         9a)         0.25         20.1         9a)         0.25         20.1         + (1 -         20.5         4e, w         20.4	Th1 (°C) g Sep 0.53 able 9c) 20.99 Th2 (°C) 20.1 5 0.46 to 7 in Tabl 20.1 f - fLA) × T2 6 20.56 /here approx 1 20.41 e 9b, so tha	Oct 0.86 20.84 20.1 0.82 e 9c) 19.94 LA = Livi 20.41 ppriate 20.26	Nov           0.98           20.42           20.1           0.98           19.37           ng area ÷ (4           19.92           19.77	Dec 1 20.07 20.1 0.99 18.87 1) = 19.49 19.34		0.52	(85) (86) (87) (88) (89) (90) (91) (92)



Utilisa	ation fac	tor for g	ains, hm	1:										
(94)m=	0.99	0.96	0.88	0.71	0.5	0.33	0.23	0.27	0.49	0.83	0.97	0.99		(94)
Usefu	ul gains,	hmGm	, W = (94	4)m x (84	4)m	•		•	•		•			
(95)m=	717.29	916.53	1048.92	1020.92	814.68	548.85	360.52	379.32	591.04	797.17	732.61	662.19		(95)
Month	nly aver	age exte	ernal tem	perature	e from Ta	able 8					-			
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat	loss rat	e for me	an intern	al tempe	erature,	Lm , W =	=[(39)m :	x [(93)m	– (96)m	]	-			
(97)m=	1429.07	1402.62	1284.92	1080.93	822.74	549.55	360.58	379.47	596.22	912.88	1197.2	1430.94		(97)
Space	e heatin	<u> </u>	ement fo	r each n	nonth, k	Wh/mon	th = 0.02	24 x [(97	)m – (95	)m] x (4	1)m			
(98)m=	529.56	326.65	175.59	43.21	6	0	0	0	0	86.08	334.51	571.95		_
								Tota	l per year	(kWh/yea	r) = Sum(9	8)15,912 =	2073.55	(98)
Space	e heatin	g require	ement in	kWh/m²	/year							[	21.48	(99)
9a. En	ergy red	quiremer	nts – Indi	ividual h	eating s	vstems i	ncluding	micro-C	CHP)			L		_
	e heati					,								
•		-	at from s	econdar	y/supple	mentary	system					]	0	(201)
Fracti	ion of s	bace hea	at from m	nain syst	em(s)			(202) = 1 -	- (201) =			Ì	1	(202)
Fracti	ion of to	tal heati	ng from	main sys	stem 1			(204) = (2	02) × [1 –	(203)] =		L L	1	(204)
			ace heat	-								Γ	90.4	(206)
	•	•	iry/suppl	0,		a sveton	n %					l	0	(208)
LIIICI						1								
-	Jan	Feb .	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/yea	ar
Space	-	ř ·	ement (c	r		í –	0		0	00.00	224 54	574.05		
	529.56	326.65	175.59	43.21	6	0	0	0	0	86.08	334.51	571.95		
(211)m	r	1	)4)] } x 1				1	1	1					(211)
	585.8	361.34	194.23	47.8	6.64	0	0	0	0	95.22	370.03	632.68		٦
								Tota	ll (kWh/yea	ar) =Sum(2	211) <sub>15,10</sub> 12	=	2293.75	(211)
•		•	econdar		month									
	i	1	00 ÷ (20											
(215)m=	0	0	0	0	0	0	0	0	0	0	0	0		
								Tota	ll (kWh/yea	ar) =Sum( <i>i</i>	215) <sub>15,10</sub> 12	- L	0	(215)
	heating	-	( / l .		· · · · · · · · · · · · · · · · · · ·									
Output	121.48	ater nea 112.41	ter (calc 126.64	122.3	122.05	109.75	108.3	118.38	119.19	127.3	118.86	116.94		
Efficier		l der hea		122.0	122.00	100.10	100.0	110.00	110.10	127.0	110.00	110.01	80.3	(216)
(217)m=	<u> </u>	87.58	85.87	82.71	80.72	80.3	80.3	80.3	80.3	84.09	87.51	88.51	00.0	(217)
					00.72	00.0	00.0	00.0	00.0	04.00	07.01	00.01		(=)
			, kWh/mo ) ÷ (217)											
. ,	137.54	128.36	147.47	147.86	151.19	136.67	134.87	147.42	148.43	151.39	135.82	132.12		
						-		Tota	I = Sum(2	19a) <sub>112</sub> =	-		1699.14	(219)
Annua	al totals	;								k	Wh/year		kWh/year	_
Space	heating	l fuel use	ed, main	system	1						-	[	2293.75	]
Water	heating	fuel use	ed									[	1699.14	Ī

Electricity for pumps, fans and electric keep-hot



(272)

(273)

(274)

1149.3

11.9

89

#### DER WorkSheet: New dwelling design stage

mechanical ventilation - balanced, extract or pos	itive input from outside		83.1		(230a)
central heating pump:			30		(230c)
boiler with a fan-assisted flue			45		(230e)
Total electricity for the above, kWh/year	sum of (230a	)(230g) =		158.1	(231)
Electricity for lighting				394.57	(232)
12a. CO2 emissions – Individual heating system	s including micro-CHP				
	<b>Energy</b> kWh/year	<b>Emission fa</b> kg CO2/kWh		<b>Emissions</b> kg CO2/ye	
Space heating (main system 1)	(211) x	0.216	=	495.45	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	367.01	(264)
Space and water heating	(261) + (262) + (263) + (264) =			862.46	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	82.06	(267)

sum of (265)...(271) =

(272) ÷ (4) =

Energy saving/generation technologies Total CO2, kg/year

#### **Dwelling CO2 Emission Rate**

El rating (section 14)



			User D	)etails:						
Assessor Name:	Peter Mitcl	hell		Strom	a Num	ber:		STRO	007945	
Software Name:	Stroma FS			Softwa					n: 1.0.4.5	
			Property.				) GREEI			
Address :	New Dwelli	ng at:, Gordon l	House, 6	Lissende	en Garde	ens, LOI	NDON, N	IW5 1LX	,	
1. Overall dwelling dim	ensions:									
			Area	a(m²)		Av. He	ight(m)		Volume(m <sup>3</sup> )	1
Ground floor			g	96.54	(1a) x	2	2.4	(2a) =	231.7	(3a)
Total floor area TFA = (	1a)+(1b)+(1c)+	(1d)+(1e)+(1	n) g	96.54	(4)					
Dwelling volume					(3a)+(3b)	)+(3c)+(3d	l)+(3e)+	.(3n) =	231.7	(5)
2. Ventilation rate:										
	main heating	seconda heating		other		total			m <sup>3</sup> per hour	•
Number of chimneys	0	+ 0	+ [	0	] = [	0	x 4	= 0	0	(6a)
Number of open flues	0	+ 0	= + F	0	] = [	0	x 2	20 =	0	(6b)
Number of intermittent fa	ans				- L	0	<b>x</b> 1	0 =	0	(7a)
Number of passive vent	S					0	<b>x</b> 1	0 =	0	(7b)
Number of flueless gas	fires				Г	0	x 4	- 0	0	(7c)
								Air ch	anges per ho	 r
Infiltration due to chinese			(7a)+(7b)+(	70) -	Г					_
Infiltration due to chimne If a pressurisation test has					continue fro	0 0 (9) to (		+ (5) =	0	(8)
Number of storeys in t						() ()	)		0	(9)
Additional infiltration							[(9)-	1]x0.1 =	0	(10)
Structural infiltration:	0.25 for steel of	r timber frame o	or 0.35 fo	r masonr	y constr	uction			0	(11)
if both types of wall are p			to the great	er wall are	a (after			•		-
deducting areas of open If suspended wooden			) 1 (seale	ad) else	enter ()			1	0	(12)
If no draught lobby, er		· ,	5. i (Seale	<i>u)</i> , 000					0	(12)
Percentage of window									0	(14)
Window infiltration				0.25 - [0.2	x (14) ÷ 1	00] =			0	(15)
Infiltration rate				(8) + (10)	+ (11) + (1	2) + (13) -	+ (15) =		0	(16)
Air permeability value	, q50, expresse	ed in cubic metr	es per ho	our per s	quare m	etre of e	nvelope	area	4	(17)
If based on air permeab	ility value, then	(18) = [(17) ÷ 20]+	(8), otherw	ise (18) = (	(16)				0.2	(18)
Air permeability value appli	es if a pressurisati	on test has been do	one or a deg	gree air pei	rmeability	is being us	sed	ľ		_
Number of sides shelter	ed			(00)	0.075 (4	0.1			3	(19)
Shelter factor				(20) = 1 -		9)] =			0.78	(20)
Infiltration rate incorpora	•			(21) = (18	) x (20) =				0.16	(21)
Infiltration rate modified										
Jan Feb	Mar Apr	May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind s	· · · · · · · · · · · · · · · · · · ·		1	r			1			
(22)m= 5.1 5	4.9 4.4	4.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (2	22)m ÷ 4									
(22a)m= 1.27 1.25	1.23 1.1	1.08 0.95	0.95	0.92	1	1.08	1.12	1.18		



Adjust	ed infiltr	ation rat	e (allowi	ng for sł	nelter an	d wind s	peed) =	(21a) x	(22a)m				_	
	0.2	0.19	0.19	0.17	0.17	0.15	0.15	0.14	0.16	0.17	0.17	0.18		
	<i>ate effec</i> echanica		-	rate for t	he appli	cable ca	se						0.5	(220)
				endix N, (2	(23a) = (23a	a) x Emv (e	equation (I	N5)) othe	rwise (23h	) = (23a)			0.5	(23a)
		• •	0	iency in %	, ,	, (		<i>,,</i> .	`	) (200)			0.5	(23b)
			-	-	-					Dh∖ma i (	00h) v [	1 (02a)	0	(23c)
a) II (24a)m=								(24a)	$a \ m = (22)$	) + m(as 0	230) × [	1 – (23c) 0	) - 100] ]	(24a)
		-	-	•	-		Ţ	Ţ			Ů	0	J	(244)
	-		r	entilation	i			1	p)m = (22)	, <u>,</u>	<u> </u>		1	(24b)
(24b)m=		0	0	0	0			0	ů	0	0	0		(240)
,				ntilation o then (24o	•	•				5 x (23)	.)			
(24c)m=	<u>, , , , , , , , , , , , , , , , , , , </u>	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	1	(24c)
										0.0	0.0	0.0	]	()
				ole hous m = (22						0.5]				
(24d)m=	<u>,                                     </u>	0	0	0	0	0	0	0	0	0	0	0	]	(24d)
Effe	ctive air	change	rate - er	nter (24a	) or (24t	) or (24	c) or (24	d) in bo	(25)				1	
(25)m=	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	1	(25)
													J	
				paramete						• • • • •				• • •
ELEN	/IEN I	Gros area		Openin m	-	Net Ar A ,r		U-val W/m2		A X U (W/		k-value kJ/m²·l		A X k kJ/K
Windo	ws Type		<b>、</b>			7.39		/[1/( 1.2 )+	0.04] =	8.46	, 			(27)
Windo	ws Type	2				3.5		/[1/( 1.2 )+	0.04] =	4.01	=			(27)
	ws Type						=	/[1/( 1.2 )+	L		$\exists$			(27)
	ws Type					8.26	=	/[1/( 1.2 )+	L	9.46	$\exists$			
	• •					8.26	=		L	9.46				(27)
	ws Type	; 5 				5.28		/[1/( 1.2 )+	0.04] =	6.05	_ ,			(27)
Walls		108.		32.6	9	75.45	5 X	0.16	=	12.07				(29)
Total a	area of e	lements	, m²			108.1	4							(31)
Party v	wall					19.25	5 X	0	=	0				(32)
Party v	wall					15.26	3 X	0	=	0				(32)
							ated using	formula 1	/[(1/U-valu	ie)+0.04] a	as given in	paragraph	1 3.2	
				nternal walı	ls and par	titions		(26)(30	) + (22) -					
			= S (A x	0)				(20)(30		(20) (2)	0) + (00-)	(22-) -	49.5	(33)
	apacity		. ,		TEAL	1.1/				(30) + (32		(32e) =	0	(34)
				⊃ = Cm ÷	,			a a ia a lu thu		tive Value		able 1f	250	(35)
			tailed calc	tails of the ulation.	construct	ion are no	t known pr	ecisely life	emuicative	values of		able II		
Therm	al bridge	es : S (L	x Y) cal	culated u	using Ap	pendix l	<						6.79	(36)
if details	s of therma	al bridging	are not kn	own (36) =	= 0.15 x (3	1)								
Total f	abric he	at loss							(33) +	(36) =			56.29	(37)
Ventila	ation hea	at loss c	alculated	monthl	y				(38)m	= 0.33 × (	25)m x (5	)	_	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	38.23	38.23	38.23	38.23	38.23	38.23	38.23	38.23	38.23	38.23	38.23	38.23	J	(38)
Heat ti	ransfer o	coefficie	nt, W/K						(39)m	= (37) + (	38)m			
(39)m=	94.52	94.52	94.52	94.52	94.52	94.52	94.52	94.52	94.52	94.52	94.52	94.52		
							_							(0.0)

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Average = Sum(39)<sub>1...12</sub> /12= 94.5 $p_{age 2}$ 



Heat lo	oss para	meter (H	HLP), W/	/m²K					(40)m	= (39)m ÷	(4)			
(40)m=	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98		_
Numbe	er of day	/s in moi	nth (Tab	le 1a)					/	Average =	Sum(40) <sub>1.</sub>	12 /12=	0.98	(40)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Wa	iter heat	ting enei	rgy requi	irement:								kWh/ye	ear:	
Assum		ipancy, I	N									74	I	(42)
			+ 1.76 x	[1 - exp	(-0.0003	49 x (TF	A -13.9	)2)] + 0.(	)013 x ( <sup>-</sup>	FFA -13.	<u>2.</u> 9)	71		(42)
	A £ 13.9	•				·			·					
			ater usag hot water							se target o		.45		(43)
		•	person per	• •		•	•			ie tu get e				
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	er usage ii	n litres per	day for ea	•		ctor from T	able 1c x	Ŭ Ŭ						
(44)m=	108.29	104.35	100.42	96.48	92.54	88.6	88.6	92.54	96.48	100.42	104.35	108.29		
											m(44) <sub>112</sub> =		1181.35	(44)
Energy o	content of	hot water	used - cal	culated mo	onthly = $4.$	190 x Vd,n	n x nm x D	0Tm / 3600	) kWh/mon	th (see Ta	bles 1b, 1	c, 1d)		
(45)m=	160.59	140.45	144.94	126.36	121.24	104.63	96.95	111.25	112.58	131.2	143.22	155.52		_
lf instan	taneous w	vater heatii	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46		Fotal = Sui	m(45) <sub>112</sub> =	:	1548.94	(45)
(46)m=	24.09	21.07	21.74	18.95	18.19	15.69	14.54	16.69	16.89	19.68	21.48	23.33		(46)
	storage													
-		. ,	) includin				-		ame ves	sel	(	0		(47)
		-	ind no ta hot wate		-			• •	ore) onto	or 'O' in (	47)			
	storage		not wate	51 (UIIS II		iistailtai					<i></i>			
	-		eclared l	oss facto	or is kno	wn (kWł	n/day):				(	0		(48)
Tempe	erature f	actor fro	m Table	2b							(	0		(49)
Energy	/ lost fro	m water	storage	, kWh/ye	ear			(48) x (49)	) =		(	0		(50)
,			eclared o	•									1	
		-	factor fr		e 2 (kWl	h/litre/da	iy)				(	0		(51)
	•	from Ta		011 4.5								) C		(52)
			m Table	2b								5 D		(53)
Energy	/ lost fro	m water	storage	, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =		0		(54)
•••		(54) in (5	-									- D		(55)
Water	storage	loss cal	culated f	for each	month			((56)m = (	55) × (41)ı	m				
(56)m=	0	0	0	0	0	0	0	0	0	0	0	0		(56)
If cylinde	er contains	s dedicate	d solar sto	rage, (57)	m = (56)m	x [(50) – (	H11)] ÷ (5	0), else (5	7)m = (56)	m where (I	H11) is fro	m Append	i lix H	
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primar	y circuit	loss (ar	nual) fro	om Table	e 3						(	C		(58)
	-		culated		-	-								
•		1	rom Tab	1	i			<u> </u>	· ·		, 		I	
(59)m=	0	0	0	0	0	0	0	0	0	0	0	0		(59)



Combi	loss cal	culated	for each	month (	(61)m =	(60) ÷ 36	35 × (41	)m						
(61)m=	50.96	46.03	50.96	47.58	47.16	43.69	45.15	47.16	6 47.58	50.96	49.32	50.96	]	(61)
Total h	eat requ	uired for	water he	eating ca	alculated	for eacl	h month	(62)m	י 1 = 0.85 ×	(45)m +	(46)m +	(57)m +	· (59)m + (61)m	
(62)m=	211.55	186.48	195.9	173.94	168.4	148.32	142.1	158.4	1 160.16	182.16	192.53	206.48	]	(62)
Solar DH	IW input o	calculated	using App	endix G or	Appendix	H (negativ	ve quantity	y) (ente	r '0' if no sol	ar contribut	ion to wate	er heating)	)	
(add ac	ditiona	l lines if	FGHRS	and/or V	WHRS	applies	, see Ap	pendi	x G)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	]	(63)
FHRS	31.8	23.57	17.43	10.72	9.02	7.72	7.39	8.33	8 8.37	12.67	24.09	33.01	-	(63) (G2)
WWHRS	-51.74	-45.53	-46.47	-38.23	-35.5	-29.28	-24.78	-30.0	-30.88	-38.18	-44.22	-50.01		(63) (G10)
Output	from wa	ater heat	ter											
(64)m=	126.18	115.73	130.17	123.27	122.18	109.75	108.3	118.3	38 119.19	129.48	122.44	121.62	]	
•								C	Output from v	ater heate	r (annual)₁	12	1446.69	(64)
Heat ga	ains froi	m water	heating,	kWh/mo	onth 0.2	5 ´ [0.85	× (45)m	ı <b>+ (61</b>	)m] + 0.8	x [(46)m	+ (57)m	+ (59)m	n]	
(65)m=	66.14	58.21	60.93	53.91	52.1	45.71	43.52	48.78	8 49.33	56.36	59.95	64.45	]	(65)
inclu	de (57)ı	m in calc	culation of	of (65)m	only if c	ylinder i	s in the a	dwellir	ng or hot v	vater is fr	om com	munity I	neating	
5. Int	ernal ga	ains (see	e Table 5	and 5a)	):									
Metabo	olic gain	s (Table	e 5), Wat	ts										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Au	g Sep	Oct	Nov	Dec	]	
(66)m=	162.31	162.31	162.31	162.31	162.31	162.31	162.31	162.3	31 162.31	162.31	162.31	162.31		(66)
Lighting	g gains	(calcula	ted in Ar	pendix l	⊥, equat	ion L9 o	r L9a), a	lso se	e Table 5	•	•	•	-	
(67)m=	55.86	49.61	40.35	30.54	22.83	19.28	20.83	27.07	7 36.34	46.14	53.85	57.41	]	(67)
Appliar	nces gai	ins (calc	ulated in	Append	lix L, eq	uation L	13 or L1	3a), a	lso see Ta	ble 5			-	
(68)m=	374.04	377.93	368.14	347.32	321.04	296.33	279.83	275.9	95 285.73	306.55	332.84	357.54	]	(68)
Cookin	g gains	(calcula	ited in A	ppendix	L, equa	tion L15	or L15a	), also	see Table	e 5			-	
(69)m=	53.94	53.94	53.94	53.94	53.94	53.94	53.94	53.94	4 53.94	53.94	53.94	53.94	]	(69)
Pumps	and far	ns gains	(Table 5	ja)		<u> </u>							-	
(70)m=	3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses	e.g. ev	aporatio	on (negat	ive valu	es) (Tab	ole 5)				-	-		-	
(71)m=	-108.2	-108.2	-108.2	-108.2	-108.2	-108.2	-108.2	-108.	.2 -108.2	-108.2	-108.2	-108.2	]	(71)
Water I	heating	gains (T	able 5)			<u> </u>				•			-	
(72)m=	88.89	86.62	81.9	74.87	70.03	63.49	58.5	65.57	7 68.51	75.76	83.26	86.63	]	(72)
Total i	nternal	gains =				(66)	)m + (67)m	ı + (68)ı	m + (69)m +	(70)m + (7	1)m + (72)	)m	-	
(73)m=	629.83	625.19	601.43	563.78	524.94	490.13	470.2	479.6	501.62	539.49	580.99	612.61	]	(73)
6. Sol	ar gains	s:											•	
Solar g	ains are c	alculated	using sola	r flux from	Table 6a	and associ	iated equa	itions to	convert to t	he applicat	ole orientat	tion.		
Orienta		Access F		Area		Flu			g_		FF		Gains	
	Т	Table 6d		m²		Tab	ble 6a		Table 6b	Т	able 6c		(W)	
Northea	ist 0.9x	0.77	x	7.3	i9	x 1	1.28	) × [	0.76	x	0.7	=	30.74	(75)
Northea	ist <sub>0.9x</sub>	0.77	x	8.2	.6	x 1	1.28	x	0.76	x	0.7	=	34.36	(75)

x

0.77

7.39

22.97

х

0.76

х

0.7

=

x

Northeast 0.9x

62.57

(75)



Northeast 0.9x	0.77	x	8.26	×	22.97	x	0.76	x	0.7	] =	69.94	(75)
Northeast 0.9x	0.77	x	7.39	x	41.38	x	0.76	x	0.7	<b>j</b> =	112.74	(75)
Northeast 0.9x	0.77	x	8.26	x	41.38	x	0.76	x	0.7	] =	126.01	(75)
Northeast 0.9x	0.77	x	7.39	×	67.96	x	0.76	x	0.7	] =	185.15	(75)
Northeast 0.9x	0.77	x	8.26	x	67.96	x	0.76	x	0.7	] =	206.94	(75)
Northeast 0.9x	0.77	x	7.39	x	91.35	x	0.76	x	0.7	] =	248.87	(75)
Northeast 0.9x	0.77	x	8.26	x	91.35	x	0.76	x	0.7	] =	278.17	(75)
Northeast 0.9x	0.77	x	7.39	x	97.38	x	0.76	x	0.7	] =	265.33	(75)
Northeast 0.9x	0.77	x	8.26	x	97.38	x	0.76	x	0.7	] =	296.56	(75)
Northeast 0.9x	0.77	x	7.39	x	91.1	x	0.76	x	0.7	] =	248.21	(75)
Northeast 0.9x	0.77	x	8.26	x	91.1	x	0.76	x	0.7	=	277.43	(75)
Northeast 0.9x	0.77	x	7.39	x	72.63	x	0.76	x	0.7	=	197.87	(75)
Northeast 0.9x	0.77	x	8.26	×	72.63	x	0.76	x	0.7	] =	221.17	(75)
Northeast 0.9x	0.77	x	7.39	x	50.42	x	0.76	x	0.7	=	137.37	(75)
Northeast 0.9x	0.77	x	8.26	×	50.42	x	0.76	x	0.7	] =	153.54	(75)
Northeast 0.9x	0.77	x	7.39	x	28.07	x	0.76	x	0.7	] =	76.47	(75)
Northeast 0.9x	0.77	x	8.26	x	28.07	x	0.76	x	0.7	=	85.47	(75)
Northeast 0.9x	0.77	x	7.39	×	14.2	x	0.76	x	0.7	] =	38.68	(75)
Northeast 0.9x	0.77	x	8.26	x	14.2	x	0.76	x	0.7	] =	43.23	(75)
Northeast 0.9x	0.77	x	7.39	x	9.21	x	0.76	x	0.7	=	25.1	(75)
Northeast 0.9x	0.77	x	8.26	x	9.21	x	0.76	x	0.7	=	28.06	(75)
Southeast 0.9x	0.77	x	3.5	x	36.79	x	0.76	x	0.7	] =	47.48	(77)
Southeast 0.9x	0.77	x	5.28	x	36.79	x	0.76	x	0.7	] =	71.62	(77)
Southeast 0.9x	0.77	x	3.5	x	62.67	x	0.76	x	0.7	] =	80.87	(77)
Southeast 0.9x	0.77	x	5.28	x	62.67	x	0.76	x	0.7	] =	122	(77)
Southeast 0.9x	0.77	x	3.5	x	85.75	x	0.76	x	0.7	] =	110.65	(77)
Southeast 0.9x	0.77	x	5.28	x	85.75	x	0.76	x	0.7	] =	166.93	(77)
Southeast 0.9x	0.77	x	3.5	x	106.25	x	0.76	x	0.7	=	137.1	(77)
Southeast 0.9x	0.77	x	5.28	x	106.25	x	0.76	x	0.7	=	206.83	(77)
Southeast 0.9x	0.77	x	3.5	x	119.01	x	0.76	x	0.7	=	153.57	(77)
Southeast 0.9x	0.77	x	5.28	x	119.01	x	0.76	x	0.7	=	231.67	(77)
Southeast 0.9x	0.77	x	3.5	x	118.15	x	0.76	x	0.7	=	152.46	(77)
Southeast 0.9x	0.77	x	5.28	x	118.15	X	0.76	x	0.7	=	229.99	(77)
Southeast 0.9x	0.77	x	3.5	x	113.91	X	0.76	x	0.7	=	146.98	(77)
Southeast 0.9x	0.77	x	5.28	x	113.91	x	0.76	x	0.7	=	221.74	(77)
Southeast 0.9x	0.77	x	3.5	×	104.39	×	0.76	x	0.7	=	134.7	(77)
Southeast 0.9x	0.77	x	5.28	×	104.39	×	0.76	x	0.7	] =	203.21	(77)
Southeast 0.9x	0.77	x	3.5	x	92.85	x	0.76	x	0.7	] =	119.81	(77)
Southeast 0.9x	0.77	x	5.28	×	92.85	×	0.76	x	0.7	=	180.75	(77)
Southeast 0.9x	0.77	x	3.5	x	69.27	x	0.76	x	0.7	] =	89.38	(77)
Southeast 0.9x	0.77	x	5.28	x	69.27	X	0.76	x	0.7	] =	134.84	(77)



		_		_			1 1					_		
Southeast 0.9x	0.77	×	3.5	×		44.07	X	0.76	_ ×	0.7	=	▫∟	56.87	(77)
Southeast 0.9x	0.77	x	5.28	×		44.07	X	0.76	×	0.7	=	Ľ	85.79	(77)
Southeast 0.9x	0.77	x	3.5	×		31.49	X	0.76	×	0.7	=	Ľ	40.63	(77)
Southeast 0.9x	0.77	x	5.28	x		31.49	X	0.76	×	0.7	=	Ľ	61.29	(77)
Southwest <sub>0.9x</sub>	0.77	x	8.26	×		36.79		0.76	×	0.7	=		112.05	(79)
Southwest <sub>0.9x</sub>	0.77	x	8.26	x		62.67		0.76	×	0.7	=	-	190.86	(79)
Southwest0.9x	0.77	x	8.26	x		85.75	]	0.76	×	0.7	=	- [	261.14	(79)
Southwest <sub>0.9x</sub>	0.77	x	8.26	x		106.25		0.76	×	0.7	=	- [	323.56	(79)
Southwest <sub>0.9x</sub>	0.77	x	8.26	x		119.01		0.76	×	0.7	=	- [	362.42	(79)
Southwest <sub>0.9x</sub>	0.77	x	8.26	×		118.15	]	0.76	×	0.7	=	- [	359.8	(79)
Southwest <sub>0.9x</sub>	0.77	x	8.26	x		113.91		0.76	×	0.7	=	-	346.88	(79)
Southwest <sub>0.9x</sub>	0.77	x	8.26	×		104.39		0.76	×	0.7	=	- [	317.9	(79)
Southwest0.9x	0.77	x	8.26	×		92.85	1	0.76	×	0.7		- Г	282.76	(79)
Southwest <sub>0.9x</sub>	0.77	x	8.26	×		69.27		0.76	×	0.7	=	- [	210.94	(79)
Southwest0.9x	0.77	x	8.26	×		44.07		0.76	×	0.7	=	- [	134.21	(79)
Southwest <sub>0.9x</sub>	0.77	x	8.26	×		31.49		0.76	×	0.7	=	- [	95.89	(79)
Solar <u>g</u> ains in	watts, calc	ulated	for each mo	onth			(83)m	= Sum(74)m	.(82)m			_		
(83)m= 296.25	526.24 7	77.46	1059.59 127	74.7	1304.1	3 1241.24	1074	.85 874.23	597.1	358.77	250.98	8		(83)
Total gains –	internal and	l solar	(84)m = (73	3)m +	(83)r	n , watts						_		
<mark>(84)</mark> m= 926.08	1151.44 13	378.89	1623.37 179	9.64	1794.2	27 1711.43	1554	.47 1375.85	1136.5	8 939.76	863.59	Э		(84)
7. Mean inte	rnal temper	ature (	heating sea	ason)				····		- <b>-</b>				
7. Mean inte Temperature		```	Ŭ		g are	a from Tab	ole 9,	Th1 (°C)					21	(85)
	e during hea	ating pe	eriods in the	e living	-		ole 9,	Th1 (°C)					21	(85)
Temperature	e during hea	ating pe	eriods in the ving area, h	e living	-	Table 9a)	ole 9,		Oct	Nov	Dec		21	(85)
Temperature Utilisation fac	e during hea ctor for gair Feb	ating pe	eriods in the ving area, h Apr M	e living n1,m (	see	Table 9a)		ıg Sep	Oct 0.78	Nov 0.95	Dec 0.99		21	(85)
Temperature Utilisation fa	e during hea ctor for gair Feb 0.94	ating pe ns for lin Mar 0.85	eriods in the ving area, h Apr M 0.67 0.	e living n1,m ( /lay 48	Jun 0.34	Table 9a)Jul0.24	Aı 0.2	ug Sep 8 0.47					21	
Temperature Utilisation fac Jan (86)m= 0.98	e during hea ctor for gair Feb 0.94 al temperatu	ating pe ns for lin Mar 0.85	eriods in the ving area, h Apr M 0.67 0. ving area T	e living n1,m ( /lay 48	Jun 0.34	Table 9a)Jul0.24	Aı 0.2	ug Sep 8 0.47 able 9c)					21	
Temperature Utilisation fac (86)m= 0.98 Mean interna (87)m= 20.33	e during hea ctor for gain Feb 0.94 al temperatu 20.56	ating penns for lin Mar 0.85 ure in li 20.8	eriods in the ving area, h Apr M 0.67 0. ving area T 20.95 20	e living n1,m ( /ay 48 1 (foll .99	Jun 0.34 low s 21	Jul           0.24           teps 3 to 7           21	Aı 0.2 7 in T 2 <sup>7</sup>	ug Sep 8 0.47 able 9c) 21	0.78	0.95	0.99		21	(86)
Temperature Utilisation fac (86)m= 0.98 Mean interna	e during hea ctor for gair Feb 0.94 al temperatu 20.56 e during hea	ating penns for lin Mar 0.85 ure in li 20.8	eriods in the ving area, h Apr M 0.67 0. ving area T 20.95 20 eriods in res	e living n1,m ( /ay 48 1 (foll .99	Jun 0.34 low s 21	Jul           0.24           teps 3 to 7           21	Aı 0.2 7 in T 2 <sup>7</sup>	ug Sep 8 0.47 able 9c) 21 , Th2 (°C)	0.78	0.95	0.99		21	(86)
Temperature Utilisation fac (86)m= 0.98 Mean interna (87)m= 20.33 Temperature (88)m= 20.1	e during hea ctor for gain Feb 0.94 al temperatu 20.56 during hea 20.1	ating penns for lin Mar 0.85 ure in li 20.8 ating penns 20.1	eriods in the ving area, h Apr M 0.67 0. ving area T 20.95 20 eriods in res 20.1 20	e living 1,m ( 1ay 48 1 (foll .99 5t of d 0.1		Table 9a)           Jul           0.24           teps 3 to 7           21           ng from Ta           20.1	Au 0.2 7 in T 2 <sup>-</sup> able 9 20.	ug Sep 8 0.47 able 9c) 21 , Th2 (°C)	0.78	0.95	0.99 20.26		21	(86) (87)
Temperature Utilisation fac (86)m= 0.98 Mean interna (87)m= 20.33 Temperature (88)m= 20.1 Utilisation fac	e during hea ctor for gair Feb 0.94 al temperatu 20.56 e during hea 20.1	ating penns for lin Mar 0.85 ure in lin 20.8 ating penns for re	eriods in the ving area, h Apr M 0.67 0. ving area T 20.95 20 eriods in res 20.1 20 est of dwelli	e living 1,m ( 1ay 48 1 (foll .99 5t of d 0.1		Table 9a)         Jul         0.24         teps 3 to 7         21         ng from Ta         20.1         see Table	Au 0.2 7 in T 2 <sup>7</sup> able 9 20. 9a)	Ig     Sep       8     0.47       able 9c)     21       0, Th2 (°C)     20.1	0.78 20.91 20.1	0.95 20.58 20.1	0.99 20.26 20.1		21	(86) (87) (88)
Temperature Utilisation fac (86)m= 0.98 Mean interna (87)m= 20.33 Temperature (88)m= 20.1 Utilisation fac (89)m= 0.97	e during hea ctor for gain Feb 0.94 al temperatu 20.56 e during hea 20.1 ctor for gain 0.93	ating penns for lin Mar 0.85 ure in li 20.8 ating penns 20.1 ns for re 0.82	eriods in the ving area, h Apr M 0.67 0. ving area T 20.95 20 eriods in res 20.1 20 est of dwelli 0.63 0.	e living 1,m ( 1,m ( 48 1 (foll .99 5t of d 0.1 ing, h 44	3see Jun 0.34 low s 21 wellin 20.1 2,m ( 0.29	Table 9a)           Jul           0.24           teps 3 to 7           21           ng from Ta           20.1           see Table           0.19	Au 0.2 7 in T 2 <sup>-</sup> able 9 20. 9a) 0.2	ug Sep 8 0.47 able 9c) 21 9, Th2 (°C) 1 20.1 3 0.41	0.78 20.91 20.1 0.74	0.95	0.99 20.26		21	(86) (87)
Temperature Utilisation fac (86)m= 0.98 Mean interna (87)m= 20.33 Temperature (88)m= 20.1 Utilisation fac (89)m= 0.97 Mean interna	e during hea ctor for gain Feb 0.94 al temperatu 20.56 e during hea 20.1 ctor for gain 0.93 al temperatu	ating penns for lin Mar 0.85 ure in li 20.8 ating penns 20.1 ms for re 0.82 ure in th	eriods in the         ving area, h         Apr       M         0.67       0.         ving area       T         20.95       20         eriods in res       20.1         20.1       20         est of dwelli       0.63         0.63       0.	e living 1,m ( 48 1 (foll .99 5t of d 0.1 ing, h 44 wellin	<u>see</u> Jun 0.34 low s 21 wellin 20.1 2,m ( 0.29 g T2	Table 9a)           Jul           0.24           teps 3 to 7           21           ng from Ta           20.1           see Table           0.19           (follow steel)	Au 0.2 7 in T 2 <sup>-</sup> able § 20. 9a) 0.2 eps 3	ug Sep 8 0.47 able 9c) 21 0, Th2 (°C) 1 20.1 3 0.41 to 7 in Table	0.78 20.91 20.1 0.74 9C)	0.95 20.58 20.1 0.94	0.99 20.26 20.1 0.98		21	(86) (87) (88) (89)
Temperature Utilisation fac (86)m= 0.98 Mean interna (87)m= 20.33 Temperature (88)m= 20.1 Utilisation fac (89)m= 0.97	e during hea ctor for gain Feb 0.94 al temperatu 20.56 e during hea 20.1 ctor for gain 0.93 al temperatu	ating penns for lin Mar 0.85 ure in li 20.8 ating penns 20.1 ns for re 0.82	eriods in the         ving area, h         Apr       M         0.67       0.         ving area       T         20.95       20         eriods in res       20.1         20.1       20         est of dwelli       0.63         0.63       0.	e living 1,m ( 1,m ( 48 1 (foll .99 5t of d 0.1 ing, h 44	3see Jun 0.34 low s 21 wellin 20.1 2,m ( 0.29	Table 9a)           Jul           0.24           teps 3 to 7           21           ng from Ta           20.1           see Table           0.19	Au 0.2 7 in T 2 <sup>-</sup> able 9 20. 9a) 0.2	ug         Sep           8         0.47           able 9c)         21           9, Th2 (°C)         1           1         20.1           3         0.41           to 7 in Table           1         20.1	0.78 20.91 20.1 0.74 <b>99c)</b> 20.01	0.95 20.58 20.1 0.94 19.59	0.99 20.26 20.1 0.98 19.14			(86) (87) (88) (89) (90)
Temperature Utilisation fac (86)m= 0.98 Mean interna (87)m= 20.33 Temperature (88)m= 20.1 Utilisation fac (89)m= 0.97 Mean interna	e during hea ctor for gain Feb 0.94 al temperatu 20.56 e during hea 20.1 ctor for gain 0.93 al temperatu	ating penns for lin Mar 0.85 ure in li 20.8 ating penns 20.1 ms for re 0.82 ure in th	eriods in the         ving area, h         Apr       M         0.67       0.         ving area       T         20.95       20         eriods in res       20.1         20.1       20         est of dwelli       0.63         0.63       0.	e living 1,m ( 48 1 (foll .99 5t of d 0.1 ing, h 44 wellin	<u>see</u> Jun 0.34 low s 21 wellin 20.1 2,m ( 0.29 g T2	Table 9a)           Jul           0.24           teps 3 to 7           21           ng from Ta           20.1           see Table           0.19           (follow steel)	Au 0.2 7 in T 2 <sup>-</sup> able § 20. 9a) 0.2 eps 3	ug         Sep           8         0.47           able 9c)         21           9, Th2 (°C)         1           1         20.1           3         0.41           to 7 in Table           1         20.1	0.78 20.91 20.1 0.74 <b>99c)</b> 20.01	0.95 20.58 20.1 0.94	0.99 20.26 20.1 0.98 19.14		0.52	(86) (87) (88) (89)
Temperature Utilisation fac (86)m= 0.98 Mean interna (87)m= 20.33 Temperature (88)m= 20.1 Utilisation fac (89)m= 0.97 Mean interna (90)m= 19.23	e during hea ctor for gain Feb 0.94 al temperatu 20.56 e during hea 20.1 ctor for gain 0.93 al temperatu 19.56 for gain 19.56	ating pensions for liming pensions for liming pensions and the second se	eriods in the ving area, h Apr M 0.67 0. ving area T 20.95 20 eriods in res 20.1 20 est of dwelli 0.63 0. he rest of dw 20.05 20	e living 1,m ( 1ay 48 1 (foll .99 .09 .09 dwellin .09	(see Jun 0.34 low s 21 wellin 20.1 2,m ( 0.29 g T2 20.1	Table 9a)         Jul         0.24         teps 3 to 7         21         ng from Ta         20.1         see Table         0.19         (follow stee)         20.1         set Table         0.19         (follow stee)         20.1	Au 0.2 7 in T 2 <sup>-</sup> able § 20. 9a) 0.2 eps 3 20. + (1	ug Sep 8 0.47 able 9c) 21 0, Th2 (°C) 1 20.1 3 0.41 to 7 in Table 1 20.1 ft - fLA) × T2	0.78 20.91 20.1 0.74 9C) 20.01 A = Liv	0.95 20.58 20.1 0.94 19.59 ring area ÷ (4	0.99 20.26 20.1 0.98 19.14			(86) (87) (88) (89) (90) (91)
Temperature Utilisation factors (86)m = 0.98 Mean interna (87)m = 20.33 Temperature (88)m = 20.1 Utilisation factors (89)m = 0.97 Mean interna (90)m = 19.23 Mean interna (92)m = 19.8	e during hea ctor for gain Feb 0.94 al temperatu 20.56 e during hea 20.1 ctor for gain 0.93 al temperatu 19.56 20.08	ating pension of the second se	eriods in the         ving area, h         Apr       M         0.67       0.         ving area       T         20.95       20         eriods in res       20.1         20.1       20         est of dwelli       0.63         0.63       0.         he rest of dwelli         20.05       20         * the whole       20.51	e living 1,m ( 1ay 48 1 (foll .99 5t of d 0.1 ing, h2 44 wellin .09 dwelli .56	(see Jun 0.34 low s 21 wellin 20.1 2,m ( 0.29 g T2 20.1 20.1	Table 9a)         Jul         0.24         teps 3 to 7         21         ng from Ta         20.1         see Table         0.19         (follow stee)         20.1         : fLA × T1         : 20.56	Au 0.2 7 in T 2 <sup>-</sup> able § 20. 9a) 0.2 9a) 0.2 9a) 	ug Sep 8 0.47 able 9c) 21 0, Th2 (°C) 1 20.1 3 0.41 to 7 in Table 1 20.1 fL - fLA) × T2 56 20.56	0.78 20.91 20.1 0.74 <b>9</b> 9c) 20.01 A = Liv 20.47	0.95 20.58 20.1 0.94 19.59 ring area ÷ (4	0.99 20.26 20.1 0.98 19.14			(86) (87) (88) (89) (90)
Temperature Utilisation factors (86)m= $0.98$ Mean interna (87)m= $20.33$ Temperature (88)m= $20.1$ Utilisation factors (89)m= $0.97$ Mean interna (90)m= $19.23$ Mean interna (92)m= $19.8$ Apply adjust	e during hea ctor for gain Feb 0.94 al temperatu 20.56 e during hea 20.1 ctor for gain 0.93 al temperatu 19.56 al temperatu 20.08	ating penditing penditing penditis for lim Mar 0.85 0 0.85 0 0.85 0 0.85 0 0.82	eriods in the ving area, h Apr M 0.67 0. ving area T 20.95 20 eriods in res 20.1 20 est of dwelli 0.63 0. he rest of dr 20.05 20 the whole of 20.51 20 internal ter	e living 1,m ( 1ay 48 1 (foll .99 5t of d 0.1 ing, h2 44 wellin .09 dwelli .56 nperat	(see Jun 0.34 low s 21 wellin 20.1 2,m ( 0.29 g T2 20.1 20.5 ture f	Table 9a)         Jul         0.24         teps 3 to 7         21         ng from Ta         20.1         see Table         0.19         (follow stee)         20.1         set Table         20.1         set Table         0.19         (follow stee)         20.1         set Table         0.19         (follow stee)         20.1	Au 0.2 7 in T 2 <sup>-</sup> able § 20. 9a) 0.2 eps 3 20. + (1 20.4	ug         Sep           8         0.47           able 9c)         21           21         21           0, Th2 (°C)         1           1         20.1           3         0.41           1         20.1           1         20.1           1         20.1           1         20.1           1         20.1           1         20.1           1         20.5           where appro	0.78 20.91 20.1 0.74 e 9c) 20.01 A = Liv 20.47 priate	0.95 20.58 20.1 0.94 19.59 ring area ÷ (4 20.1	0.99 20.26 20.1 0.98 19.14 1) =			(86) (87) (88) (89) (90) (91) (92)
Temperature Utilisation far (86)m= $0.98$ Mean interna (87)m= $20.33$ Temperature (88)m= $20.1$ Utilisation far (89)m= $0.97$ Mean interna (90)m= $19.23$ Mean interna (92)m= $19.8$ Apply adjust (93)m= $19.65$	e during hea ctor for gain Feb 0.94 al temperatu 20.56 e during hea 20.1 ctor for gain 0.93 al temperatu 19.56 al temperatu 20.08 2 ment to the 19.93	ating pension of the second se	eriods in the         ving area, h         Apr       M         0.67       0.         ving area       T         20.95       20         eriods in res       20.1         20.1       20         est of dwelli       0.63         0.63       0.         he rest of dwelli       20         20.05       20         the whole of the	e living 1,m ( 1ay 48 1 (foll .99 5t of d 0.1 ing, h2 44 wellin .09 dwelli .56	(see Jun 0.34 low s 21 wellin 20.1 2,m ( 0.29 g T2 20.1 20.1	Table 9a)         Jul         0.24         teps 3 to 7         21         ng from Ta         20.1         see Table         0.19         (follow stee)         20.1         set Table         20.1         set Table         0.19         (follow stee)         20.1         set Table         0.19         (follow stee)         20.1         set fLA × T1         20.56         rom Table	Au 0.2 7 in T 2 <sup>-</sup> able § 20. 9a) 0.2 9a) 0.2 9a) 	ug         Sep           8         0.47           able 9c)         21           21         21           0, Th2 (°C)         1           1         20.1           3         0.41           1         20.1           1         20.1           1         20.1           1         20.1           1         20.1           1         20.1           1         20.5           where appro	0.78 20.91 20.1 0.74 <b>9</b> 9c) 20.01 A = Liv 20.47	0.95 20.58 20.1 0.94 19.59 ring area ÷ (4 20.1	0.99 20.26 20.1 0.98 19.14			(86) (87) (88) (89) (90) (91)
Temperature Utilisation factor (86)m = 0.98 Mean interna (87)m = 20.33 Temperature (88)m = 20.1 Utilisation factor (89)m = 0.97 Mean interna (90)m = 19.23 Mean interna (92)m = 19.8 Apply adjust (93)m = 19.65 8. Space heat	e during hea ctor for gain Feb 0.94 al temperatu 20.56 e during hea 20.1 ctor for gain 0.93 al temperatu 19.56 al temperatu 20.08 2 ment to the 19.93 ating require	ating pension of the second se	eriods in the ving area, h Apr M 0.67 0. ving area T 20.95 20 eriods in res 20.1 20 est of dwelli 0.63 0. he rest of dwelli 20.05 20 the whole of 20.51 20 internal terr 20.36 20	e living 1,m ( 1ay 48 1 (foll .99 5t of d 0.1 ing, h <sup>2</sup> 44 wellin .09 dwelli .56 nperat .41	(see Jun 0.34 low s 21 wellin 20.1 2,m ( 0.29 g T2 20.1 20.56 ture f 20.41	Table 9a)         Jul         0.24         teps 3 to 7         21         ng from Ta         20.1         see Table         0.19         (follow ster         20.1         set Table         20.1	Au 0.2 7 in T 2 <sup>-</sup> able § 20. 9a) 0.2 eps 3 20. + (1 20.4 20.4	ug         Sep           8         0.47           able 9c)         21           21         21           0, Th2 (°C)         1           1         20.1           3         0.41           to 7 in Table           1         20.1           fL           - fLA) × T2           56         20.56           where appro           11         20.41	0.78 20.91 20.1 0.74 20.01 A = Liv 20.47 priate 20.32	0.95 20.58 20.1 0.94 19.59 ring area ÷ (4 20.1 19.95	0.99 20.26 20.1 0.98 19.14 1) = 19.72 19.57		0.52	(86) (87) (88) (89) (90) (91) (92)
Temperature Utilisation factor (86)m = 0.98 Mean internat (87)m = 20.33 Temperature (88)m = 20.1 Utilisation factor (89)m = 0.97 Mean internat (90)m = 19.23 Mean internat (92)m = 19.8 Apply adjust (93)m = 19.65 8. Space heator	e during hea ctor for gain Feb 0.94 al temperatu 20.56 e during hea 20.1 ctor for gain 0.93 al temperatu 19.56 ctor for gain 19.56 ctor for gain ctor for gain 19.56 ctor for gain ctor for gain 19.56 ctor for gain ctor f	ating pension of the second se	eriods in the ving area, h Apr M 0.67 0. ving area T 20.95 20 eriods in res 20.1 20 est of dwelli 0.63 0. he rest of dwelli 20.05 20 the whole of 20.51 20 internal ten 20.36 20 perature of	e living 1,m ( 1ay 48 1 (foll .99 5t of d 0.1 ing, h <sup>2</sup> 44 wellin .09 dwelli .56 nperat .41 btaine	(see Jun 0.34 low s 21 wellin 20.1 2,m ( 0.29 g T2 20.1 20.56 ture f 20.41	Table 9a)         Jul         0.24         teps 3 to 7         21         ng from Ta         20.1         see Table         0.19         (follow ster         20.1         set Table         20.1	Au 0.2 7 in T 2 <sup>-</sup> able § 20. 9a) 0.2 eps 3 20. + (1 20.4 20.4	ug         Sep           8         0.47           able 9c)         21           21         21           0, Th2 (°C)         1           1         20.1           3         0.41           to 7 in Table           1         20.1           fL           - fLA) × T2           56         20.56           where appro           11         20.41	0.78 20.91 20.1 0.74 20.01 A = Liv 20.47 priate 20.32	0.95 20.58 20.1 0.94 19.59 ring area ÷ (4 20.1 19.95	0.99 20.26 20.1 0.98 19.14 1) = 19.72 19.57		0.52	(86) (87) (88) (89) (90) (91) (92)
Temperature Utilisation factor (86)m = 0.98 Mean interna (87)m = 20.33 Temperature (88)m = 20.1 Utilisation factor (89)m = 0.97 Mean interna (90)m = 19.23 Mean interna (92)m = 19.8 Apply adjust (93)m = 19.65 8. Space heat	e during hea ctor for gain Feb 0.94 al temperatu 20.56 e during hea 20.1 ctor for gain 0.93 al temperatu 19.56 ctor for gain 19.56 ctor for gain ctor for gain 19.56 ctor for gain ctor for gain 19.56 ctor for gain ctor f	ating pension of the second se	eriods in the ving area, h Apr M 0.67 0. ving area T 20.95 20 eriods in res 20.1 20 est of dwelli 0.63 0. he rest of dwelli 20.05 20 the whole of 20.51 20 internal tem 20.36 20 mperature of sing Table	e living 1,m ( 1ay 48 1 (foll .99 5t of d 0.1 ing, h <sup>2</sup> 44 wellin .09 dwelli .56 nperat .41 btaine	(see Jun 0.34 low s 21 wellin 20.1 2,m ( 0.29 g T2 20.1 20.56 ture f 20.41	Table 9a)         Jul         0.24         teps 3 to 7         21         ng from Ta         20.1         see Table         0.19         (follow stee)         20.1         see Table         0.19         (follow stee)         20.1         step 11 of	Au 0.2 7 in T 2 <sup>-</sup> able § 20. 9a) 0.2 eps 3 20. + (1 20.4 20.4	Jg         Sep           8         0.47           able 9c)         21           21         21           0, Th2 (°C)         1           1         20.1           3         0.41           to 7 in Table           1         20.1           fL           - fLA) × T2           56         20.56           where appro           11         20.41           e 9b, so that	0.78 20.91 20.1 0.74 20.01 A = Liv 20.47 priate 20.32	0.95 20.58 20.1 0.94 19.59 ing area ÷ (4 20.1 19.95 (76)m and	0.99 20.26 20.1 0.98 19.14 1) = 19.72 19.57		0.52	(86) (87) (88) (89) (90) (91) (92)



Utilisa	ation fac	tor for g	ains, hm	:										
(94)m=	0.97	0.92	0.82	0.64	0.45	0.31	0.21	0.24	0.43	0.75	0.94	0.98		(94)
Usefu	l gains,	hmGm	, W = (94	4)m x (84	4)m	•								
(95)m=	899.15	1064.83	1135.39	1045.6	818.03	549.15	360.55	379.39	593.7	850.56	880.3	845.23		(95)
Mont	hly aver	age exte	rnal tem	perature	e from Ta	able 8		-	-		-			
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat	loss rat	e for mea	an intern	al tempe	erature,	Lm , W =	=[(39)m :	x [(93)m	– (96)m	]				
(97)m=	1450.6	1420.31	1295.06	1083.7	823.12	549.58	360.59	379.48	596.53	919.06	1214.82	1452.54		(97)
	e heatir	g require	r		honth, k	Wh/mon	th = 0.02	24 x [(97	)m – (95	)m] x (4	1)m			
(98)m=	410.28	238.89	118.79	27.43	3.78	0	0	0	0	50.96	240.85	451.84		-
								Tota	l per year	(kWh/yea	r) = Sum(9	8)15,912 =	1542.82	(98)
Space	e heatir	g require	ement in	kWh/m²	/year							]	15.98	(99)
9a. En	ergy re	quiremer	nts – Indi	ividual h	eating s	ystems i	ncluding	micro-C	CHP)			-		-
Spac	e heati	ng:												
Fract	ion of s	bace hea	at from s	econdar	y/supple	mentary	system						0	(201)
Fract	ion of s	bace hea	at from m	nain syst	em(s)			(202) = 1 ·	- (201) =			Ī	1	(202)
Fract	ion of to	tal heati	ng from	main sys	stem 1			(204) = (2	02) × [1 –	(203)] =		Ì	1	(204)
Efficie	ency of	main spa	ace heat	ing syste	em 1							ļ	90.4	(206)
	•	seconda				a svsten	ı. %					[	0	(208)
	- -					1		A	Con	Oat	Nevi		-	<b>_</b>
Space	Jan e beatir	Feb g require	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/yea	11
opaci	410.28	238.89	118.79	27.43	3.78	) 0	0	0	0	50.96	240.85	451.84		
(211)~						Ů	Ŭ	ů	ů					(011)
(211)11	453.85	3)m x (20 264.26	131.41	30.34	4.18	0	0	0	0	56.37	266.43	499.82		(211)
	400.00	204.20	101.41	00.04	4.10	0	Ŭ	-	-		200.40 211) <sub>15,1012</sub>		1706.66	(211)
Snoo	o hootin	g fuel (s	ooondor		month				(		- 715,1012	l	1700.00	
•		01)] } x 1			monui									
(215)m=		0	0	0	0	0	0	0	0	0	0	0		
. ,								Tota	l Il (kWh/yea	ar) =Sum(2	215) <sub>15,1012</sub>	=	0	(215)
Water	heating	u c										L		٦
		ater hea	ter (calc	ulated a	bove)									
•	126.18	115.73	130.17	123.27	122.18	109.75	108.3	118.38	119.19	129.48	122.44	121.62		
Efficie	ncy of w	ater hea	iter								-		80.3	(216)
(217)m=	87.8	86.84	84.82	81.97	80.57	80.3	80.3	80.3	80.3	82.92	86.72	88.05		(217)
		heating,									-			
. ,		<u>m x 100</u>			454.05	400.07	404.07	4 47 40	4 4 9 4 9	450.45				
(219)m=	143.7	133.27	153.46	150.39	151.65	136.67	134.87	147.42	148.43	156.15	141.19	138.13		٦
_	• • • •							TO(a	ll = Sum(2			l	1735.35	(219)
	al totals	; I fuel use	ad main	svetem	1					k	Wh/year	г	<b>kWh/year</b>	Г
	-			system	1							ļ	1706.66	ļ
Water	heating	fuel use	d										1735.35	1

Electricity for pumps, fans and electric keep-hot



mechanical ventilation - balanced, extract	or positive input from outside	83.1	(230a
central heating pump:		30	(230c)
boiler with a fan-assisted flue		45	(230e
Total electricity for the above, kWh/year	sum of	(230a)(230g) =	158.1 (231)
Electricity for lighting			394.57 (232)
Electricity generated by PVs			-690.9 (233)
10a. Fuel costs - individual heating system	าร:		
	<b>Fuel</b> kWh/year	<b>Fuel Price</b> (Table 12)	<b>Fuel Cost</b> £/year
Space heating - main system 1	(211) x	3.48 × 0.01	= 59.39 (240)
Space heating - main system 2	(213) x	0 × 0.01	= 0 (241)
Space heating - secondary	(215) x	13.19 × 0.01	= 0 (242)
Water heating cost (other fuel)	(219)	3.48 × 0.01	= 60.39 (247)
Pumps, fans and electric keep-hot	(231)	13.19 × 0.01	= 20.85 (249)
(if off-peak tariff, list each of (230a) to (230) Energy for lighting	g) separately as applicable and (232)	apply fuel price according to 13.19 × 0.01	
Additional standing charges (Table 12)			120 (251)
	one of (233) to (235) x)	13.19 × 0.01	=91.13 (252)
Appendix Q items: repeat lines (253) and (253)	254) as needed		
	5)(247) + (250)(254) =		221.55 (255)
Total energy cost         (24           11a. SAP rating - individual heating system			221.55 (255)
			221.55 (255) 0.42 (256)
11a. SAP rating - individual heating system Energy cost deflator (Table 12)			
11a. SAP rating - individual heating systemEnergy cost deflator (Table 12)Energy cost factor (ECF)SAP rating (Section 12)	ns 55) x (256)] ÷ [(4) + 45.0] =		0.42 (256)
11a. SAP rating - individual heating systemEnergy cost deflator (Table 12)Energy cost factor (ECF)	ns 55) x (256)] ÷ [(4) + 45.0] =		0.42 (256) 0.66 (257)
11a. SAP rating - individual heating systemEnergy cost deflator (Table 12)Energy cost factor (ECF)SAP rating (Section 12)	ns 55) x (256)] ÷ [(4) + 45.0] =	<b>Emission factor</b> kg CO2/kWh	0.42 (256) 0.66 (257)
11a. SAP rating - individual heating systemEnergy cost deflator (Table 12)Energy cost factor (ECF)SAP rating (Section 12)	ns 55) x (256)] ÷ [(4) + 45.0] = systems including micro-CHP Energy		0.42 (256) 0.66 (257) 90.83 (258) Emissions
11a. SAP rating - individual heating system         Energy cost deflator (Table 12)         Energy cost factor (ECF)       [(2         SAP rating (Section 12)         12a. CO2 emissions – Individual heating s	ns 55) x (256)] ÷ [(4) + 45.0] = systems including micro-CHP Energy kWh/year	kg CO2/kWh	0.42 (256) 0.66 (257) 90.83 (258) Emissions kg CO2/year
11a. SAP rating - individual heating system         Energy cost deflator (Table 12)         Energy cost factor (ECF)       [(2         SAP rating (Section 12)         12a. CO2 emissions – Individual heating s         Space heating (main system 1)	ns 55) x (256)] ÷ [(4) + 45.0] = systems including micro-CHP Energy kWh/year (211) x	kg CO2/kWh	0.42 (256) 0.66 (257) 90.83 (258) Emissions kg CO2/year 368.64 (261)
11a. SAP rating - individual heating system         Energy cost deflator (Table 12)         Energy cost factor (ECF)         SAP rating (Section 12)         12a. CO2 emissions – Individual heating s         Space heating (main system 1)         Space heating (secondary)	ns 55) x (256)] ÷ [(4) + 45.0] = systems including micro-CHP Energy kWh/year (211) x (215) x	kg CO2/kWh 0.216 = 0.519 = 0.216 =	0.42 (256) 0.66 (257) 90.83 (258) Emissions kg CO2/year 368.64 (261) 0 (263)
11a. SAP rating - individual heating system         Energy cost deflator (Table 12)         Energy cost factor (ECF)         SAP rating (Section 12)         12a. CO2 emissions – Individual heating s         Space heating (main system 1)         Space heating (secondary)         Water heating	ns 55) x (256)] ÷ [(4) + 45.0] = systems including micro-CHP Energy kWh/year (211) x (215) x (219) x (261) + (262) + (263) + (263)	kg CO2/kWh 0.216 = 0.519 = 0.216 =	0.42 (256) 0.66 (257) 90.83 (258) Emissions kg CO2/year 368.64 (261) 0 (263) 374.83 (264)
11a. SAP rating - individual heating system         Energy cost deflator (Table 12)         Energy cost factor (ECF)         SAP rating (Section 12)         12a. CO2 emissions – Individual heating s         Space heating (main system 1)         Space heating (secondary)         Water heating         Space and water heating	ns 55) x (256)] ÷ [(4) + 45.0] = systems including micro-CHP Energy kWh/year (211) x (215) x (219) x (261) + (262) + (263) + (263)	kg CO2/kWh 0.216 = 0.519 = 0.216 = 4) =	0.42 (256) 0.66 (257) 90.83 (258) Emissions kg CO2/year 368.64 (261) 0 (263) 374.83 (264) 743.47 (265)
11a. SAP rating - individual heating system         Energy cost deflator (Table 12)         Energy cost factor (ECF)         SAP rating (Section 12)         12a. CO2 emissions – Individual heating s         Space heating (main system 1)         Space heating (secondary)         Water heating         Space and water heating         Electricity for pumps, fans and electric keep	ns 55) x (256)] ÷ [(4) + 45.0] = systems including micro-CHP Energy kWh/year (211) x (215) x (215) x (219) x (261) + (262) + (263) + (263) p-hot (231) x	kg CO2/kWh 0.216 = 0.519 = 0.216 = 4) = 0.519 =	0.42       (256)         0.66       (257)         90.83       (258)         Emissions kg CO2/year         368.64       (261)         0       (263)         374.83       (264)         743.47       (265)         82.06       (267)



CO2 emissions per m <sup>2</sup>		(272) ÷ (4) =		6.96	(273)
El rating (section 14)				94	(274)
13a. Primary Energy					
	<b>Energy</b> kWh/year	<b>Primary</b> factor		<b>P. Energy</b> kWh/year	
Space heating (main system 1)	(211) x	1.22	=	2082.12	(261)
Space heating (secondary)	(215) x	3.07	=	0	(263)
Energy for water heating	(219) x	1.22	=	2117.12	(264)
Space and water heating	(261) + (262) + (263) + (264	4) =		4199.24	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	3.07	=	485.38	(267)
Electricity for lighting	(232) x	0	=	1211.32	(268)
Energy saving/generation technologies Item 1		3.07	=	-2121.05	(269)
'Total Primary Energy		sum of (265)(271) =		3774.9	(272)
Primary energy kWh/m²/year		(272) ÷ (4) =		39.1	(273)



	vare Name:Stroma FSAP 2012Software Version:Version: 1.0.4.5Property Address: Unit 6 (GFEND) GREENess :New Dwelling at:, Gordon House, 6 Lissenden Gardens, LONDON, NW5 1LXcertail dwelling dimensions:Area(m²)Av. Height(m)Volume(m³)d floor96.54(1a) x2.4(2a) =231.7(3a)oor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n)96.54(4)main g volume(3a)+(3b)+(3c)+(3d)+(3e)+(3n) =231.7(5)htilation rate:er of chimneys0+0=0(6a)										
Assessor Name:	Peter Mitcl	nell			Stroma	a Numl	ber:		STRO	007945	
Software Name:											
			Pro	perty /	Address:	Unit 6 (	GFEND	) GREEI	٧		
Address :	New Dwelli	ng at:, Goro	don Hoı	use, 6	Lissende	n Garde	ens, LON	NDON, N	IW5 1LX		
1. Overall dwelling dim	ensions:										
				Area	a(m²)		Av. Hei	ight(m)		Volume(m <sup>3</sup> )	_
Ground floor				9	96.54	(1a) x	2	4	(2a) =	231.7	(3a)
Total floor area TFA = (1	la)+(1b)+(1c)+	(1d)+(1e)+	(1n)	9	96.54	(4)					
Dwelling volume						(3a)+(3b)	+(3c)+(3d	)+(3e)+	(3n) =	231.7	(5)
2. Ventilation rate:			-							2 I	
					otner		total			m <sup>°</sup> per nour	,
Number of chimneys	0	+	0	+	0	] = [	0	x 4	= 0	0	(6a)
Number of open flues	0	+	0	+	0	] = [	0	x 2	20 =	0	(6b)
Number of intermittent fa	ans					- F	0	<b>x</b> 1	0 =	0	(7a)
Number of passive vents	S					Ē	0	<b>x</b> 1	0 =	0	(7b)
Number of flueless gas t	fires						0	x 4	-0 =	0	(7c)
									Δir ch	anges per ho	- r
Infiltration due to chimne	we flues and f	anc = (6a)t	-(6h)+(7a)	+(7b)+(	7c) =						_
If a pressurisation test has						ontinue fro	0 om (9) to (		+ (5) =	0	(8)
Number of storeys in t							(-) (	- /		0	(9)
Additional infiltration								[(9)-	1]x0.1 =	0	(10)
Structural infiltration: (	0.25 for steel of	r timber fra	ime or 0	.35 foi	r masonr	y constru	uction			0	(11)
if both types of wall are p			nding to th	ne great	er wall area	a (after					_
deducting areas of open If suspended wooden			l) or 0 1	(seale	ed) else	enter 0			I	0	(12)
If no draught lobby, er		`	.) 01 011	(ooulo	<i>, elec</i>					0	(13)
Percentage of window			ped							0	(14)
Window infiltration		0 1	•		0.25 - [0.2	x (14) ÷ 10	= [00			0	(15)
Infiltration rate					(8) + (10) -	+ (11) + (1	2) + (13) +	+ (15) =		0	(16)
Air permeability value	, q50, expresse	ed in cubic	metres	per ho	our per so	quare me	etre of e	nvelope	area	4	(17)
If based on air permeab	ility value, then	(18) = [(17)	÷ 20]+(8),	otherwi	ise (18) = (	16)			İ	0.2	(18)
Air permeability value appli		on test has be	een done	or a deg	gree air per	meability i	s being us	sed			_
Number of sides shelter	ed				(20) = 1 - [	0 075 v (1)	0)1 -			3	(19)
Shelter factor	1	1			· í		9)] –			0.78	(20)
Infiltration rate incorpora	-				(21) = (18)	x (20) –			l	0.16	(21)
Infiltration rate modified				1.1		0	0.1	NL			
Jan Feb	Mar Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind s									( - )		
(22)m= 5.1 5	4.9 4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (2	22)m ÷ 4										
(22a)m= 1.27 1.25	1.23 1.1	1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		



Adjuste	ed infiltra	ation rat	e (allowi	ng for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m				_	
	0.2	0.19	0.19	0.17	0.17	0.15	0.15	0.14	0.16	0.17	0.17	0.18		
		al ventila	-	rate for t	he appli	cable ca	se						0.5	(23a)
				endix N, (2	3b) = (23a	a) × Fmv (e	equation (N	N5)) othe	rwise (23b	) = (23a)			0.5	(23a)
				iency in %					-	) (200)			0.5	
					Ũ		,		,	$(b)m \pm (b)$	22P) ^ L	1 – (23c)	0 ÷ 1001	(23c)
(24a)m=	r							0	$\frac{1}{0}$		230) ^ [	$\frac{1-(230)}{0}$	 	(24a)
		-	-	ntilation	-	-		-	-	-	÷	ů	l	()
(24b)m=								0	0	0	230)	0	1	(24b)
	-	-		-	÷	-	-		-	0	0	Ū	J	(210)
,				ntilation o then (24o	•	•				5 × (23h	)			
(24c)m=	<u> </u>	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	]	(24c)
· · ·		ventilatio	n or wh	ole hous		l /e input	ventilatio	n from	oft				l	
				m = (22k						0.5]				
(24d)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24d)
Effec	ctive air	change	rate - er	nter (24a	) or (24t	o) or (24	c) or (24	d) in bo	(25)			•		
(25)m=	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5		(25)
2 40	atlassa	e and he		paramete	or:			•	•					
ELEN		Gros		Openin		Net Ar	22	U-val		AXU		k-value	2	AXk
		area		m		A,r		W/m2		(W/I	K)	kJ/m <sup>2</sup> ·l		kJ/K
Window	ws Type	e 1				7.39	x1.	/[1/( 1.2 )+	0.04] =	8.46				(27)
Window	ws Type	2				3.5		/[1/( 1.2 )+	0.04] =	4.01	=			(27)
Window	ws Type	e 3				8.26		/[1/( 1.2 )+	0.04] =	9.46	=			(27)
	ws Type					8.26	<b>_</b> .	/[1/( 1.2 )+	0.04] =	9.46	=			(27)
	ws Type					5.28	่ .	/[1/( 1.2 )+	L	6.05	=			(27)
Walls		108.	14	32.69		75.45		0.16		12.07	≓ ,			(29)
	urea of e	lements		32.03	9			0.10		12.07	I			
		lemento	, 111			108.1			—		— ,			(31)
Party v						19.25		0		0			$\dashv$	(32)
Party v		<b>.</b>		<b>.</b>		15.26		0	= [	0	I			(32)
				affective wi Internal wall			ated using	i formula 1	/[(1/U-valu	ie)+0.04] a	is given in	n paragraph	1 3.2	
			= S (A x		,			(26)(30	) + (32) =				49.5	(33)
		Cm = S(	·	,					((28)	(30) + (32	2) + (32a)	(32e) =	0	(34)
				⊃ = Cm ÷	- TFA) ir	ו kJ/m²K			Indica	tive Value	: Medium		250	(35)
		•	•	tails of the	,			ecisely the	e indicative	values of	TMP in T	able 1f		
			tailed calc											
	-	•		culated ı	• •	-	K						6.79	(36)
			are not kn	own (36) =	= 0.15 x (3	1)			(22)	(26) =				
	abric he		alaulataa	الماميم						(36) =	OC)	<b>、</b>	56.29	(37)
ventila			r	monthly		1	11	A	r	= 0.33 × (		T	1	
(20)-	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(38)
(38)m=	38.23	38.23	38.23	38.23	38.23	38.23	38.23	38.23	38.23	38.23	38.23	38.23	l	(00)
		coefficie	-		a				1	= (37) + (3			1	
(39)m=	94.52	94.52	94.52	94.52	94.52	94.52	94.52	94.52	94.52	94.52	94.52	94.52		

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Average = Sum(39)<sub>1...12</sub> /12=  $94.5p_{age 2}$ 



Average = Sum(41):,1220.38(40)Number of days in month (Table 1a)JuiJuiAugSepOctNovDec(41)::::::::::::::::::::::::::::::::::::	Heat lo	oss para	ameter (I	HLP), W	/m²K					(40)m	= (39)m ÷	(4)			
Number of days in month (Table 1a) (4) $an$ Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec 31 28 31 30 31 30 31 30 31 30 31 30 31 (41) (41) $an$ Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (41) $an$ Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (42) (11 TFA 13.9, N = 1 Assumed occupancy, N (42) (11 TFA 13.9, N = 1 Annual average hot water usage in litres per day Vd, average = (25 x N) + 35 Reduct be annual wrange hot water usage by 5% (If the dwelling is designed to achieve a water use target of and more that 125 litres per garped by 30, If the dwelling is designed to achieve a water use target of and more that 125 litres per garped by 30, If the dwelling is designed to achieve a water use target of and more that 125 litres per day cal water usage in factor from Table Table Table 32, If the dwelling is designed to achieve a water use target of the water usage in these red water each month Vd in factor from Table Table 12, If 13, If 143, If 144, If 16, 36, If 21, 24, If 146, 36, If 21, 24, If 146, 36, If 144, If 16, 36, If 144, If 14, If 144, If	(40)m=	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98		
(41)m:       31       28       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31       30       31        <	Numbe	er of day	ys in mo	nth (Tab	le 1a)					,	Average =	Sum(40) <sub>1.</sub>	12 /12=	0.98	(40)
4. Water healing energy requirement:         Whityear:           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)         2.71         (42)           Annual average hot water usage in litres per day Vd, average = (25 x N) + 36 Reduce the annual average hot water usage b f5 with evables its designed to achieve a water use larget of not more that 125 litres per parson per day (all water use, hot and cold)         98.45         (43)           Jan         Feb         Mar         Apr.         May         Jun         Jul         Aug         Sep         Oct         Nov         Dec           Hot water usage in litres 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, if m factor from Table 1c x (43)         Total = Sum(41) =         Total = Sum(42) =         Total = Sum(44) =         1181.35         (44)           (45) me (100.59         140.45         121.24         104.63         96.95         111.25         132.8         132.2         135.82         (45)           Water storage loss:         Total = Sum(42) =         Total = Sum(43) =         Total = Sum(44) =         Total = Sum(45) =         Total = Sum(45) = <td></td> <td>Jan</td> <td>Feb</td> <td>Mar</td> <td>Apr</td> <td>May</td> <td>Jun</td> <td>Jul</td> <td>Aug</td> <td>Sep</td> <td>Oct</td> <td>Nov</td> <td>Dec</td> <td></td> <td></td>		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
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 E 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA - 13.9)2)] + 0.0013 x (TFA - 13.9) if TFA E 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA - 13.9)2)] + 0.0013 x (TFA - 13.9) if TFA E 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA - 13.9)2)] + 0.0013 x (TFA - 13.9) if TFA E 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA - 13.9)2)] + 0.0013 x (TFA - 13.9) if TFA E 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA - 13.9)2)] + 0.0013 x (TFA - 13.9) if TFA E 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA - 13.9)2)] + 0.0013 x (TFA - 13.9) if TFA E 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA - 13.9)2)] + 0.0013 x (TFA - 13.9) if TFA E 13.9, N = 1 + 1.76 x [1 - exp(-10.001349 x (TFA - 13.9)2)] + 0.0013 x (TFA - 13.9) if TFA = 10.59 140.45 144.54 128.36 12.24 13.01 2 14.04 2 104.52 165.62 Total = Sum(45) = 1181.35 (44) if astantaneous water heating at point of use (no not water storage), enter 0 in boxes (46) to (61) if astantaneous water heating at point of use (no not water storage), enter 0 in boxes (46) to (61) if astantaneous water heating at point of use (no not water storage), enter 0 in boxes (46) to (61) if community heating and no tank in dwelling, enter 110 litres in (47) Otherwise if no stored hot water (this includes instantaneous combi bioliers) enter '0' in (47) Water storage loss: a) If manufacturer's declared loss factor is known (kWh/day): if community heating see section 4.3 Volume factor from Table 2b if community heating see section 4.3 Volume factor from Table 2A if community heating see section 4.3 Volume factor from Table 2A if community heating see section 4.3 Volume factor from Table 2A if community neating see section 4.3 Volume factor from Table 2A if community constructed solar storage, (KVh/year if community heating see section 4.3 Volume factor from Table 2A if community constructed for each month if (65)m = (50) x (41)m (65)m = 0 0	(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
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 E 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA - 13.9)2)] + 0.0013 x (TFA - 13.9) if TFA E 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA - 13.9)2)] + 0.0013 x (TFA - 13.9) if TFA E 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA - 13.9)2)] + 0.0013 x (TFA - 13.9) if TFA E 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA - 13.9)2)] + 0.0013 x (TFA - 13.9) if TFA E 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA - 13.9)2)] + 0.0013 x (TFA - 13.9) if TFA E 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA - 13.9)2)] + 0.0013 x (TFA - 13.9) if TFA E 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA - 13.9)2)] + 0.0013 x (TFA - 13.9) if TFA E 13.9, N = 1 + 1.76 x [1 - exp(-10.001349 x (TFA - 13.9)2)] + 0.0013 x (TFA - 13.9) if TFA = 10.59 140.45 144.54 128.36 12.24 13.01 2 14.04 2 104.52 165.62 Total = Sum(45) = 1181.35 (44) if astantaneous water heating at point of use (no not water storage), enter 0 in boxes (46) to (61) if astantaneous water heating at point of use (no not water storage), enter 0 in boxes (46) to (61) if astantaneous water heating at point of use (no not water storage), enter 0 in boxes (46) to (61) if community heating and no tank in dwelling, enter 110 litres in (47) Otherwise if no stored hot water (this includes instantaneous combi bioliers) enter '0' in (47) Water storage loss: a) If manufacturer's declared loss factor is known (kWh/day): if community heating see section 4.3 Volume factor from Table 2b if community heating see section 4.3 Volume factor from Table 2A if community heating see section 4.3 Volume factor from Table 2A if community heating see section 4.3 Volume factor from Table 2A if community neating see section 4.3 Volume factor from Table 2A if community constructed solar storage, (KVh/year if community heating see section 4.3 Volume factor from Table 2A if community constructed for each month if (65)m = (50) x (41)m (65)m = 0 0															
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 Reduce the annual average hot water usage in litres per day Vd,average = (25 x N) + 36 Reduce the annual average hot water usage in litres per day Ud,average = (25 x N) + 36 Reduce the annual average hot water usage in litres per day Ud,average = (25 x N) + 36 Reduce the annual average hot water usage in litres per day Ud,average = (25 x N) + 36 (43) Total = Sum(44), = (44) If (44) <sup>me</sup> 106.29 104.35 100.42 96.48 92.54 98.6 86 92.54 96.48 100.42 104.35 108.29 Total = Sum(44), = (1181.35 (44) If (44) <sup>me</sup> 106.29 104.05 104.42 106.48 92.54 98.6 86 92.54 96.48 100.42 104.35 108.29 Total = Sum(44), = (1181.35 (44) If (45) <sup>me</sup> 100.59 140.45 144.94 126.36 121.24 104.63 96.95 111.25 112.58 131.2 143.22 155.52 If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61) If (49) <sup>me</sup> 24.09 21.07 21.74 18.95 18.19 15.69 144.54 16.69 16.89 19.68 21.48 23.33 (46) Water storage loss: a) If manufacturer's declared loss factor is known (kWh/day): 0 (47) Water storage loss: a) If manufacturer's declared loss factor is known (kWh/day): 0 (48) Temperature factor from Table 2b (49) = 0 (49) If community heating and no tank in dwelling, enter 110 litres in (47) Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47) Water storage loss: factor from Table 2 (kWh/litre/day) 0 (51) If community heating see section 4.3 Volume factor from Table 2A (47) x (51) x (52) x (53) = 0 (52) Temperature factor from Table 2A (47) x (51) x (52) x (53) = 0 (53) Temperature factor from Table 2A (47) x (51) x (52) x (53) = 0 (53) Temperature factor from Table 2A (52) (53) = 0 (53) Temperature factor from Table 2A (52) (53) = 0 (53) Temperature factor from Table 2A (52) (53) = 0 (53) Temperature factor from Table 2A (53) (55) (55) (55) (55) (55) (55)	4. Wa	iter hea	ting ene	rgy requ	irement:								kWh/ye	ear:	
Reduce the annual average hot water usage by 5% if the divelling is designed to achieve a water use target of not more that 125 litres per person per day (all water usa, hot and cold)       Image: Ima	if TF	A > 13.	9, N = 1		[1 - exp	(-0.0003	349 x (TF	-A -13.9	)2)] + 0.(	0013 x ( <sup>-</sup>	TFA -13.		71		(42)
Hot water usage in littes per day for each month Vd.m = factor from Table 1c x [43]       Total = Sum(4), =         (44)m=       108.29       104.35       100.42       96.48       92.54       88.6       92.54       96.48       100.42       104.35       108.29         Total = Sum(4), =       1181.35       (44)         # 100.59       140.45       144.94       126.36       121.24       104.63       96.95       111.25       112.58       131.2       143.32       155.52         If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)       Total = Sum(45), =       1548.94       (45)         Water Storage loss:       100.42       10.4.8       131.2       143.32       155.52         Storage volume (litres) including any solar or WWHRS storage within same vessel       0       (47)         Hot water storage loss:       0       (47)         Water storage loss:       0       (47)         Water storage loss:       0       (48)       (49) =       0       (47)         Water storage loss:       0       (47)       (48) x (49) =       0       (47)         Water storage loss:       0       (47)       (48) x (49) =       0       (50)         b) If manufacturer's de	Reduce	the annua	al average	hot water	usage by	5% if the a	lwelling is	designed			se target o		.45		(43)
(44)me       108 29       104 35       100 42       96 48       92 54       88.6       89.6       92 54       96.48       100 42       104 35       108 29         Total = Sum(44) =       1181.35       (44)         Energy content of hot water used - calculated monthly = 4.190 x Vd.m x nm x DTm / 3600 kWMmonth (see Tables 1b. 1c. 1d)         (44)         (45)         Total = Sum(41) =       1181.35       (44)         (44)         (44)         (45)         Total = Sum(45) =         (181.35       111.25       112.58       131.22       155.52         Total = Sum(45) =       1548.94       (45)         (46)         (46)         (47)         (48)       12.63       19.68       14.54       16.69       16.89       19.68       21.48       23.33       (46)         Water storage loss:       (47)         O       (47)         (48) × (49)        0       (47)         Manufacture's declared loss factor is known (kWh/day):       0		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Total = Sum(44)	Hot wate	er usage i	n litres per	day for ea	ach month	Vd,m = fa	ctor from T	Table 1c x	(43)						
Energy content of hot water used - calculated monthly = 4.190 x Vd, m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d) $\begin{array}{c} (45)m = & 160.59 & 140.45 & 144.94 & 126.36 & 121.24 & 104.63 & 96.95 & 111.25 & 112.58 & 131.2 & 143.22 & 155.52 \\ \hline Total = Sum(45)_{$	(44)m=	108.29	104.35	100.42	96.48	92.54	88.6	88.6	92.54	96.48	100.42	104.35	108.29		
160.59       140.45       144.94       126.36       121.24       104.63       96.95       111.25       112.58       131.2       143.22       155.52         Total = Sum(45) =       1548.94       (45)         trinstantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)         (46)         (47)         formation of the set of the se	Energy	content of	f hot water	used - cal	culated m	onthly = 4	190 v Vd r	n v nm v F	)Tm / 360(			· · ·		1181.35	(44)
Total = Sum(45)			i	i					i			i	,	l	
<i>if instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)</i> (46)me       24.09       21.07       21.74       18.95       18.19       15.69       14.54       16.69       16.89       19.68       21.48       23.33       (46)         Water storage loss:       0       0       0       0       (47)       0       (47)         Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)       0       (47)         Water storage loss:       0       0       0       (48)         Year storage loss:       0       (47)         a) If manufacturer's declared loss factor is known (kWh/day):       0       (48)         Temperature factor from Table 2b       0       (49)         Energy lost from water storage, kWh/year       (48) × (49) =       0       (50)         b) If manufacturer's declared cylinder loss factor is not known:       0       (51)       (52) × (52) × (53) =       0       (51)         How water storage loss factor from Table 2b       0       0       (61)       (61)       (62)       (63)         Energy lost from water storage, kWh/year       (47) × (51) × (52) × (52) =       0       (62)       (63)         Energy lost from water storage, kWh/year       (47) × (51) × (52) × (53) =<	(43)11-	100.59	140.43	144.94	120.30	121.24	104.05	90.95	111.25					1548 94	(45)
Water storage loss:Storage volume (litres) including any solar or WWHRS storage within same vessel0(47)If community heating and no tank in dwelling, enter 110 litres in (47)Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)Water storage loss:a) If manufacturer's declared loss factor is known (kWh/day): $0$ (48)Temperature factor from Table 2bColspan="2">Colspan="2"Colspan	lf instant	taneous v	vater heati	ng at point	of use (no	o hot water	r storage),	enter 0 in	boxes (46			111(-10)112		1040.04	()
Storage volume (litres) including any solar or WWHRS storage within same vessel       0       (47)         If community heating and no tank in dwelling, enter 110 litres in (47)       0       (47)         Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)       Water storage loss:       0       (48)         a) If manufacturer's declared loss factor is known (kWh/day):       0       (48)       (49)       (49)         Temperature factor from Table 2b       0       (49)       (49)       (49)       (49)         Energy lost from water storage, kWh/year       (48) x (49) =       0       (50)       (51)         If community heating see section 4.3       0       (51)       (52)       (53)       (53)         Volume factor from Table 2a       0       (52)       (53)       (53)       (53)       (54)         Energy lost from water storage, kWh/year       (47) x (51) x (52) x (53) =       0       (53)       (55)         Water storage loss calculated for each month       ((56)m = (55) × (41)m       (56)m = (56) × (41)m       (56)m       (56)         (57)m 0       0       0       0       0       0       0       (57)         Primary circuit loss (annual) from Table 3       0       (57)       (58)       (58)       (58)	(46)m=	24.09	21.07	21.74	18.95	18.19	15.69	14.54	16.69	16.89	19.68	21.48	23.33		(46)
If community heating and no tank in dwelling, enter 110 litres in (47) Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47) Water storage loss: a) If manufacturer's declared loss factor is known (kWh/day): 0 (48) Temperature factor from Table 2b $0$ (49) Energy lost from water storage, kWh/year (48) x (49) = $0$ (50) b) If manufacturer's declared cylinder loss factor is not known: Hot water storage loss factor from Table 2 (kWh/litre/day) $0$ (51) If community heating see section 4.3 Volume factor from Table 2b $0$ (52) Temperature factor from Table 2b $0$ (52) Temperature factor from Table 2b (53) Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = $0$ (54) Enter (50) or (54) in (55) $0$ (55) Water storage loss calculated for each month ((56)m = (55) × (41)m (56)m where (H11) is from Appendix H (57)m $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$		•		) in alvelie		- 		-	itleine er						
Otherwise if no stored hot water (this includes instantaneous combi boilers) enter '0' in (47)Water storage loss:0(48)a) If manufacturer's declared loss factor is known (kWh/day):0(48)Temperature factor from Table 2b0(49)Energy lost from water storage, kWh/year(48) x (49) =0b) If manufacturer's declared cylinder loss factor is not known:0(50)Hot water storage loss factor from Table 2 (kWh/litre/day)0(51)If community heating see section 4.30(52)Volume factor from Table 2a0(52)Temperature factor from Table 2b0(53)Energy lost from water storage, kWh/year(47) x (51) x (52) x (53) =0Energy lost from water storage, kWh/year(47) x (51) x (52) x (53) =0Energy lost from water storage, kWh/year(47) x (51) x (52) x (53) =0Energy lost from water storage, kWh/year(47) x (51) x (52) x (53) =0(56)me00000(56)me00000(56)me00000(57)me00000(57)me00000(57)me00000(57)me00000(57)me00000(57)me00000(57)me00000(5	•				0,			•		ame ves	sei		0		(47)
Water storage loss:0(48)a) If manufacturer's declared loss factor is known (kWh/day):0(48)Temperature factor from Table 2b0(49)Energy lost from water storage, kWh/year(48) × (49) =0b) If manufacturer's declared cylinder loss factor is not known:0(50)Hot water storage loss factor from Table 2 (kWh/litre/day)0(51)If community heating see section 4.30(52)Volume factor from Table 2a0(52)Temperature factor from Table 2b0(53)Energy lost from water storage, kWh/year(47) × (51) × (52) × (53) =0Energy lost from water storage, kWh/year(47) × (51) × (52) × (53) =0Energy lost from water storage, kWh/year(47) × (51) × (52) × (53) =0(56) me [50) or (54) in (55)000(56) me [000000(56) me [000000(57) me [000000(57) me [000000Primary circuit loss (annual) from Table 30(57)Primary circuit loss calculated for each month (59) m = (58) + 365 × (41) m(58)Primary circuit loss calculated for each month (59) m = (58) + 365 × (41) m(58)Primary circuit loss calculated for each month (59) m = (58) + 365 × (41) m(58)		•	•			•			• •	ers) ente	er '0' in (	47)			
Temperature factor from Table 2b (49) Energy lost from water storage, kWh/year (48) × (49) = 0 (50) b) If manufacturer's declared cylinder loss factor is not known: Hot water storage loss factor from Table 2 (kWh/litre/day) 0 (51) If community heating see section 4.3 Volume factor from Table 2a 0 (52) Temperature factor from Table 2b 0 (53) Energy lost from water storage, kWh/year (47) × (51) × (52) × (53) = 0 (54) Enter (50) or (54) in (55) 0 (56) (56) (56) (56) (56) (56) (56) (56)					,					,	,				
Energy lost from water storage, kWh/year (48) x (49) = 0 (50) b) If manufacturer's declared cylinder loss factor is not known: Hot water storage loss factor from Table 2 (kWh/litre/day) 0 (51) If community heating see section 4.3 Volume factor from Table 2a 0 (52) Temperature factor from Table 2b (53) Energy lost from water storage, kWh/year (47) x (51) x (52) x (53) = 0 (54) Enter (50) or (54) in (55) (55) Water storage loss calculated for each month ((56)m = (55) × (41)m (56)m $0$ 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	a) If m	anufact	turer's d	eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)
b) If manufacturer's declared cylinder loss factor is not known: Hot water storage loss factor from Table 2 (kWh/litre/day) 0 (51) If community heating see section 4.3 Volume factor from Table 2a 0 (52) Temperature factor from Table 2b 0 (53) Energy lost from water storage, kWh/year (47) $\times$ (51) $\times$ (52) $\times$ (53) = 0 (54) Enter (50) or (54) in (55) 0 (55) (55) 0 (56) 0 (56) Water storage loss calculated for each month ((56)m = (55) $\times$ (41)m (56)m 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 (56)) If cylinder contains dedicated solar storage, (57)m = (56)m $\times$ [(50) – (H11)] + (50), else (57)m = (56)m where (H11) is from Appendix H (57)m 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 (57) Primary circuit loss (annual) from Table 3 0 (58) Primary circuit loss calculated for each month (59)m = (58) $\div$ 365 $\times$ (41)m (modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)	•												0		(49)
Hot water storage loss factor from Table 2 (kWh/litre/day) If community heating see section 4.3 Volume factor from Table 2a Temperature factor from Table 2b Energy lost from water storage, kWh/year Enter (50) or (54) in (55) Water storage loss calculated for each month ( $(56)m = 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0$				-	-		or is not		(48) x (49	) =			0		(50)
If community heating see section 4.3 Volume factor from Table 2a Temperature factor from Table 2b Energy lost from water storage, kWh/year Enter (50) or (54) in (55) Water storage loss calculated for each month ( $(56)m = 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 $	,												0		(51)
Temperature factor from Table 2b(53)Energy lost from water storage, kWh/year $(47) \times (51) \times (52) \times (53) =$ 0(54)Enter (50) or (54) in (55)Water storage loss calculated for each month $((56)m = (55) \times (41)m$ (56)m $=$ 00000(56)m $=$ 00000(57)m $=$ 00000(56)If cylinder contains dedicated solar storage, (57)m $=$ (56)m $\times$ [(50) - (H11)] $+$ (50), else (57)m $=$ (56)m where (H11) is from Appendix H(57)m $=$ 0000000(57)m $=$ 000000(57)m $=$ 000000(58) $\times$ 365 $\times$ (41)m(c		•	-		on 4.3										
Energy lost from water storage, kWh/year $(47) \times (51) \times (52) \times (53) = 0$ (54) Enter (50) or (54) in (55) 0 (55) (41)m (56)m = (56) m x [(50) - (H11)] + (50), else (57)m = (56)m where (H11) is from Appendix H (57)m = 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0					0										
Enter (50) or (54) in (55) Water storage loss calculated for each month $(56)m = (55) \times (41)m$ (56)m = 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0													0		
Water storage loss calculated for each month $((56)m = (55) \times (41)m$ $(56)m = 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 $				-	e, KVVh/ye	ear			(47) x (51	) x (52) x (	53) =	<u> </u>	-		
$(56)m = \boxed{0}  0  0  0  0  0  0  0  0  0 $		. ,	. , .	,	for each	month			((56)m = (	55) × (41)	m		0		(55)
If cylinder contains dedicated solar storage, $(57)m = (56)m \times [(50) - (H11)] + (50)$ , else $(57)m = (56)m$ where $(H11)$ is from Appendix H (57)m = 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0			-			i	0				i	0	0		(56)
Primary circuit loss (annual) from Table 3 Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m (modified by factor from Table H5 if there is solar water heating and a cylinder thermostat) (58)	1.												-	ix H	(00)
Primary circuit loss (annual) from Table 3 Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m (modified by factor from Table H5 if there is solar water heating and a cylinder thermostat) (58)	(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primary circuit loss calculated for each month (59)m = (58) ÷ 365 × (41)m (modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)															
(modified by factor from Table H5 if there is solar water heating and a cylinder thermostat)		•					59)m = (	(58) ÷ 36	65 × (41)	m			U	l	(00)
		•				•	,		• •		r thermo	stat)			
	(59)m=	0	0	0	0	0	0	0	0	0	0	0	0		(59)



Combi	loss cal	lculated	for each	n month (	61)m =	(60) ÷ 36	65 × (41)	)m						
(61)m=	50.96	46.03	50.96	47.58	47.16	43.69	45.15	47.16	47.58	50.96	49.32	50.96		(61)
Total h	eat requ	uired for	water h	eating ca	alculated	for each	n month	(62)m =	0.85 ×	(45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	211.55	186.48	195.9	173.94	168.4	148.32	142.1	158.41	160.16	182.16	192.53	206.48		(62)
Solar DH	IW input o	calculated	using App	endix G or	Appendix	H (negativ	ve quantity	/) (enter '0	' if no sola	r contribut	ion to wate	er heating)		
(add a	dditiona	l lines if	FGHRS	and/or V	VWHRS	applies,	, see Ap	pendix (	G)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
FHRS	36.49	26.88	20.95	11.7	9.16	7.72	7.39	8.33	8.37	14.85	27.67	37.7		(63) (G2)
WWHRS	-51.74	-45.53	-46.47	-38.23	-35.5	-29.28	-24.78	-30.01	-30.88	-38.18	-44.22	-50.01		(63) (G10
Output	from wa	ater hea	ter											
(64)m=	121.48	112.41	126.64	122.3	122.05	109.75	108.3	118.38	119.19	127.3	118.86	116.94		
			•	•				Outp	out from w	ater heate	r (annual)₁	12	1423.6	(64)
Heat g	ains froi	m water	heating,	, kWh/mo	onth 0.2	5 ´ [0.85	× (45)m	+ (61)m	n] + 0.8 x	x [(46)m	+ (57)m	+ (59)m	]	
(65)m=	66.14	58.21	60.93	53.91	52.1	45.71	43.52	48.78	49.33	56.36	59.95	64.45		(65)
inclu	de (57)ı	m in calo	culation	of (65)m	only if c	ylinder is	s in the c	dwelling	or hot w	vater is fr	om com	munity h	eating	
5. Int	ernal ga	ains (see	e Table 5	5 and 5a)	):									
			e 5), Wat	,										
motab	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	135.26	135.26	135.26	135.26	135.26	135.26	135.26	135.26	135.26	135.26	135.26	135.26		(66)
Liahtin	a aains	(calcula	ted in Ar	pendix l	equat	ion L9 or	r L9a). a	lso see <sup>-</sup>	Table 5	ļ	1			
(67)m=	22.34	19.84	16.14	12.22	9.13	7.71	8.33	10.83	14.54	18.46	21.54	22.96		(67)
	nces dai	ins (calc	ulated in	Append	lix Lea	uation L	13 or I 1	i 3a) also	) see Ta	ble 5				
(68)m=	250.61	253.21	246.66	232.71	215.09	198.54	187.49	184.89	191.44	205.39	223	239.55		(68)
				ı ppendix			or I 15a'	l ) also se	e Table	ـــــــــــــــــــــــــــــــــــــ				
(69)m=	36.53	36.53	36.53	36.53	36.53	36.53	36.53	36.53	36.53	36.53	36.53	36.53		(69)
			(Table {											
(70)m=	3	3 3 3 3		3	3	3	3	3	3	3	3	3		(70)
		-					0	0	0	5	5	ÿ		()
(71)m=	-108.2	-108.2	-108.2	tive valu -108.2	-108.2	-108.2	-108.2	-108.2	-108.2	-108.2	-108.2	-108.2		(71)
				-100.2	-100.2	-100.2	-100.2	-100.2	-100.2	-100.2	-100.2	-100.2		('')
	88.89	gains (T	able 5) 81.9	74.97	70.02	63.49	E0 E	65.57	C0 E1	75.76	02.06	96.62	1	(72)
(72)m=		86.62		74.87	70.03		58.5	65.57	68.51	75.76	83.26	86.63		(72)
		gains =			000.04			1	· ·	(70)m + (7	· · ·	i		(70)
(73)m=		426.25	411.27	386.37	360.84	336.32	320.89	327.86	341.06	366.18	394.38	415.72		(73)
	ar gains			r flux from	Table 6c		atod ogua	tions to co	nvort to th			ion		
•			•	r flux from						e applicat	FF	IUII.	Coinc	
Unenta		Access F Table 6d		Area m²		Flu: Tab	x ble 6a	Т	g_ able 6b	Т	able 6c		Gains (W)	
Northea	_	0.77	x				1.28	) × [	0.76	□ × □	0.7	=	30.74	(75)
		0.77	· · ·	1 1.3		<u>^    </u>	1.20	<b>^</b>	0.70	· ^	0.7		30.74	(,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,

х

x

8.26

7.39

11.28

22.97

х

x

0.76

0.76

Х

х

0.7

0.7

=

=

х

x

Northeast 0.9x

Northeast 0.9x

0.77

0.77

34.36

62.57

(75)

(75)

be	compliance <b>testing</b> consulting
build energy	

Northeast 0.9x	0.77	x	8.26	x	22.97	x	0.76	x	0.7	] =	69.94	(75)
Northeast 0.9x	0.77	x	7.39	×	41.38	x	0.76	x	0.7	] =	112.74	(75)
Northeast 0.9x	0.77	x	8.26	x	41.38	x	0.76	x	0.7	] =	126.01	(75)
Northeast 0.9x	0.77	x	7.39	x	67.96	×	0.76	x	0.7	] =	185.15	(75)
Northeast 0.9x	0.77	x	8.26	×	67.96	×	0.76	x	0.7	] =	206.94	(75)
Northeast 0.9x	0.77	x	7.39	x	91.35	×	0.76	x	0.7	] =	248.87	(75)
Northeast 0.9x	0.77	x	8.26	×	91.35	×	0.76	x	0.7	] =	278.17	(75)
Northeast 0.9x	0.77	x	7.39	×	97.38	×	0.76	x	0.7	] =	265.33	(75)
Northeast 0.9x	0.77	x	8.26	×	97.38	×	0.76	x	0.7	] =	296.56	(75)
Northeast 0.9x	0.77	x	7.39	×	91.1	×	0.76	x	0.7	] =	248.21	(75)
Northeast 0.9x	0.77	x	8.26	x	91.1	×	0.76	x	0.7	] =	277.43	(75)
Northeast 0.9x	0.77	x	7.39	×	72.63	×	0.76	x	0.7	] =	197.87	(75)
Northeast 0.9x	0.77	x	8.26	x	72.63	x	0.76	x	0.7	] =	221.17	(75)
Northeast 0.9x	0.77	x	7.39	x	50.42	×	0.76	x	0.7	] =	137.37	(75)
Northeast 0.9x	0.77	x	8.26	×	50.42	×	0.76	x	0.7	] =	153.54	(75)
Northeast 0.9x	0.77	x	7.39	×	28.07	×	0.76	x	0.7	] =	76.47	(75)
Northeast 0.9x	0.77	x	8.26	x	28.07	×	0.76	x	0.7	] =	85.47	(75)
Northeast 0.9x	0.77	x	7.39	x	14.2	x	0.76	x	0.7	] =	38.68	(75)
Northeast 0.9x	0.77	x	8.26	x	14.2	×	0.76	x	0.7	] =	43.23	(75)
Northeast 0.9x	0.77	x	7.39	x	9.21	×	0.76	x	0.7	] =	25.1	(75)
Northeast 0.9x	0.77	x	8.26	x	9.21	×	0.76	x	0.7	] =	28.06	(75)
Southeast 0.9x	0.77	x	3.5	x	36.79	×	0.76	x	0.7	] =	47.48	(77)
Southeast 0.9x	0.77	x	5.28	x	36.79	×	0.76	x	0.7	] =	71.62	(77)
Southeast 0.9x	0.77	x	3.5	x	62.67	x	0.76	x	0.7	] =	80.87	(77)
Southeast 0.9x	0.77	x	5.28	x	62.67	×	0.76	x	0.7	] =	122	(77)
Southeast 0.9x	0.77	x	3.5	×	85.75	×	0.76	x	0.7	] =	110.65	(77)
Southeast 0.9x	0.77	x	5.28	×	85.75	×	0.76	x	0.7	] =	166.93	(77)
Southeast 0.9x	0.77	x	3.5	x	106.25	×	0.76	x	0.7	] =	137.1	(77)
Southeast 0.9x	0.77	x	5.28	×	106.25	×	0.76	x	0.7	] =	206.83	(77)
Southeast 0.9x	0.77	x	3.5	x	119.01	×	0.76	x	0.7	=	153.57	(77)
Southeast 0.9x	0.77	x	5.28	x	119.01	X	0.76	x	0.7	=	231.67	(77)
Southeast 0.9x	0.77	x	3.5	x	118.15	X	0.76	x	0.7	=	152.46	(77)
Southeast 0.9x	0.77	x	5.28	x	118.15	×	0.76	x	0.7	=	229.99	(77)
Southeast 0.9x	0.77	x	3.5	x	113.91	X	0.76	x	0.7	=	146.98	(77)
Southeast 0.9x	0.77	x	5.28	x	113.91	X	0.76	x	0.7	=	221.74	(77)
Southeast 0.9x	0.77	x	3.5	x	104.39	X	0.76	x	0.7	=	134.7	(77)
Southeast 0.9x	0.77	x	5.28	x	104.39	X	0.76	x	0.7	=	203.21	(77)
Southeast 0.9x	0.77	x	3.5	x	92.85	x	0.76	x	0.7	=	119.81	(77)
Southeast 0.9x	0.77	x	5.28	×	92.85	×	0.76	x	0.7	] =	180.75	(77)
Southeast 0.9x	0.77	x	3.5	×	69.27	×	0.76	x	0.7	] =	89.38	(77)
Southeast 0.9x	0.77	x	5.28	×	69.27	×	0.76	x	0.7	] =	134.84	(77)



Southeast 0.9x	0.77	X	3.5	5	X	44	.07	×	0.76	×	0.7	=		56.87	(77)
Southeast 0.9x	0.77	x	5.28	8	x	44	.07	×	0.76	x	0.7	=		85.79	(77)
Southeast 0.9x	0.77	x	3.5	5	x	31	.49	x	0.76	×	0.7	=		40.63	(77)
Southeast 0.9x	0.77	x	5.28	8	x	31	.49	<b>x</b>	0.76	×	0.7	=		61.29	(77)
Southwest <sub>0.9x</sub>	0.77	x	8.26	6	x	36	6.79	] [	0.76	×	0.7	=		112.05	(79)
Southwest <sub>0.9x</sub>	0.77	x	8.26	6	x	62	2.67	] [	0.76	×	0.7	=		190.86	(79)
Southwest0.9x	0.77	x	8.26	6	x	85	5.75	] [	0.76	×	0.7	=		261.14	(79)
Southwest <sub>0.9x</sub>	0.77	x	8.26	6	x	10	6.25	] [	0.76	×	0.7	=		323.56	(79)
Southwest <sub>0.9x</sub>	0.77	x	8.26	6	x	11	9.01	] [	0.76	×	0.7	=		362.42	(79)
Southwest <sub>0.9x</sub>	0.77	x	8.26	6	x	11	8.15	] [	0.76	×	0.7	=		359.8	(79)
Southwest <sub>0.9x</sub>	0.77	x	8.26	6	x	11	3.91	] [	0.76	x	0.7	=		346.88	(79)
Southwest <sub>0.9x</sub>	0.77	x	8.26	6	x	10	4.39	] [	0.76	×	0.7	=		317.9	(79)
Southwest <sub>0.9x</sub>	0.77	x	8.26	6	x	92	2.85	] [	0.76	×	0.7	=		282.76	(79)
Southwest <sub>0.9x</sub>	0.77	x	8.26	6	x	69	9.27	] [	0.76	×	0.7	=		210.94	(79)
Southwest <sub>0.9x</sub>	0.77	x	8.26	6	x	44	l.07	] [	0.76	×	0.7	=		134.21	(79)
Southwest <sub>0.9x</sub>	0.77	x	8.26	6	x	31	.49	Ì	0.76	×	0.7	=		95.89	(79)
		-													
Solar gains in wa	itts, calcula	ated	for each	n mont	h			(83)m	= Sum(74)m .	(82)m			_		
(83)m= 296.25 5	26.24 777	.46	1059.59	1274.7	7 13	04.13	1241.24	1074.	85 874.23	597.1	358.77	250.98			(83)
Total gains – inte	ernal and s	olar	(84)m =	(73)m	ו + (מ	33)m ,	watts						_		
			4445 00	4005 5							750 45	000 7			(84)
(84)m= 724.67 9	52.49 1188	3.73	1445.96	1635.5	4 16	40.45	1562.13	1402	.7 1215.29	963.28	753.15	666.7			(04)
(84)m= 724.67 9 7. Mean interna	I					640.45	1562.13	1402	.7 1215.29	963.28	753.15	000.7			(04)
	l temperat	ure (	heating	seaso	on)					963.28	753.15	000.7		21	(85)
7. Mean interna	l temperat Iring heatir	ure ( ng pe	heating eriods in	seaso the liv	n) /ing	area fr	om Tab			963.28	753.15	000.7		21	
7. Mean interna Temperature du Utilisation factor	l temperat Iring heatin	ure ( ng pe	heating eriods in	seaso the liv	on) /ing m (s	area fr	om Tab		Th1 (°C)	963.28 Oct	753.15 Nov	Dec		21	
7. Mean interna Temperature du Utilisation factor Jan	l temperat Iring heatir for gains	ure ( ng pe for li ar	heating eriods in ving area	seaso the liv a, h1,i	on) /ing m (s /	area fr ee Tab	om Tab ble 9a)	ble 9,	Th1 (°C) g Sep					21	
7. Mean interna Temperature du Utilisation factor Jan (86)m= 0.99	l temperat Iring heatin for gains Feb M 0.97 0.	ure ( ng pe for li ar	heating eriods in ving area Apr 0.74	seaso the liv a, h1,i May 0.53	on) /ing m (s /	area fr ee Tat Jun 0.37	rom Tab ble 9a) Jul 0.27	Die 9, Au 0.31	Th1 (°C) g Sep 0.53	Oct	Nov	Dec		21	(85)
7. Mean interna Temperature du Utilisation factor Jan (86)m= 0.99 0 Mean internal te	l temperat Iring heatin for gains Feb M 0.97 0.	ure ( ng pe for li ar 9 e in li	heating eriods in ving area Apr 0.74	seaso the liv a, h1,i May 0.53	ving m (s /	area fr ee Tat Jun 0.37	rom Tab ble 9a) Jul 0.27	Die 9, Au 0.31	Th1 (°C) g Sep 0.53	Oct	Nov	Dec	」 【二 】 】	21	(85)
7. Mean interna         Temperature du         Utilisation factor         Jan         (86)m=       0.99         Mean internal te         (87)m=       20.14	I temperaturing heatingfor gainsFebM0.970.emperature20.420	ure ( ng pe for li ar 9 e in li .7	heating eriods in ving area Apr 0.74 iving are 20.92	seaso the liv a, h1,i <u>May</u> 0.53 ea T1 ( 20.99	n) /ing m (s /	area fr ee Tak Jun D.37 w step 21	rom Tab ble 9a) Jul 0.27 bs 3 to 7 21	ole 9, Au 0.31 7 in Ta 21	Th1 (°C) g Sep 0.53 able 9c) 20.99	Oct 0.86	Nov 0.98	Dec 1		21	(85)
7. Mean interna Temperature du Utilisation factor (86)m= 0.99 ( Mean internal te (87)m= 20.14 ( Temperature du	I temperat       uring heatin       for gains       Feb     M       0.97     0.1       emperature       20.4     20       uring heatin	ure ( ng pe for li ar 9 e in li .7	heating eriods in ving area Apr 0.74 iving are 20.92 eriods in	seaso the liv a, h1,i May 0.53 ea T1 ( 20.99	(follo	area fr ee Tab Jun 0.37 w step 21 'elling	rom Tab ble 9a) Jul 0.27 bs 3 to 7 21 from Ta	ole 9, Au 0.31 7 in Ta 21 able 9	Th1 (°C) g Sep 0.53 able 9c) 20.99 , Th2 (°C)	Oct 0.86 20.84	Nov 0.98 20.42	Dec 1 20.07		21	(85) (86) (87)
7. Mean interna Temperature du Utilisation factor (86)m= 0.99 0 Mean internal te (87)m= 20.14 2 Temperature du (88)m= 20.1 2	I temperaturing heatinfor gainsFebM0.970.1emperature20.420uring heatin20.120	ure ( ng pe for li ar 9 e in li .7 ng pe .1	heating eriods in ving area Apr 0.74 iving are 20.92 eriods in 20.1	seaso the liv a, h1,i May 0.53 ea T1 ( 20.99 rest o 20.1	on) ving m (s / (follo of dw	area fr ee Tab Jun 0.37 w step 21 velling	rom Tab ble 9a) Jul 0.27 bs 3 to 7 21 from Ta 20.1	ole 9, Au 0.31 7 in Ta 21 able 9 20.1	Th1 (°C) g Sep 0.53 able 9c) 20.99 , Th2 (°C)	Oct 0.86	Nov 0.98	Dec 1		21	(85)
7. Mean interna Temperature du Utilisation factor Jan (86)m= 0.99 0 Mean internal te (87)m= 20.14 2 Temperature du (88)m= 20.1 2	I temperaturing heatingfor gainsFebM0.970.emperature20.420uring heating20.120for gains	ure ( ng pe for li ar 9 9 2 9 3 9 9 7 1 7 1 1 1	heating eriods in ving area Apr 0.74 iving are 20.92 eriods in 20.1 est of dw	seaso the liv a, h1,1 May 0.53 ea T1 ( 20.99 rest o 20.1 velling	n) m (s /(follo	area fr ee Tab Jun 0.37 w step 21 velling 20.1 m (see	rom Tab ble 9a) Jul 0.27 bs 3 to 7 21 from Ta 20.1 e Table	Die 9, Au 0.31 7 in Ta 21 able 9 20.1 9a)	Th1 (°C) g Sep 0.53 able 9c) 20.99 , Th2 (°C) 20.1	Oct 0.86 20.84 20.1	Nov 0.98 20.42 20.1	Dec 1 20.07 20.1		21	(85) (86) (87) (88)
7. Mean interna Temperature du Utilisation factor (86)m= 0.99 ( Mean internal te (87)m= 20.14 ( Temperature du (88)m= 20.1 ( Utilisation factor	I temperaturing heatinfor gainsFebM0.970.1emperature20.420uring heatin20.120	ure ( ng pe for li ar 9 9 2 9 3 9 9 7 1 7 1 1 1	heating eriods in ving area Apr 0.74 iving are 20.92 eriods in 20.1	seaso the liv a, h1,i May 0.53 ea T1 ( 20.99 rest o 20.1	n) m (s /(follo	area fr ee Tab Jun 0.37 w step 21 velling	rom Tab ble 9a) Jul 0.27 bs 3 to 7 21 from Ta 20.1	ole 9, Au 0.31 7 in Ta 21 able 9 20.1	Th1 (°C) g Sep 0.53 able 9c) 20.99 , Th2 (°C) 20.1	Oct 0.86 20.84	Nov 0.98 20.42	Dec 1 20.07		21	(85) (86) (87)
7. Mean interna         Temperature du         Utilisation factor         Jan         (86)m=       0.99         Mean internal te         (87)m=       20.14         Temperature du         (88)m=       20.1         Utilisation factor         (88)m=       0.99         Mean internal te         (89)m=       0.99         Mean internal te	I temperaturing heatinfor gainsFebM0.970.1emperature20.420uring heatin20.120for gains0.970.8emperatureemperature	ure ( ng pe for li ar 9 9 9 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	heating eriods in ving area Apr 0.74 iving are 20.92 eriods in 20.1 est of dw 0.69 he rest c	seaso the liv a, h1,1 May 0.53 ea T1 ( 20.99 rest o 20.1 velling 0.48 of dwe	n) ving m (s / (follo of dw , h2, ( ulling	area fr ee Tab Jun 0.37 w step 21 velling 20.1 m (see 0.32	rom Tab ole 9a) Jul 0.27 os 3 to 7 21 from Ta 20.1 e Table 0.21 llow ste	ole 9, Au 0.31 7 in Ta 21 able 9 20.1 9a) 0.25	Th1 (°C) g Sep 0.53 able 9c) 20.99 , Th2 (°C) 20.1 5 0.46	Oct 0.86 20.84 20.1 0.82	Nov 0.98 20.42 20.1	Dec 1 20.07 20.1		21	(85) (86) (87) (88) (89)
7. Mean interna Temperature du Utilisation factor (86)m= 0.99 ( Mean internal te (87)m= 20.14 ( 88)m= 20.1 ( Utilisation factor (89)m= 0.99 ( Mean internal te	I temperaturing heatingfor gainsFebM0.970.emperature20.420uring heating20.120for gains0.970.8	ure ( ng pe for li ar 9 9 9 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	heating eriods in ving area Apr 0.74 iving are 20.92 eriods in 20.1 est of dw 0.69	seaso the liv a, h1,1 May 0.53 ea T1 ( 20.99 rest o 20.1 velling 0.48	n) ving m (s / (follo of dw , h2, ( ulling	area fr ee Tab Jun 0.37 w step 21 velling 20.1 m (see 0.32	rom Tab ole 9a) Jul 0.27 os 3 to 7 21 from Ta 20.1 e Table 0.21	ole 9, Au 0.31 7 in Ta 21 able 9 20.1 9a) 0.25	Th1 (°C) g Sep 0.53 able 9c) 20.99 , Th2 (°C) 20.1 5 0.46 to 7 in Tabl 20.1	Oct 0.86 20.84 20.1 0.82 e 9c) 19.94	Nov           0.98           20.42           20.1           0.98           19.37	Dec 1 20.07 20.1 0.99 18.87		21	(85) (86) (87) (88)
7. Mean interna         Temperature du         Utilisation factor         Jan         (86)m=       0.99         Mean internal temperature du         (87)m=       20.14         Temperature du         (88)m=       20.1         Utilisation factor         (88)m=       0.99         Mean internal temperature du         (88)m=       0.1         Utilisation factor         (89)m=       0.99         Mean internal temperature	I temperaturing heatinfor gainsFebM0.970.1emperature20.420uring heatin20.120for gains0.970.8emperatureemperature	ure ( ng pe for li ar 9 9 9 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	heating eriods in ving area Apr 0.74 iving are 20.92 eriods in 20.1 est of dw 0.69 he rest c	seaso the liv a, h1,1 May 0.53 ea T1 ( 20.99 rest o 20.1 velling 0.48 of dwe	n) ving m (s / (follo of dw , h2, ( ulling	area fr ee Tab Jun 0.37 w step 21 velling 20.1 m (see 0.32 T2 (fo	rom Tab ole 9a) Jul 0.27 os 3 to 7 21 from Ta 20.1 e Table 0.21 llow ste	ole 9, Au 0.31 7 in Ta 21 able 9 20.1 9a) 0.25 eps 3 f	Th1 (°C) g Sep 0.53 able 9c) 20.99 , Th2 (°C) 20.1 5 0.46 to 7 in Tabl 20.1	Oct 0.86 20.84 20.1 0.82 e 9c) 19.94	Nov           0.98           20.42           20.1           0.98	Dec 1 20.07 20.1 0.99 18.87		21	(85) (86) (87) (88) (89)
7. Mean internaTemperature duUtilisation factorJan(86)m= $0.99$ Mean internal te(87)m=20.1420.14Temperature du(88)m=20.1Utilisation factor(89)m=0.99Mean internal te(90)m=18.96	ItemperatIring heatingfor gainsFebM0.970.emperature20.420uring heating20.120for gains0.970.8emperature19.3419.	ure ( ng pe for li ar 9 e in li 7 1 for re 1 for re 1 5 1 1 7 1 1 1 1 1 1 1 1 1 1 1 1 1	heating eriods in ving area Apr 0.74 iving are 20.92 eriods in 20.1 est of dw 0.69 he rest of 20.02	seaso the liv a, h1,1 May 0.53 ea T1 ( 20.99 rest o 20.1 velling 0.48 of dwe 20.09	n) ving m (s / (follo of dw ), h2, (i, h2, ) (i, h2, h2, ) (i, h2, h2, ) (i, h2, h2, h2, h2, h2, h2, h2, h2, h2, h2	area fr ee Tab Jun 0.37 w step 21 20.1 m (see 0.32 T2 (fo 20.1	rom Tab ole 9a) Jul 0.27 os 3 to 7 21 from Ta 20.1 e Table 0.21 llow ste 20.1	Die 9, Au 0.31 7 in Ta 21 20.1 9a) 0.25 20.1	Th1 (°C) g Sep 0.53 able 9c) 20.99 Th2 (°C) 20.1 5 0.46 to 7 in Tabl 20.1 f	Oct 0.86 20.84 20.1 0.82 e 9c) 19.94	Nov           0.98           20.42           20.1           0.98           19.37	Dec 1 20.07 20.1 0.99 18.87			(85) (86) (87) (88) (89) (90)
7. Mean internaTemperature duUtilisation factorJan(86)m=0.99Mean internal temperature du(87)m=20.14Temperature du(88)m=20.1Utilisation factor(89)m=0.99Mean internal temperature(90)m=18.961Mean internal temperature	ItemperatIring heatingfor gainsFebM0.970.emperature20.420uring heating20.120for gains0.970.8emperature19.3419.	ure ( ng pe for li ar 9 $\Rightarrow$ in li 7 hg pe 1 for re 38 $\Rightarrow$ in the 75 $\Rightarrow$ (for	heating eriods in ving area Apr 0.74 iving are 20.92 eriods in 20.1 est of dw 0.69 he rest of 20.02	seaso the liv a, h1,1 May 0.53 ea T1 ( 20.99 rest o 20.1 velling 0.48 of dwe 20.09	n) ving m (s / (follo (follo f dw i, h2, ( ulling i, h2, vellin	area fr ee Tab Jun 0.37 w step 21 20.1 m (see 0.32 T2 (fo 20.1	rom Tab ole 9a) Jul 0.27 os 3 to 7 21 from Ta 20.1 e Table 0.21 llow ste 20.1	Die 9, Au 0.31 7 in Ta 21 20.1 9a) 0.25 20.1	Th1 (°C) g Sep 0.53 able 9c) 20.99 , Th2 (°C) 20.1 5 0.46 to 7 in Tabl 20.1 f - fLA) × T2	Oct 0.86 20.84 20.1 0.82 e 9c) 19.94	Nov           0.98           20.42           20.1           0.98           19.37	Dec 1 20.07 20.1 0.99 18.87			(85) (86) (87) (88) (89) (90)
7. Mean internaTemperature duUtilisation factorJan(86)m=0.99Mean internal temperature du(87)m=20.14Temperature du(88)m=20.1Utilisation factor(89)m=0.99Mean internal temperature(90)m=18.961Mean internal temperature	ItemperatureIring heatingfor gainsFebM0.970.emperature20.420uring heating20.120for gains0.970.8emperature19.3419.emperature19.8920.	ure ( ng pee for li ar 9 e in li 7 ng pe 1 for re 88 e in ti 75 e (for 24	heating eriods in ving area Apr 0.74 iving are 20.92 eriods in 20.1 est of dw 0.69 he rest of 20.02	seaso the liv a, h1,1 May 0.53 ea T1 ( 20.99 rest o 20.1 velling 0.48 of dwe 20.09	n) ving m (s / (follo (follo f dw (follo (foll	area fr ee Tab Jun 0.37 w step 21 20.1 m (see 0.32 T2 (fo 20.1 T2 (fo 20.1 T2 (fo 20.1	rom Tab ole 9a) Jul 0.27 os 3 to 7 21 from Ta 20.1 e Table 0.21 llow ste 20.1 A × T1 20.56	ble 9, Au 0.31 7 in Ta 21 able 9 20.1 9a) 0.25 20.1 + (1 - 20.5	Th1 (°C) g Sep 0.53 able 9c) 20.99 Th2 (°C) 20.1 5 0.46 to 7 in Tabl 20.1 f - fLA) × T2 6 20.56	Oct 0.86 20.84 20.1 0.82 e 9c) 19.94 LA = Livi 20.41	Nov           0.98           20.42           20.1           0.98           19.37           ng area + (4)	Dec 1 20.07 20.1 0.99 18.87 1) =			(85) (86) (87) (88) (89) (90) (91)
7. Mean internaTemperature duUtilisation factorJan(86)m=0.99Mean internal te(87)m=20.14Temperature du(88)m=20.1Utilisation factor(89)m=0.99Mean internal te(90)m=18.961Mean internal te(92)m=19.571Apply adjustment	ItemperatureIring heatingfor gainsFebM0.970.emperature20.420uring heating20.120for gains0.970.8emperature19.3419.emperature19.8920.	ure ( ng pe for li ar 9 e in li 7 ng pe 1 for re 38 e in ti 75 e (for 24 ean	heating eriods in ving area Apr 0.74 iving are 20.92 eriods in 20.1 est of dw 0.69 he rest of 20.02	seaso the liv a, h1,1 May 0.53 ea T1 ( 20.99 rest o 20.1 velling 0.48 of dwe 20.09	n) ving m (s / (follo f dw f d	area fr ee Tab Jun 0.37 w step 21 20.1 m (see 0.32 T2 (fo 20.1 T2 (fo 20.1 T2 (fo 20.1	rom Tab ole 9a) Jul 0.27 os 3 to 7 21 from Ta 20.1 e Table 0.21 llow ste 20.1 A × T1 20.56	ble 9, Au 0.31 7 in Ta 21 able 9 20.1 9a) 0.25 20.1 + (1 - 20.5	Th1 (°C) g Sep 0.53 able 9c) 20.99 , Th2 (°C) 20.1 5 0.46 to 7 in Tabl 20.1 f - fLA) × T2 6 20.56 /here approx	Oct 0.86 20.84 20.1 0.82 e 9c) 19.94 LA = Livi 20.41	Nov           0.98           20.42           20.1           0.98           19.37           ng area + (4)	Dec 1 20.07 20.1 0.99 18.87 1) =			(85) (86) (87) (88) (89) (90) (91)
7. Mean internaTemperature duUtilisation factorJan(86)m=0.99Mean internal te(87)m=20.14Temperature du(88)m=20.1Utilisation factor(89)m=0.99Mean internal te(90)m=18.961Mean internal te(92)m=19.571Apply adjustment	Itemperatureiring heatingfor gainsFebM0.970.emperature20.420iring heating20.120for gains0.970.8emperature19.3419.emperature19.8920.nt to the m19.7420.	ure (         ng pe         for li         ar         9         ar         9         ar         ng pe         1         for re         8         ar         75         ean         09         09	heating eriods in ving area Apr 0.74 iving are 20.92 eriods in 20.1 est of dw 0.69 he rest of 20.02 the who 20.02	seaso the liv a, h1,1 May 0.53 ea T1 ( 20.99 rest o 20.1 velling 0.48 of dwe 20.09 ole dw 20.55 tempe	n) ving m (s / (follo f dw f d	area fr ee Tab Jun 0.37 w step 21 elling 20.1 m (see 0.32 T2 (fo 20.1 T2 (fo 20.1 T2 (fo 20.1 T2 (fo 20.1	rom Tab ole 9a) Jul 0.27 os 3 to 7 21 from Ta 20.1 e Table 0.21 llow ste 20.1 A × T1 20.56 n Table	Au         0.31         7 in Ta         21         able 9         20.1         9a)         0.25         eps 3 f         20.1         + (1 -         20.5         44e, w	Th1 (°C) g Sep 0.53 able 9c) 20.99 , Th2 (°C) 20.1 5 0.46 to 7 in Tabl 20.1 f - fLA) × T2 6 20.56 /here approx	Oct 0.86 20.84 20.1 0.82 e 9c) 19.94 LA = Livi 20.41 ppriate	Nov           0.98           20.42           20.1           0.98           19.37           ng area + (4           19.92	Dec 1 20.07 20.1 0.99 18.87 1) = 19.49			(85) (86) (87) (88) (89) (90) (91) (92)
7. Mean interna Temperature du Utilisation factor $\begin{bmatrix} Jan \\ 0.99 \end{bmatrix}$ Mean internal te (86)m= 0.99 0 Mean internal te (87)m= 20.14 2 Temperature du (88)m= 20.1 2 Utilisation factor (89)m= 0.99 0 Mean internal te (90)m= 18.96 1 Mean internal te (92)m= 19.57 1 Apply adjustment (93)m= 19.42 1 8. Space heatin Set Ti to the me	I temperatureiring heatingfor gainsFebM0.970.emperature20.420iring heating20.120ring heating20.120r for gains0.970.80.970.8emperature19.3419.int to the m19.7420.g requireman interna	ure ( ng pe for li ar 9 e in li 7 ng pe 1 for re 88 e in ti 75 e (for 24 ean 09 nent l tem	heating eriods in ving are Apr 0.74 iving are 20.92 eriods in 20.1 est of dw 0.69 he rest of 20.02 the who 20.49 internal 20.34	seaso the liv a, h1,1 May 0.53 ea T1 ( 20.99 rest o 20.1 velling 0.48 of dwe 20.09 ole dw 20.55 tempe 20.4	n) ving m (s / (follo f dw f dw f dw f dw f dw f 2 cellin 2 ceratu 2 ined	area fr ee Tab Jun 0.37 w step 21 celling 20.1 m (see 0.32 T2 (fo 0.32 T2 (fo 0.34 T2 (fo 0.34	rom Tab ble 9a) Jul 0.27 bs 3 to 7 21 from Ta 20.1 e Table 0.21 llow ste 20.1 A × T1 20.56 n Table 20.41	Die 9,         Au         0.31         7 in Ta         21         able 9         20.1         9a)         0.25         20.1         9a)         0.25         20.1         + (1 -         20.5         4e, w         20.4	Th1 (°C) g Sep 0.53 able 9c) 20.99 , Th2 (°C) 20.1 5 0.46 to 7 in Tabl 20.1 f - fLA) × T2 6 20.56 /here approx 1 20.41	Oct 0.86 20.84 20.1 0.82 e 9c) 19.94 LA = Livi 20.41 ppriate 20.26	Nov           0.98           20.42           20.1           0.98           19.37           ng area ÷ (4           19.92           19.77	Dec 1 20.07 20.1 0.99 18.87 1) = 19.49 19.34		0.52	(85) (86) (87) (88) (89) (90) (91) (92)
7. Mean interna Temperature du Utilisation factor $\begin{bmatrix} Jan \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\$	Itemperaturering heatingfor gainsFebM0.970.emperature20.420uring heating20.120ring heating20.120of or gains0.970.8emperature19.3419.emperature19.8920.nt to the m19.7420.g requireman internactor for gains	ure ( ng pe for li ar 9 e in li 7 ng pe 1 for re 88 e in ti 75 e (for 24 ean 09 nent l tem	heating eriods in ving are Apr 0.74 iving are 20.92 eriods in 20.1 est of dw 0.69 he rest of 20.02 the who 20.49 internal 20.34	seaso the liv a, h1,1 May 0.53 ea T1 ( 20.99 rest o 20.1 velling 0.48 of dwe 20.09 ole dw 20.55 tempe 20.4	n) ving m (s / (follo of dw ; f dw ; f dw ; ing ; ; ing ; ; ing ; ; ; ; ; ; ; ; ; ; ; ; ;	area fr ee Tab Jun 0.37 w step 21 celling 20.1 m (see 0.32 T2 (fo 0.32 T2 (fo 0.34 T2 (fo (	rom Tab ble 9a) Jul 0.27 bs 3 to 7 21 from Ta 20.1 e Table 0.21 llow ste 20.1 A × T1 20.56 n Table 20.41	Die 9,         Au         0.31         7 in Ta         21         able 9         20.1         9a)         0.25         20.1         9a)         0.25         20.1         + (1 -         20.5         4e, w         20.4	Th1 (°C) g Sep 0.53 able 9c) 20.99 Th2 (°C) 20.1 5 0.46 to 7 in Tabl 20.1 f - fLA) × T2 6 20.56 /here approx 1 20.41 e 9b, so tha	Oct 0.86 20.84 20.1 0.82 e 9c) 19.94 LA = Livi 20.41 ppriate 20.26	Nov           0.98           20.42           20.1           0.98           19.37           ng area ÷ (4           19.92           19.77	Dec 1 20.07 20.1 0.99 18.87 1) = 19.49 19.34		0.52	(85) (86) (87) (88) (89) (90) (91) (92)



Utilisa	ation fac	tor for g	ains, hm	1:										
(94)m=	0.99	0.96	0.88	0.71	0.5	0.33	0.23	0.27	0.49	0.83	0.97	0.99		(94)
Usefu	ul gains,	hmGm	, W = (94	4)m x (84	4)m	•		•	•		•			
(95)m=	717.29	916.53	1048.92	1020.92	814.68	548.85	360.52	379.32	591.04	797.17	732.61	662.19		(95)
Month	nly aver	age exte	ernal tem	perature	e from Ta	able 8	-				-			
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat	loss rat	e for me	an intern	al tempe	erature,	Lm , W =	=[(39)m :	x [(93)m	– (96)m	]	-			
(97)m=	1429.07	1402.62	1284.92	1080.93	822.74	549.55	360.58	379.47	596.22	912.88	1197.2	1430.94		(97)
Space	e heatin	<u> </u>	ement fo	r each n	nonth, k	Wh/mon	th = 0.02	24 x [(97	)m – (95	)m] x (4	1)m			
(98)m=	529.56	326.65	175.59	43.21	6	0	0	0	0	86.08	334.51	571.95		_
								Tota	l per year	(kWh/yea	r) = Sum(9	8)15,912 =	2073.55	(98)
Space	e heatin	g require	ement in	kWh/m²	/year							[	21.48	(99)
9a. En	ergy red	quiremer	nts – Indi	ividual h	eating s	vstems i	ncluding	micro-C	CHP)			L		_
	e heati					,								
•		-	at from s	econdar	y/supple	mentary	system					]	0	(201)
Fracti	ion of s	bace hea	at from m	nain syst	em(s)			(202) = 1 -	- (201) =			Ì	1	(202)
Fracti	ion of to	tal heati	ng from	main sys	stem 1			(204) = (2	02) × [1 –	(203)] =		L L	1	(204)
			ace heat									Γ	90.4	(206)
	•	•	iry/suppl	0,		a sveton	n %					l	0	(208)
LIIICI						1								
-	Jan	Feb .	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/yea	ar
Space	-	ř ·	ement (c	r		Í	0		0	00.00	224 54	574.05		
	529.56	326.65	175.59	43.21	6	0	0	0	0	86.08	334.51	571.95		
(211)m	r	1	)4)] } x 1				1	1	1					(211)
	585.8	361.34	194.23	47.8	6.64	0	0	0	0	95.22	370.03	632.68		٦
								Tota	ll (kWh/yea	ar) =Sum(2	211) <sub>15,10</sub> 12	=	2293.75	(211)
•		•	econdar		month									
	i	1	00 ÷ (20	· ·										
(215)m=	0	0	0	0	0	0	0	0	0	0	0	0		
								Tota	ll (kWh/yea	ar) =Sum( <i>i</i>	210) <sub>15,10</sub> 12	- L	0	(215)
	heating	-	( / l .		· · · · · · · · · · · · · · · · · · ·									
Output	121.48	ater nea 112.41	ter (calc 126.64	122.3	122.05	109.75	108.3	118.38	119.19	127.3	118.86	116.94		
Efficier		l der hea		122.0	122.00	100.10	100.0	110.00	110.10	127.0	110.00	110.01	80.3	(216)
(217)m=	<u> </u>	87.58	85.87	82.71	80.72	80.3	80.3	80.3	80.3	84.09	87.51	88.51	00.0	(217)
					00.72	00.0	00.0	00.0	00.0	04.00	07.01	00.01		(=)
			, kWh/mo ) ÷ (217)											
. ,	137.54	128.36	147.47	147.86	151.19	136.67	134.87	147.42	148.43	151.39	135.82	132.12		
						-		Tota	I = Sum(2	19a) <sub>112</sub> =	-		1699.14	(219)
Annua	al totals	;								k	Wh/year		kWh/year	_
Space	heating	l fuel use	ed, main	system	1						-	[	2293.75	]
Water	heating	fuel use	ed									[	1699.14	Ī

Electricity for pumps, fans and electric keep-hot



mechanical ventilation - balanced, extract or positi	ve input from outside		83.1		(230a)
central heating pump:			30		(230c)
boiler with a fan-assisted flue			45		(230e)
Total electricity for the above, kWh/year	sum of (2	230a)(230g) =	[	158.1	(231)
Electricity for lighting			[	394.57	(232)
Electricity generated by PVs			[	-690.9	(233)
12a. CO2 emissions – Individual heating systems i	including micro-CHP				
	<b>Energy</b> kWh/year	<b>Emission fac</b> kg CO2/kWh	tor	Emissions kg CO2/yea	r
Space heating (main system 1)	(211) x	0.216	= [	495.45	(261)
Space heating (secondary)	(215) x	0.519	= [	0	(263)
Water heating	(219) x	0.216	= [	367.01	(264)
Space and water heating	(261) + (262) + (263) + (264)	) =	[	862.46	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	= [	82.06	(267)
Electricity for lighting	(232) x	0.519	= [	204.78	(268)
Energy saving/generation technologies Item 1		0.519	= [	-358.57	(269)
Total CO2, kg/year		sum of (265)(271) =	[	790.73	(272)
Dwelling CO2 Emission Rate		(272) ÷ (4) =	[	8.19	(273)
El rating (section 14)			[	93	(274)



				User D	etails:						
Assessor Name:	Peter Mitch	nell			Strom	a Num	ber:		STRO	007945	
Software Name:	Stroma FS	AP 2012			Softwa	are Ver	sion:		Versio	n: 1.0.4.5	
			Pro	operty <i>i</i>	Address:	: Unit 6 (	GFEND	) LEAN			
Address :	New Dwellir	ng at:, Goro	don Ho	use, 6	Lissende	en Garde	ens, LON	NDON, N	W5 1LX		
1. Overall dwelling dime	nsions:										
					a(m²)		Av. Hei		1	Volume(m <sup>3</sup>	
Ground floor					6.54	(1a) x	2	2.4	(2a) =	231.7	(3a)
Total floor area TFA = (1a	a)+(1b)+(1c)+(	(1d)+(1e)+.	(1n)	9	6.54	(4)					
Dwelling volume						(3a)+(3b)	+(3c)+(3d	)+(3e)+	.(3n) =	231.7	(5)
2. Ventilation rate:											
	main heating		ondary iting	,	other		total			m <sup>3</sup> per hou	r
Number of chimneys	0	+	0	+	0	] = [	0	x 4	40 =	0	(6a)
Number of open flues	0	+	0	1+ [	0	i = L	0	x 2	20 =	0	(6b)
Number of intermittent fa	ns			J <u> </u>		, г	2	<b>x</b> 1	10 =	20	(7a)
Number of passive vents							0	<b>x</b> 1	10 =	0	(7b)
Number of flueless gas fi	res						0	x 4	40 =	0	(7c)
						L					
						_			Air ch	anges per ho	_
Infiltration due to chimney							20		÷ (5) =	0.09	(8)
If a pressurisation test has b Number of storeys in th			oroceeu	10 (17), 0	ourierwise c	continue inc	5111 (9) 10 (	10)		0	(9)
Additional infiltration		,						[(9)-	-1]x0.1 =	0	(0)
Structural infiltration: 0	.25 for steel or	timber frai	me or (	0.35 for	masonr	y constr	uction		-	0	(11)
if both types of wall are pr			nding to t	the greate	er wall area	a (after			ľ		
deducting areas of openir If suspended wooden f			) or () 1	l (seale	d) else	enter ()			I		(12)
If no draught lobby, ent			) 01 0.1		<i>a</i> ), cise					0	(12)
Percentage of windows			ped							0	(14)
Window infiltration		0 1	•		0.25 - [0.2	x (14) ÷ 1	00] =			0	(15)
Infiltration rate					(8) + (10)	+ (11) + (1	2) + (13) +	+ (15) =		0	(16)
Air permeability value,	q50, expresse	d in cubic i	metres	per ho	our per so	quare m	etre of e	nvelope	area	4	(17)
If based on air permeabil	•								İ	0.29	(18)
Air permeability value applie. Number of sides sheltere		on test has be	en done	e or a deg	ree air pei	rmeability i	s being us	sed	1		(19)
Shelter factor	u .				(20) = 1 -	[0.075 x (1	9)] =			3 0.78	(19)
Infiltration rate incorporat	ing shelter fac	tor			(21) = (18)	) x (20) =				0.22	(21)
Infiltration rate modified f	or monthly win	ld speed							I		
Jan Feb	Mar Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	eed from Tabl	e 7	-								
(22)m= 5.1 5	4.9 4.4	4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (22	2)m ÷ 4										
	1.23 1.1	1.08 (	0.95	0.95	0.92	1	1.08	1.12	1.18		
· ′ [ ·	I						-		-		



Adjust	ed infiltr	ation rat	e (allowi	ng for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m					
	0.28	0.28	0.27	0.24	0.24	0.21	0.21	0.21	0.22	0.24	0.25	0.26		
		<i>ctive air (</i> al ventila	•	rate for t	he appli	cable ca	se						0	(23a)
				endix N, (2	3b) = (23a	a) × Fmv (e	equation (N	N5)) othei	rwise (23b	) = (23a)			0	(23a) (23b)
			• • •	iency in %	, ,	, ,				) (200)			0	
			-	-	-					$2h m \pm ($	22P) ^ [	1 – (23c)	0 ÷ 1001	(23c)
(24a)m=											230) ^ [	0	÷ 100]	(24a)
		-	-	ntilation	-	-	-	-	-			ů		( ,
(24b)m=	-							0	0		230)	0		(24b)
		-	-	tilation o	-	-	-	-	-	0	Ū	0		()
,				then (24	•	•				5 × (23b	))			
(24c)m=	r í	0	0	0	0	0	0	0	0	0	0	0		(24c)
		l ventilatio	L on or wh	l ole hous	e positiv	l /e input v	l ventilatio	n from l	oft					
				m = (22						0.5]				
(24d)m=	0.54	0.54	0.54	0.53	0.53	0.52	0.52	0.52	0.52	0.53	0.53	0.53		(24d)
Effe	ctive air	change	rate - er	nter (24a	) or (24b	o) or (240	c) or (24	d) in box	x (25)	-	-	-		
(25)m=	0.54	0.54	0.54	0.53	0.53	0.52	0.52	0.52	0.52	0.53	0.53	0.53		(25)
3 He	at losse	s and he	at loss i	paramete	⊇r.									
ELEN		Gros		Openin		Net Ar	ea	U-valı	le	AXU		k-value		A X k
		area		m		A ,n		W/m2		(W/I	K)	kJ/m²·ł		kJ/K
Windo	ws Type	e 1				7.39	x1.	/[1/( 1.2 )+	0.04] =	8.46				(27)
Windo	ws Type	e 2				3.5	x1	/[1/( 1.2 )+	0.04] =	4.01				(27)
Windo	ws Type	e 3				8.26	x1.	/[1/( 1.2 )+	0.04] =	9.46				(27)
Windo	ws Type	e 4				8.26		/[1/( 1.2 )+	0.04] =	9.46	=			(27)
Windo	ws Type	e 5				5.28		/[1/( 1.2 )+	0.04] =	6.05	=			(27)
Walls		108.	14	32.6	9	75.45	x	0.16	= [	12.07	ı ۲			(29)
	area of e	lements		02.0	<u> </u>	108.1		0.10	I	12.01	L			(31)
Party v			,			19.25		0	= [	0			-	(32)
Party								-	=	-			$\dashv$	
		roofwind		ffective wi	ndow	15.26		0	= [ ////////////////////////////////////	0		paragraph		(32)
				nternal wal			aleu using	ionnula n	/[(1/0-valu	ie)+0.0 <del>4</del> ] c	is given in	paragraph	5.2	
Fabric	heat los	ss, W/K :	= S (A x	U)				(26)(30)	) + (32) =				49.5	(33)
Heat c	apacity	Cm = S(	(Axk)						((28)	(30) + (32	2) + (32a).	(32e) =	0	(34)
Therm	al mass	parame	ter (TMF	⊃ = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250	(35)
		sments wh ad of a dea		tails of the ulation.	constructi	ion are not	t known pr	ecisely the	e indicative	values of	TMP in T	able 1f		
Therm	al bridg	es : S (L	x Y) cal	culated u	using Ap	pendix ł	<						6.79	(36)
if details	of therma	al bridging	are not kn	own (36) =	= 0.15 x (3	1)								
Total f	abric he	at loss							(33) +	(36) =			56.29	(37)
Ventila	ation hea	at loss ca	alculated	monthl	y		-		(38)m	= 0.33 × (	25)m x (5	)	l	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	41.29	41.17	41.05	40.51	40.41	39.93	39.93	39.84	40.11	40.41	40.61	40.83		(38)
Heat ti	ransfer o	coefficier	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m=	97.58	97.47	97.35	96.8	96.7	96.22	96.22	96.13	96.41	96.7	96.91	97.12		
Stroma	FSAP 201	2 Version	1.0.4.5 (8	SAP 9.92)	- http://ww	w.stroma.c	com		1	Average =	Sum(39)1	12 /12=	96.8Þag	ge 2 o <mark>f 39</mark> )



Heat lo	oss para	meter (I	HLP), W/	′m²K					(40)m	= (39)m ÷	(4)			
(40)m=	1.01	1.01	1.01	1	1	1	1	1	1	1	1	1.01		
Numbe	er of day	/s in mo	nth (Tab	le 1a)					1	Average =	Sum(40) <sub>1.</sub>	12 /12=	1	(40)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Wa	iter heat	ting ene	rgy requi	rement:								kWh/ye	ear:	
if TF			N + 1.76 x	[1 - exp	(-0.0003	349 x (TF	A -13.9	)2)] + 0.(	0013 x (1	ΓFA -13.	2. 9)	71		(42)
Reduce	the annua	al average	ater usag hot water person per	usage by a	5% if the d	welling is	designed t			se target o		.45		(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Δυσ	Sep	Oct	Nov	Dec		
Hot wate			r day for ea					Aug (43)	Jeh	001	INOV	Dec		
(44)m=	108.29	104.35	100.42	96.48	92.54	88.6	88.6	92.54	96.48	100.42	104.35	108.29		
											m(44) <sub>112</sub> =		1181.35	(44)
Energy o	content of	hot water	used - cal	culated mo	onthly = $4$ .	190 x Vd,n	n x nm x D	)Tm / 3600	) kWh/mon	th (see Ta	ables 1b, 1	c, 1d)		
(45)m=	160.59	140.45	144.94	126.36	121.24	104.63	96.95	111.25	112.58	131.2	143.22	155.52		_
lf instant	taneous w	vater heati	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46,		Total = Su	m(45) <sub>112</sub> =		1548.94	(45)
(46)m=	24.09	21.07	21.74	18.95	18.19	15.69	14.54	16.69	16.89	19.68	21.48	23.33		(46)
	storage		· · · · · · · · · · · · · · · · · ·							1				
•			) includin	• •			•		ame ves	sei		0		(47)
		•	and no ta hot wate		•			• •	ers) ente	er '0' in <i>(</i>	47)			
	storage		not wate			notantai				51 O III (	,			
a) If m	nanufact	urer's d	eclared l	oss facto	or is kno	wn (kWł	n/day):				(	0		(48)
Tempe	erature f	actor fro	m Table	2b							(	0		(49)
0,			storage					(48) x (49)	) =		(	0		(50)
,			eclared of factor fr									•		(51)
		-	factor fr			n/nue/ua	y)					0		(51)
	-	from Ta		-							(	0		(52)
Tempe	erature f	actor fro	m Table	2b							(	0		(53)
			r storage	, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =	(	0		(54)
Enter	(50) or (	(54) in ( <del></del>	55)								(	0		(55)
Water	storage	loss cal	culated f	or each	month			((56)m = (	55) × (41)r	n				
(56)m=	0	0	0	0	0	0	0	0	0	0	0	0		(56)
If cylinde	er contains	s dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (	H11)] ÷ (5	0), else (5	7)m = (56)	m where (	H11) is fro	m Append	ix H	
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primar	y circuit	loss (ar	nnual) fro	om Table	e 3						(	0		(58)
	-		lculated f		•			. ,						
	· ·	1	rom Tab		1			r <u> </u>	<u> </u>		<u> </u>	•		(50)
(59)m=	0	0	0	0	0	0	0	0	0	0	0	0		(59)



Combi	loss ca	lculated	for eac	ch i	month (	61)m =	(60	)) ÷ 36	65 × (41)	)m										
(61)m=	50.96	46.03	50.96		47.58	47.16	4	3.69	45.15	47.	16	47.58	50.9	6	49.32	50	.96		(61)	
Total h	eat req	uired for	water	he	ating ca	alculate	d fo	r eacl	h month	(62)	m =	0.85 × (	(45)m	+	(46)m +	(57)	)m +	(59)m + (61)m		
(62)m=	211.55	186.48	195.9		173.94	168.4	1	48.32	142.1	158	.41	160.16	182.	16	192.53	206	6.48		(62)	
Solar DH	W input	calculated	using Ap	ope	ndix G or	Appendi	хH	(negativ	ve quantity	/) (ent	er '0	' if no sola	r contr	ibut	tion to wate	er hea	ating)			
(add a	dditiona	l lines if	FGHR	Sa	and/or V	VWHR	S ap	oplies	, see Ap	penc	lix C	G)								
(63)m=	0	0	0		0	0		0	0	0		0	0		0	(	0		(63)	
Output	from w	ater hea	ter				-					-								
(64)m=	211.55	186.48	195.9		173.94	168.4	1	48.32	142.1	158	.41	160.16	182.	16	192.53	206	6.48			
I											Outp	but from wa	ater he	ate	r (annual)	12		2126.43	(64)	
Heat g	ains fro	m water	heatin	g, l	kWh/mo	onth 0.2	25 ´	[0.85	× (45)m	+ (6	i1)m	n] + 0.8 x	c [(46	)m	+ (57)m	+ (5	59)m	]		
(65)m=	66.14	58.21	60.93		53.91	52.1	4	5.71	43.52	48.	78	49.33	56.3	6	59.95	64	.45		(65)	
inclu	de (57)	m in calo	ulatior	יי ו סו	f (65)m	only if	cylin	nder is	s in the o	dwell	ing	or hot w	ater i	s fi	rom com	mun	nity h	leating		
	. ,	ains (see			. ,		,				J						-			ſ
		ns (Table																		
ivictab	Jan	Feb	Mar		Apr	May	Τ	Jun	Jul	A	ug	Sep	00	ct	Nov	C	)ec			
(66)m=		162.31	162.31	+	162.31	162.31	1	62.31	162.31	162	Ŭ	162.31	162.		162.31		2.31		(66)	
Liahtin	a aains	(calcula	ted in A		oendix l	equa	tion	L9 oi	r L9a), a	lso s	ee	Table 5						I		
(67)m=	55.86	49.61	40.35	<u> </u>	30.54	22.83	-	9.28	20.83	27.		36.34	46.1	4	53.85	57	.41		(67)	
		ins (calc						tion L	13 or I 1				ble 5							
(68)m=	-	377.93	368.14	_	347.32	321.04	T	96.33	279.83	275		285.73	306.	55	332.84	357	7.54	l	(68)	
		(calcula																	. ,	
(69)m=	53.94	53.94	53.94	-i-	53.94	53.94	1	53.94	53.94	53.		53.94	53.9	14	53.94	53	.94	l	(69)	
		ns gains		_		00.01		.0.01		00.		00.01	00.0		00.01	00	.01		()	
(70)m=	3			1	а) 3	3	$\mathbf{T}$	3	3	3		3	3		3		3		(70)	
									0		,	Ŭ	0		Ů		<u> </u>		()	
	-108.2	/aporatic	· · ·	_	-108.2	-108.2	-	5) 108.2	-108.2	-108	8.2	-108.2	-108	2	-108.2	10	)8.2	l	(71)	
		Į			-100.2	-100.2	-	100.2	-100.2	-100	0.2	-100.2	-100	.2	-100.2	-10	0.2		(11)	
	<u> </u>	gains (T	r	) 	74.07	70.00		0.40	50.5	05		00.54	75 -		00.00	0.0	00	I	(72)	
(72)m=	88.89	86.62	81.9		74.87	70.03		3.49	58.5	65.		68.51	75.7		83.26		.63		(12)	
		gains =	i	<u>,                                     </u>	500 70	504.04				· ·	-				(1)m + (72)		0.01	I	(72)	
(73)m=		625.19	601.43	5	563.78	524.94	4	90.13	470.2	479	.62	501.62	539.	49	580.99	612	2.61		(73)	
	ar gains		using so	lar	flux from	Table 6a	and	associ	iated equa	tions	to co	nvert to th	e anni	ical	ole orientat	ion				
0		Access F	Ũ	a	Area		anu	Flu		10113	10 00	g_	c appi	loai	FF	1011.		Gains		
Ononia		Table 6d			m²				ole 6a		Т	able 6b		Т	able 6c			(W)		
Northea	ast <u>0.9</u> x	0.77		x	7.3	0	x	1	1.28	×		0.76	×	Г	0.7		=	30.74	(75)	
	ast 0.9x	0.77		^   x	8.2		x		1.28	×		0.76	╡ ^	F	0.7		2	34.36	(75) (75)	
	ast 0.9x	0.77		^   x	7.3		x		2.97	x		0.76	╡ ^	F	0.7		2	62.57	](75) ](75)	
	ast 0.9x									1			=	늗			_		(75) (75)	
	ast 0.9x	0.77		X V	8.2		x		2.97	×		0.76		F	0.7			69.94	4	
	131 U.9X	0.77		x	7.3	Э	x	4	1.38	X		0.76	X	L	0.7		=	112.74	(75)	



Northeast 0.9x	0.77	] ×	8.26	×	41.38	×	0.76	×	0.7	1 =	126.01	(75)
Northeast 0.9x	0.77	] ^ ] x	7.39	x l	67.96	x	0.76	x	0.7	]   _	185.15	(75)
Northeast 0.9x	0.77	] ^ ] x	8.26	x	67.96	x	0.76	x	0.7	」   =	206.94	(75)
Northeast 0.9x	0.77	」 】 × 【	7.39	l x	91.35	l X	0.76	x	0.7	   =	248.87	(75)
Northeast 0.9x	0.77	」 】 ×	8.26	l x	91.35	x	0.76	x	0.7	   =	278.17	(75)
Northeast 0.9x	0.77	」 】 × 【	7.39	l x	97.38	l X	0.76	x	0.7	=	265.33	(75)
Northeast 0.9x	0.77	ı x [	8.26	×	97.38	×	0.76	x	0.7	=	296.56	(75)
Northeast 0.9x	0.77	] x	7.39	x	91.1	x	0.76	x	0.7	=	248.21	(75)
Northeast 0.9x	0.77	] ×	8.26	×	91.1	×	0.76	x	0.7	=	277.43	(75)
Northeast 0.9x	0.77	] ×	7.39	×	72.63	×	0.76	x	0.7	=	197.87	(75)
Northeast 0.9x	0.77	] ×	8.26	×	72.63	×	0.76	x	0.7	i =	221.17	(75)
Northeast 0.9x	0.77	] ×	7.39	×	50.42	×	0.76	x	0.7	<b>j</b> =	137.37	(75)
Northeast 0.9x	0.77	x	8.26	x	50.42	x	0.76	x	0.7	=	153.54	(75)
Northeast 0.9x	0.77	x	7.39	x	28.07	x	0.76	x	0.7	i =	76.47	(75)
Northeast 0.9x	0.77	x	8.26	×	28.07	×	0.76	x	0.7	] =	85.47	(75)
Northeast 0.9x	0.77	x	7.39	×	14.2	×	0.76	x	0.7	=	38.68	(75)
Northeast 0.9x	0.77	x	8.26	×	14.2	×	0.76	x	0.7	=	43.23	(75)
Northeast 0.9x	0.77	x	7.39	x	9.21	x	0.76	x	0.7	] =	25.1	(75)
Northeast 0.9x	0.77	x	8.26	x	9.21	x	0.76	x	0.7	] =	28.06	(75)
Southeast 0.9x	0.77	x	3.5	×	36.79	×	0.76	x	0.7	] =	47.48	(77)
Southeast 0.9x	0.77	x	5.28	x	36.79	×	0.76	x	0.7	=	71.62	(77)
Southeast 0.9x	0.77	x	3.5	x	62.67	×	0.76	x	0.7	=	80.87	(77)
Southeast 0.9x	0.77	x	5.28	×	62.67	×	0.76	x	0.7	] =	122	(77)
Southeast 0.9x	0.77	x	3.5	×	85.75	×	0.76	x	0.7	] =	110.65	(77)
Southeast 0.9x	0.77	x	5.28	x	85.75	×	0.76	x	0.7	=	166.93	(77)
Southeast 0.9x	0.77	x	3.5	×	106.25	×	0.76	x	0.7	=	137.1	(77)
Southeast 0.9x	0.77	x	5.28	×	106.25	×	0.76	x	0.7	=	206.83	(77)
Southeast 0.9x	0.77	x	3.5	x	119.01	×	0.76	x	0.7	=	153.57	(77)
Southeast 0.9x	0.77	x	5.28	×	119.01	×	0.76	x	0.7	=	231.67	(77)
Southeast 0.9x	0.77	×	3.5	×	118.15	×	0.76	x	0.7	=	152.46	(77)
Southeast 0.9x	0.77	×	5.28	×	118.15	×	0.76	x	0.7	=	229.99	(77)
Southeast 0.9x	0.77	×	3.5	×	113.91	×	0.76	x	0.7	=	146.98	(77)
Southeast 0.9x	0.77	×	5.28	×	113.91	X	0.76	x	0.7	=	221.74	(77)
Southeast 0.9x	0.77	×	3.5	×	104.39	×	0.76	X	0.7	=	134.7	(77)
Southeast 0.9x	0.77	×	5.28	×	104.39	×	0.76	X	0.7	=	203.21	(77)
Southeast 0.9x	0.77	×	3.5	×	92.85	×	0.76	x	0.7	=	119.81	(77)
Southeast 0.9x	0.77	X	5.28	×	92.85	×	0.76	x	0.7	=	180.75	(77)
Southeast 0.9x	0.77	×	3.5	×	69.27	×	0.76	×	0.7	=	89.38	(77)
Southeast 0.9x	0.77	×	5.28	×	69.27	×	0.76	×	0.7	=	134.84	(77)
Southeast 0.9x	0.77		3.5	×	44.07	X	0.76	x	0.7	= 1	56.87	(77)
Southeast 0.9x	0.77	x	5.28	X	44.07	X	0.76	X	0.7	=	85.79	(77)



Southe	ast <mark>0.9x</mark>	0.77	)		3.5	5	x	3	31.49	<b>x</b>	0.76	x	0.7		= [	40.63	(77)
Southe	ast <mark>0.9x</mark>	0.77	)		5.2	8	x	3	31.49	<b>x</b> [	0.76	x	0.7	:	= [	61.29	(77)
Southw	est <mark>0.9x</mark>	0.77	)		8.2	6	x	3	6.79	] [	0.76	x	0.7		= [	112.05	(79)
Southw	est <mark>0.9x</mark>	0.77	)		8.2	6	x	6	2.67	Ī	0.76	x	0.7		= [	190.86	(79)
Southw	est <mark>0.9x</mark>	0.77	,		8.2	6	x	8	5.75	ĪĪ	0.76	x	0.7		= [	261.14	(79)
Southw	est <mark>0.9x</mark>	0.77	,		8.2	6	x	1(	06.25	ΪĪ	0.76	x	0.7		= [	323.56	(79)
Southw	est <mark>0.9x</mark>	0.77	,		8.2	6	x	1	19.01	ΪĪ	0.76	x	0.7		= [	362.42	(79)
Southw	est <sub>0.9x</sub>	0.77	,		8.2	6	x	1	18.15	ΪĪ	0.76	x	0.7		= [	359.8	(79)
Southw	est <mark>0.9x</mark>	0.77	,		8.2	6	x	1	13.91	ΪĪ	0.76	x	0.7		= [	346.88	(79)
Southw	est <mark>0.9x</mark>	0.77	,		8.2	6	x	1(	04.39	ĪĪ	0.76	x	0.7		= [	317.9	(79)
Southw	est <mark>0.9x</mark>	0.77	,		8.2	6	x	9	2.85	ĪĪ	0.76	x	0.7		= [	282.76	(79)
Southw	est <mark>0.9x</mark>	0.77	,		8.2	6	x	6	9.27	ĪĒ	0.76	x	0.7		= [	210.94	(79)
Southw	est <mark>0.9x</mark>	0.77	,		8.2	6	x	4	4.07	ĪĪ	0.76	x	0.7		= [	134.21	(79)
Southw	est <mark>0.9x</mark>	0.77	,		8.2	6	x	3	31.49	ĪĪ	0.76	x	0.7		= [	95.89	(79)
	_														-		
Solar g	ains in v	watts, ca	lculate	d fo	or each	n mont	h			(83)m	= Sum(74)m	(82)m					
(83)m=	296.25	526.24	777.46	10	059.59	1274.7	/ 13	304.13	1241.24	1074.	85 874.23	597.1	358.77	250.9	8		(83)
Total g	ains – ir	nternal a	nd sola	ır (8	 34)m =	(73)m	<u>ו</u> 1 + (ל	83)m	, watts								
(84)m=		1151.44		Ť		、 ,	Ť	,	1711.43	1554.	47 1375.85	1136.5	8 939.76	863.5	59		(84)
7 Me	an inter	nal temp	erature	he (he	eating	seaso	n)		I	ļ		1					
		during h			Ŭ		ĺ.	area f	from Tab	0 ماد	Th1 (°C)				1	21	(85)
romp	oracaro	aaning n	ounig					aloui								<b>Z</b> 1	
Litilion	tion foo	tor for a	-		na ara		-			JIC 3,	IIII ( C)				l		(00)
Utilisa		tor for ga	ains for	livir		a, h1,i	m (s	ee Ta	ble 9a)				Neu	<b>D</b> -			
	Jan	Feb	ains for Mar	livir	Apr	a, h1,i May	m (s /	ee Ta Jun	ble 9a) Jul	Au	g Sep	Oct		De	_		
Utilisa (86)m=			ains for	livir		a, h1,i	m (s /	ee Ta	ble 9a)		g Sep	Oct 0.79	Nov 0.96	De 0.99	_		(86)
(86)m=	Jan 0.98	Feb	ains for Mar 0.86	livir	Apr 0.69	ea, h1,ı May 0.49	m (s /	ee Ta Jun <sup>0.34</sup>	ble 9a) Jul 0.25	Au 0.28	g Sep 3 0.48				_		
(86)m=	Jan 0.98	Feb 0.95	ains for Mar 0.86	livir c	Apr 0.69	ea, h1,ı May 0.49	m (s /	ee Ta Jun <sup>0.34</sup>	ble 9a) Jul 0.25	Au 0.28	g Sep 3 0.48				)		
(86)m= Mean (87)m=	Jan 0.98 interna 20.28	Feb           0.95           tempera           20.52	ains for Mar 0.86 ature ir 20.77	livir c livir	Apr 0.69 ing are 20.94	ea, h1,i May 0.49 ea T1 ( 20.99	m (s /	ee Ta Jun 0.34 ow ste 21	ble 9a) Jul 0.25 ps 3 to 7 21	Au 0.28 7 in Ta 21	g Sep 3 0.48 able 9c) 20.99	0.79	0.96	0.99	)		(86)
(86)m= Mean (87)m=	Jan 0.98 interna 20.28	Feb           0.95           tempera           20.52	ains for Mar 0.86 ature ir 20.77	livir livir livir	Apr 0.69 ing are 20.94	ea, h1,i May 0.49 ea T1 ( 20.99	m (s /	ee Ta Jun 0.34 ow ste 21	ble 9a) Jul 0.25 ps 3 to 7 21	Au 0.28 7 in Ta 21	g Sep 3 0.48 able 9c) 20.99 , Th2 (°C)	0.79	0.96	0.99	2		(86)
(86)m= Mean (87)m= Temp (88)m=	Jan 0.98 internal 20.28 erature 20.07	Feb 0.95 I tempera 20.52 during h 20.08	ains for Mar 0.86 ature ir 20.77 eating 20.08	livir c livir 2 perio	Apr           0.69           ing are           20.94           iods in           20.08	ea, h1,r May 0.49 ea T1 ( 20.99 rest o 20.08	m (s / follo of dw	ee Ta Jun 0.34 ww ste 21 /elling 20.09	ble 9a) Jul 0.25 ps 3 to 7 21 from Ta 20.09	Au 0.28 7 in Ta 21 able 9 20.0	g Sep 3 0.48 able 9c) 20.99 , Th2 (°C)	0.79	0.96	0.99	2		(86) (87)
(86)m= Mean (87)m= Temp (88)m= Utilisa	Jan 0.98 internal 20.28 erature 20.07 ation fac	Feb 0.95 tempera 20.52 during h 20.08 tor for ga	A mar Mar 0.86 ature ir 20.77 eating 20.08 ains for	livir livir livir 2 perio 2 res	Apr 0.69 ing are 20.94 iods in 20.08 st of dv	ea, h1,r May 0.49 ea T1 ( 20.99 rest o 20.08 velling	m (s / follo of dw 2 , h2,	ee Ta Jun 0.34 ww ste 21 velling 20.09 ,m (se	ble 9a) Jul 0.25 ps 3 to 7 21 from Ta 20.09 ee Table	Au 0.28 7 in Ta 21 able 9 20.0 9a)	g Sep 3 0.48 able 9c) 20.99 , Th2 (°C) 9 20.08	0.79 20.9 20.08	0.96 20.55 20.08	0.99 20.22 20.08	2		(86) (87) (88)
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(86)m= Mean (87)m= Temp (88)m= Utilisa (89)m= Mean	Jan 0.98 internal 20.28 erature 20.07 ation fac 0.98 internal	Feb 0.95 I tempera 20.52 during h 20.08 tor for ga 0.93	ains for Mar 0.86 ature ir 20.77 eating 20.08 ains for 0.83 ature ir	livir livir livir livir 2 perio 2 res c the	Apr           0.69           ing are           20.94           iods in           20.08           st of dv           0.64	ea, h1,r May 0.49 ea T1 ( 20.99 rest o 20.08 velling 0.45 of dwe	m (s / follo f dw 2 , h2,	ee Ta Jun 0.34 ww ste 21 velling 20.09 ,m (se 0.29 T2 (fe	ble 9a) Jul 0.25 ps 3 to 7 21 from Ta 20.09 ee Table 0.2 ollow ste	Au 0.28 7 in Ta 21 1ble 9 20.0 9a) 0.23 eps 3	g         Sep           3         0.48           able 9c)         20.99           , Th2 (°C)         9           9         20.08           3         0.42           to 7 in Tab	0.79 20.9 20.08 0.75 le 9c)	0.96 20.55 20.08 0.94	0.99 20.22 20.08 0.98	8		(86) (87) (88) (89)
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(86)m= Mean (87)m= Temp (88)m= Utilisa (89)m= Mean (90)m= Mean (92)m= Apply (93)m= 8. Spa	Jan 0.98 internal 20.28 erature 20.07 ation fac 0.98 internal 19.15 internal 19.73 adjustn 19.73 ace hea	Feb 0.95 I tempera 20.52 during h 20.08 tor for ga 0.93 I tempera 19.48 I tempera 20.02 nent to th 20.02	ains for Mar 0.86 ature ir 20.77 eating 20.08 ains for 0.83 ature ir 19.82 ature (f 20.31 ne mea 20.31 ne mea	livir livir 2 period 2 rest 2 rest 1 2 1 1 2 1 1 2 1 1 2 1 1 2 1 1 2 1 1 2 1 1 2 1 1 2 1 1 1 2 1 1 1 2 1 1 1 2 1 1 1 1 2 1 1 1 1 1 1 1 1	Apr           0.69           ing are           20.94           iods in           20.08           at of dv           0.64           a rest of           20.02           he who           20.5           aternal           20.5	a, h1,i May 0.49 a T1 ( 20.99 rest o 20.08 velling 0.45 of dwe 20.07 ole dw 20.55 tempe 20.55	m (s / follo f dw 2 f dw 2 1 1 2 elling 2 ellin 2 2 eratu 2 2	ee Ta Jun 0.34 ww ste 21 velling 20.09 ,m (se 0.29 T2 (fc 20.09 g) = fl 20.56 ire fro 20.56	ble 9a) Jul 0.25 ps 3 to 7 21 from Ta 20.09 ce Table 0.2 ollow ste 20.09 LA × T1 20.56 m Table 20.56	Au 0.28 7 in Ta 21 able 9 20.0 9a) 0.23 9a) 0.23 9a) 0.23 20.0 + (1 - 20.5 4e, v 20.5	g       Sep         3       0.48         able 9c)       20.99         20.99       20.08         3       0.42         40       7 in Tab         9       20.08         - fLA) × T2       20.55         vhere approx         6       20.55	0.79 20.9 20.08 0.75 le 9c) 19.98 fLA = Liv 20.45 opriate 20.45	0.96 20.55 20.08 0.94 19.54 ting area ÷ (4 20.06	0.99 20.22 20.08 0.98 19.06 19.66	2 8 6 6 6		(86) (87) (88) (89) (90) (91) (92)
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(86)m= Mean (87)m= Temp (88)m= Utilisa (89)m= Mean (90)m= Mean (90)m= Mean (92)m= Apply (93)m= 8. Spa Set T	Jan 0.98 internal 20.28 erature 20.07 ation fac 0.98 internal 19.15 internal 19.73 adjustn 19.73 ace hea i to the r	Feb 0.95 I tempera 20.52 during h 20.08 tor for ga 0.93 I tempera 19.48 I tempera 20.02 nent to th 20.02 nent to th 20.02	ains for Mar 0.86 ature ir 20.77 eating 20.08 ains for 0.83 ature ir 19.82 ature (f 20.31 ne mea 20.31 ne mea 20.31 ne mea	livir livir 2 period 2 rest 2 rest 1 the 2 the 2 rest 1 2 rest 1 2 1 1 1 2 1 1 1 2 1 1 1 2 1 1 1 1 1 2 1 1 1 1 1 2 1 1 1 1 1 1 1 1	Apr           0.69           ing are           20.94           iods in           20.08           st of dv           0.64           e rest of           20.02           he who           20.5           iternal           20.5	ea, h1,i May 0.49 ea T1 ( 20.99 i rest o 20.08 velling 0.45 of dwe 20.07 ole dw 20.55 tempe 20.55	m (s / follo f dw 2 f dw 2 1 1 1 2 2 2 2 2 1 1 2 2 1 2 2 1 2 2 1 2 2 1 2 2 1 2 2 1 2 2 1 2 2 2 1 2 2 1 2 2 1 2 2 2 2 2 2 2 2 2 2 2 2 2	ee Ta Jun 0.34 ww ste 21 velling 20.09 ,m (se 0.29 T2 (fc 20.09 g) = fl 20.56 ire fro 20.56	ble 9a) Jul 0.25 ps 3 to 7 21 from Ta 20.09 ce Table 0.2 ollow ste 20.09 LA × T1 20.56 m Table 20.56	Au 0.28 7 in Ta 21 able 9 20.0 9a) 0.23 9a) 0.23 9a) 0.23 20.0 + (1 - 20.5 4e, v 20.5	g       Sep         3       0.48         able       9c)         20.99         , Th2 (°C)         9       20.08         3       0.42         to 7 in Tab         9       20.08         - fLA) × T2         6       20.55         vhere appro         6       20.55	0.79 20.9 20.08 0.75 le 9c) 19.98 fLA = Liv 20.45 opriate 20.45	0.96 20.55 20.08 0.94 19.54 ing area ÷ (4 20.06 20.06	0.99 20.22 20.08 0.98 19.06 19.66	2 8 6 6 6 8		(86) (87) (88) (89) (90) (91) (92)
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0.66

0.47

0.32

0.22

0.26

0.45

0.77

0.94

0.98

0.84

(94)m=

0.97

0.93

(94)



Usefu	ul gains,	hmGm ,	, W = (9	4)m x (84	4)m									
(95)m=	901.41	1072.39	1154.57	1074.81	848.62	572.57	380.75	399.58	618.13	869.78	885.28	846.6		(95)
Mont	hly aver	age exte	rnal terr	nperature	e from Ta	able 8								
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat	loss rate	e for mea	an interr	nal tempe		Lm , W =	=[(39)m :	x [(93)m	– (96)m	]				
(97)m=	1505.81	1473.48	1344.35	1122.58	855.54	573.19	380.81	399.72	622.03	952.7	1255.88	1501.59		(97)
•		<u> </u>	1	or each m	nonth, k	Wh/mont	th = 0.02	24 x [(97]	)m – (95	)m] x (4 <sup>-</sup>	1)m			
(98)m=	449.67	269.54	141.2	34.4	5.14	0	0	0	0	61.69	266.83	487.31		_
								Tota	l per year (	(kWh/year	r) = Sum(98	8) <sub>15,912</sub> =	1715.77	(98)
Space	e heatin	g require	ement in	ո kWh/m²	²/year								17.77	(99)
9a. En	ergy rec	quiremer	nts – Ind	lividual h	eating s	ystems i	ncluding	micro-C	CHP)			-		_
Spac	e heatiı	ng:												_
Fract	ion of sp	bace hea	it from s	econdar	y/supple	mentary	system						0	(201)
Fract	ion of sp	bace hea	it from n	nain syst	em(s)			(202) = 1 -	- (201) =				1	(202)
Fract	ion of to	tal heatii	ng from	main sys	stem 1			(204) = (2	02) × [1 – (	(203)] =			1	(204)
Efficie	ency of I	main spa	ace heat	ting syste	em 1								90.4	(206)
Efficie	ency of s	seconda	ry/suppl	ementar	y heatin	g system	ı, %						0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/yea	⊐ ar
Space	e heatin	g require	ement (o	calculate	d above	)								
	449.67	269.54	141.2	34.4	5.14	0	0	0	0	61.69	266.83	487.31		
(211)m	ו = {[(98	)m x (20	4)]}x1	100 ÷ (20	)6)									(211)
. ,	497.42	298.16	156.19	38.05	5.69	0	0	0	0	68.24	295.16	539.06		
				<u>.                                    </u>				Tota	l (kWh/yea	r) =Sum(2	211) <sub>15,1012</sub>	-	1897.98	(211)
Space	e heatin	g fuel (s	econdar	ry), kWh/	month							I		1
•		)1)]}x1		. ,										
(215)m=	0	0	0	0	0	0	0	0	0	0	0	0		
								Tota	ll (kWh/yea	ar) =Sum(2	215) <sub>15,1012</sub>	=	0	(215)
Water	heating	3										-		-
Output				ulated a		1								
	211.55	186.48	195.9	173.94	168.4	148.32	142.1	158.41	160.16	182.16	192.53	206.48		-
	<u> </u>	ater hea	iter	<del> </del>									80.3	(216)
(217)m=	86.9	85.98	84.24	81.81	80.57	80.3	80.3	80.3	80.3	82.64	85.87	87.14		(217)
		heating,												
• •	1 = (64) 243.43	m x 100 216.9	232.54	)m 212.61	209.02	184.71	176.96	197.27	199.45	220.44	224.21	236.96		
()									l = Sum(21				2554.5	(219)
Δnnus	al totals										Wh/year	. I	kWh/year	
			ed, main	system	1					n.	, year		1897.98	1
	0	fuel use		,								l [	2554.5	1
	0			electric	keep-ho	t						I		1
		ng pump:		2.254.10		-						30		(230c)
Contra	arnoadi	a parip	•									50		()



boiler with a fan-assisted flue		45	(230e)
Total electricity for the above, kWh/year	sum of (23	0a)(230g) =	75 (231)
Electricity for lighting			394.57 (232)
10a. Fuel costs - individual heating systems:			
	<b>Fuel</b> kWh/year	Fuel Price (Table 12)	<b>Fuel Cost</b> £/year
Space heating - main system 1	(211) x	3.48 × 0.01 =	66.05 (240)
Space heating - main system 2	(213) x	0 x 0.01 =	0 (241)
Space heating - secondary	(215) x	13.19 x 0.01 =	0 (242)
Water heating cost (other fuel)	(219)	3.48 × 0.01 =	88.9 (247)
Pumps, fans and electric keep-hot	(231)	13.19 × 0.01 =	9.89 (249)
(if off-peak tariff, list each of (230a) to (230g) sep Energy for lighting	arately as applicable and ap (232)	pply fuel price according to $13.19$ x 0.01 =	
Additional standing charges (Table 12)			120 (251)
	one of (233) to (235) x)	13.19 x 0.01 =	0 (252)
Appendix Q items: repeat lines (253) and (254) a Total energy cost (245)(24	s needed 17) + (250)(254) =		336.88 (255)
11a. SAP rating - individual heating systems			
Energy cost deflator (Table 12)			0.42 (256)
Energy cost factor (ECF) [(255) x (2	256)] ÷ [(4) + 45.0] =		1 (257)
SAP rating (Section 12)			86.05 (258)
12a. CO2 emissions – Individual heating system	ns including micro-CHP		
	<b>Energy</b> kWh/year	Emission factor kg CO2/kWh	<b>Emissions</b> kg CO2/year
Space heating (main system 1)	(211) x	0.216 =	409.96 (261)
Space heating (secondary)	(215) x	0.519 =	0 (263)
Water heating	(219) x	0.216 =	551.77 (264)
Space and water heating	(261) + (262) + (263) + (264) =		961.74 (265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519 =	38.93 (267)
Electricity for lighting	(232) x	0.519 =	204.78 (268)
Energy saving/generation technologies Total CO2, kg/year	su	m of (265)(271) =	1205.44 (272)
CO2 emissions per m²	(21	72) ÷ (4) =	12.49 (273)
El rating (section 14)			89 (274)
13a. Primary Energy			
	<b>Energy</b> kWh/year	<b>Primary</b> factor	<b>P. Energy</b> kWh/year
Space heating (main system 1)	(211) x	1.22 =	2315.53 (261)



Space heating (secondary)	(215) x	3.07	=	0	(263)
Energy for water heating	(219) x	1.22	=	3116.49	(264)
Space and water heating	(261) + (262) + (263) + (264) =			5432.03	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	3.07	=	230.25	(267)
Electricity for lighting	(232) x	0	=	1211.32	(268)
Energy saving/generation technologies 'Total Primary Energy	sum	of (265)(271) =		6873.6	(272)
Primary energy kWh/m²/year	(272	) ÷ (4) =		71.2	(273)



			User L	Details:						
Assessor Name:	Peter Mitch	ell		Strom	a Num	ber:		STRO	007945	
Software Name:	Stroma FS/	AP 2012		Softwa	are Ver	sion:		Versio	on: 1.0.4.5	
		F	Property	Address:	Unit 6 (	GFEND	) LEAN			
Address :	New Dwellin	ig at:, Gordon ⊦	louse, 6	Lissende	en Garde	ens, LOI	NDON, N	W5 1LX	(	
1. Overall dwelling dime	nsions:									
			Are	a(m²)		Av. He	ight(m)	-	Volume(m <sup>3</sup> )	)
Ground floor			ę	96.54	(1a) x	2	2.4	(2a) =	231.7	(3a)
Total floor area TFA = (1a	a)+(1b)+(1c)+(	1d)+(1e)+(1	n) 🤤	96.54	(4)					
Dwelling volume					(3a)+(3b)	+(3c)+(3d	l)+(3e)+	.(3n) =	231.7	(5)
2. Ventilation rate:									<u> </u>	
	main heating	seconda heating	ry	other		total			m <sup>3</sup> per hou	ſ
Number of chimneys	0	+ 0	+	0	] = [	0	x 4	40 =	0	(6a)
Number of open flues	0	+ 0	_ + _	0	ī = [	0	x 2	20 =	0	(6b)
Number of intermittent fai	ns					2	<b>x</b> 1	10 =	20	(7a)
Number of passive vents					Γ	0	<b>x</b> 1	10 =	0	(7b)
Number of flueless gas fi	res					0	x 4	40 =	0	(7c)
								Δir ch	anges per ho	
Infiltration due to chimnes	in fluing and fo	(6a) + (6b) +	7a)+(7b)+(	70) -				1		_
Infiltration due to chimney If a pressurisation test has be					continue fro	20		+ (5) =	0.09	(8)
Number of storeys in th			u to (11),			, (0) (0)	, 0)		0	(9)
Additional infiltration	Ũ	,					[(9)-	1]x0.1 =	0	(10)
Structural infiltration: 0.	25 for steel or	timber frame o	r 0.35 fo	r masonr	y constru	uction			0	(11)
if both types of wall are pr			o the great	ter wall area	a (after					_
deducting areas of openin If suspended wooden f				ad) also	optor 0					
If no draught lobby, ent		. ,	. I (Seald	su), eise	enter u				0	(12)
Percentage of windows									0	(13) (14)
Window infiltration		aught stripped		0.25 - [0.2	x (14) ÷ 1	001 =			0	(15)
Infiltration rate				(8) + (10)		-	+ (15) =		0	(16)
Air permeability value,	q50, expresse	d in cubic metre	es per ho	our per se	quare me	etre of e	nvelope	area	4	(17)
If based on air permeabili	ity value, then	(18) = [(17) ÷ 20]+(	8), otherw	ise (18) = (	16)				0.29	(18)
Air permeability value applies	s if a pressurisatio	n test has been do	ne or a de	gree air pei	rmeability i	is being us	sed			
Number of sides sheltere	d								3	(19)
Shelter factor				(20) = 1 -		9)] =			0.78	(20)
Infiltration rate incorporat	•			(21) = (18)	) x (20) =				0.22	(21)
Infiltration rate modified for		· ·		1					I	
Jan Feb	Mar Apr	May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	eed from Table	e 7	r						I	
(22)m= 5.1 5	4.9 4.4	4.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (22	2)m ÷ 4									
(22a)m= 1.27 1.25	1.23 1.1	1.08 0.95	0.95	0.92	1	1.08	1.12	1.18		
		1	•	•					•	



Adjust	ed infiltr	ation rat	e (allowi	ing for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m	-	-	-			
	0.28	0.28	0.27	0.24	0.24	0.21	0.21	0.21	0.22	0.24	0.25	0.26			
		c <i>tive air (</i> al ventila	-	rate for t	he appli	cable ca	se						0		(23a)
				endix N, (2	3b) = (23a	ı) × Fmv (e	equation (1	√5)) . othe	rwise (23b	) = (23a)			0		(23b)
				iency in %						, , ,			0		(23c)
a) If	balance	ed mech	anical ve	entilation	with he	at recove	erv (MVI	HR) (24a	) m = (22	2b)m + (	23b) × [ <sup>•</sup>	1 – (23c)	-	I	(200)
(24a)m=	r	0		0	0	0	0	0	0	0		0			(24a)
b) If	balance	ed mecha	ı anical ve	entilation	without	heat rec	L Coverv (N	//V) (24b	)m = (22	1 2b)m + ()	23b)				
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0			(24b)
c) If	whole h	iouse ex	tract ver	ntilation o	or positiv	ve input v	ventilatio	n from c	utside						
,				then (24d	•	•				.5 × (23b	<b>)</b> )				
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0			(24c)
				ole hous m = (22t						0.5]					
(24d)m=	0.54	0.54	0.54	0.53	0.53	0.52	0.52	0.52	0.52	0.53	0.53	0.53			(24d)
Effe	ctive air	change	rate - er	nter (24a	) or (24b	o) or (240	c) or (24	d) in box	(25)	•					
(25)m=	0.54	0.54	0.54	0.53	0.53	0.52	0.52	0.52	0.52	0.53	0.53	0.53			(25)
3 He	at losse	s and he	at loss i	paramete	⊃r∙					•	•	•	•		
ELEN		Gros		Openin		Net Ar	ea	U-valı	Je	AXU		k-value		AXK	ĸ
		area		m		A ,n		W/m2		(W/	K)	kJ/m²∙l		kJ/K	
Windo	ws Type	e 1				7.39	x1.	/[1/( 1.2 )+	0.04] =	8.46					(27)
Windo	ws Type	e 2				3.5	x1.	/[1/( 1.2 )+	0.04] =	4.01					(27)
Windo	ws Type	e 3				8.26	x1.	/[1/( 1.2 )+	0.04] =	9.46					(27)
Windo	ws Type	e 4				8.26	x1.	/[1/( 1.2 )+	0.04] =	9.46					(27)
Windo	ws Type	e 5				5.28	x1.	/[1/( 1.2 )+	0.04] =	6.05	=				(27)
Walls		108.	14	32.69	9	75.45	5 X	0.16	] = [	12.07	ו ד				(29)
Total a	area of e	elements	, m²			108.1	4		·						(31)
Party v	wall					19.25	5 X	0	=	0					(32)
Party v	wall					15.26	x	0		0	= i		$\dashv$	=	(32)
				effective wil		alue calcula		formula 1	I /[(1/U-valu		as given in	paragraph	3.2		
Fabric	heat los	ss, W/K :	= S (A x	U)				(26)(30)	) + (32) =				49.5		(33)
Heat c	apacity	Cm = S(	(Axk)						((28)	(30) + (32	2) + (32a).	(32e) =	0		(34)
Therm	al mass	parame	ter (TM	⊃ = Cm ÷	- TFA) in	n kJ/m²K			Indica	tive Value	: Medium		250		(35)
	•	sments wh ad of a dei		tails of the ulation.	constructi	ion are not	t known pr	ecisely the	e indicative	e values of	TMP in T	able 1f			
Therm	al bridg	es : S (L	x Y) cal	culated u	using Ap	pendix ł	<						6.79		(36)
			are not kr	own (36) =	= 0.15 x (3	1)			(						ſ
	abric he									(36) =			56.29	)	(37)
Ventila		r		d monthly	, 					= 0.33 × (			1		
(29)	Jan	Feb	Mar	Apr 40.51	May 40.41	Jun	Jul	Aug	Sep	Oct 40.41	Nov	Dec 40.83			(38)
(38)m=	41.29	41.17	41.05	40.31	40.41	39.93	39.93	39.84	40.11		40.61	40.83			(00)
				00.0	00 7	00.00	00.00	00.40	1	= (37) + (3	I	07.40	1		
(39)m=	97.58	97.47	97.35	96.8	96.7	96.22	96.22	96.13	96.41	96.7	96.91	97.12	06.0		(30)
Stroma	FSAP 201	version:	: 1.0.4.5 (8	SAP 9.92) ·	- nttp://ww	w.stroma.c	com		1	Average =	Sun(39)1	12714-	90.0	Page 2 o	1001



Heat lo	oss para	ımeter (I	HLP), W/	/m²K					(40)m	= (39)m ÷	(4)			
(40)m=	1.01	1.01	1.01	1	1	1	1	1	1	1	1	1.01		_
Numbe	er of day	/s in mo	nth (Tab	le 1a)					/	Average =	Sum(40) <sub>1.</sub>	12 /12=	1	(40)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m=	31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Wa	ater heat	ting ene	rgy requi	irement:								kWh/ye	ear:	
	_												1	( ) = )
if TF			n + 1.76 x	[1 - exp	(-0.0003	849 x (TF	FA -13.9	)2)] + 0.(	0013 x (1	FFA -13.		71		(42)
			ater usag	ge in litre	es per da	ay Vd,av	erage =	(25 x N)	+ 36		98	.45		(43)
			hot water person per					to achieve	a water us	se target o	f			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	er usage i	n litres pei	r day for ea	ach month	Vd,m = fa	ctor from T	Table 1c x	(43)						
(44)m=	108.29	104.35	100.42	96.48	92.54	88.6	88.6	92.54	96.48	100.42	104.35	108.29		
_							_				m(44) <sub>112</sub> =		1181.35	(44)
Energy o		i		i		·	i		i	`	ables 1b, 1	. ,	1	
(45)m=	160.59	140.45	144.94	126.36	121.24	104.63	96.95	111.25	112.58	131.2	143.22	155.52		<b>-</b>
lf instan	taneous w	ater heati	ng at point	of use (no	hot water	r storage),	enter 0 in	boxes (46		Fotal = Su	m(45) <sub>112</sub> =		1548.94	(45)
(46)m=	24.09	21.07	21.74	18.95	18.19	15.69	14.54	16.69	16.89	19.68	21.48	23.33		(46)
	storage		\ in aludin		olor or M		atorogo	within or				-	1	
-			) includin				-			501		0		(47)
	•	-	and no ta hot wate		-				ers) ente	er '0' in (	47)			
	storage			,					/	- (	/			
a) If m	nanufact	urer's d	eclared l	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Tempe	erature f	actor fro	m Table	2b								0		(49)
			storage					(48) x (49)	) =			0		(50)
,			eclared o factor fr	•								0		(51)
		-	ee secti			n/nu c/ua	(y)					0		(51)
	-	from Ta										0		(52)
Tempe	erature f	actor fro	m Table	2b								0		(53)
•••			<sup>-</sup> storage	, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =		0		(54)
Enter	(50) or (	(54) in (క	55)									0		(55)
Water	storage	loss cal	culated f	for each	month	-	-	((56)m = (	55) × (41)r	n	-			
(56)m=	0	0	0	0	0	0	0	0	0	0	0	0		(56)
If cylinde	er contains	s dedicate	d solar sto	rage, (57)	m = (56)m	x [(50) – (	H11)] ÷ (5	0), else (5	7)m = (56)	m where (	H11) is fro	m Append	ix H	
(57)m=	0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primar	y circuit	loss (ar	nnual) fro	om Table	e 3							0		(58)
		•	culated			59)m = (	(58) ÷ 36	65 × (41)	m					
		· · · · · ·	rom Tab	1	r	r	1	<u> </u>	<u> </u>		<u> </u>		1	(==:
(59)m=	0	0	0	0	0	0	0	0	0	0	0	0		(59)



Combi	loss ca	lculated	for each	month	(61)m =	(60) ÷ 3	65 × (41	)m						
(61)m=	50.96	46.03	50.96	47.58	47.16	43.69	45.15	47.16	47.58	50.96	49.32	50.96	]	(61)
Total h	eat req	uired for	water h	eating ca	alculated	for eac	h month	(62)m	= 0.85 ×	(45)m +	(46)m +	(57)m +	· (59)m + (61)m	
(62)m=	211.55	186.48	195.9	173.94	168.4	148.32	142.1	158.4	1 160.16	182.16	192.53	206.48	1	(62)
Solar DH	IW input	calculated	using App	endix G o	r Appendix	H (negat	ive quantit	y) (enter	'0' if no sola	r contribu	tion to wate	er heating)	)	
(add a	dditiona	l lines if	FGHRS	and/or \	WWHRS	applies	, see Ap	pendix	(G)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	]	(63)
Output	from w	ater hea	ter		-		-	-	-	-		-	-	
(64)m=	211.55	186.48	195.9	173.94	168.4	148.32	142.1	158.4	1 160.16	182.16	192.53	206.48	]	
								0	utput from w	ater heate	er (annual)	112	2126.43	(64)
Heat g	ains fro	m water	heating	, kWh/m	onth 0.2	5 ´ [0.85	5 × (45)m	n + (61)	)m] + 0.8 x	k [(46)m	+ (57)m	+ (59)m	n]	
(65)m=	66.14	58.21	60.93	53.91	52.1	45.71	43.52	48.78	49.33	56.36	59.95	64.45	]	(65)
inclu	de (57)	m in calo	ulation	of (65)m	only if c	ylinder i	s in the	dwellin	g or hot w	vater is f	rom com	munity I	- neating	
5. Int	ernal g	ains (see	Table {	5 and 5a	):									
Metab	olic dair	ns (Table	e 5). Wat	ts	,									
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	J Sep	Oct	Nov	Dec	]	
(66)m=	135.26	135.26	135.26	135.26	135.26	135.26	135.26	135.20	3 135.26	135.26	135.26	135.26		(66)
Lightin	g gains	(calcula	ted in A	pendix	L, equati	ion L9 o	r L9a), a	lso see	e Table 5		-		-	
(67)m=	22.34	19.84	16.14	12.22	9.13	7.71	8.33	10.83	14.54	18.46	21.54	22.96	]	(67)
Applia	nces ga	ins (calc	ulated ir	Appen	dix L, eq	uation L	13 or L1	3a), al:	so see Ta	ble 5			3	
	250.61	253.21	246.66	232.71	215.09	198.54	187.49	184.8		205.39	223	239.55	]	(68)
Cookir	iq gains	(calcula	ted in A	ppendix	L, equat	ion L15	or L15a	), also	see Table	5		ļ	1	
(69)m=	36.53	36.53	36.53	36.53	36.53	36.53	36.53	36.53		36.53	36.53	36.53	]	(69)
Pumps	and fa	ns gains	(Table :	5a)			1						1	
(70)m=	3	3	3	3	3	3	3	3	3	3	3	3	]	(70)
Losses	se.a. ev	/aporatio	n (nega	ı tive valu	es) (Tab	le 5)	1						1	
	-	-108.2	· ·		-108.2	-108.2	-108.2	-108.2	2 -108.2	-108.2	-108.2	-108.2	]	(71)
Water	heating	gains (T	able 5)										1	
(72)m=	88.89	86.62	81.9	74.87	70.03	63.49	58.5	65.57	68.51	75.76	83.26	86.63	1	(72)
	nternal	gains =				(66	)m + (67)n	l 1 + (68)n	n + (69)m + (			)m	1	
(73)m=	428.42	<u> </u>	411.27	386.37	360.84	336.32	320.89	327.8	3 341.06	366.18	394.38	415.72	1	(73)
	ar gain							<b></b>					<u>]</u>	• •
	Ŭ		using sola	r flux from	Table 6a a	and assoc	ciated equa	ations to	convert to th	ne applical	ble orientat	tion.		
Orienta	ation:	Access F	actor	Area	l	Flu	х		g_		FF		Gains	
	-	Table 6d		m²		Та	ble 6a		Table 6b	Т	able 6c		(W)	
Northea	ast <mark>0.9x</mark>	0.77	x	7.3	39	x	11.28	x	0.76	x	0.7	=	30.74	(75)
Northea	ast <mark>0.9x</mark>	0.77	x	8.2	26	x	11.28	×	0.76	×	0.7	=	34.36	(75)
Northea	ast <mark>0.9x</mark>	0.77	x	7.3	39	x	22.97	×	0.76	×	0.7	=	62.57	(75)
Northea	ast <mark>0.9x</mark>	0.77	x	8.2	26	x :	22.97	] × [	0.76	× [	0.7	=	69.94	(75)
Northea	ast <mark>0.9x</mark>	0.77	×	7.3	39	x	41.38	] × [	0.76	×	0.7	=	112.74	(75)



Northeast 0.9x	0.77	x	8.26	×	41.38	x	0.76	x	0.7	] =	126.01	(75)
Northeast 0.9x	0.77	x	7.39	×	67.96	×	0.76	x	0.7	] =	185.15	(75)
Northeast 0.9x	0.77	x	8.26	x	67.96	x	0.76	x	0.7	] =	206.94	(75)
Northeast 0.9x	0.77	x	7.39	×	91.35	x	0.76	x	0.7	] =	248.87	(75)
Northeast 0.9x	0.77	x	8.26	×	91.35	x	0.76	x	0.7	] =	278.17	(75)
Northeast 0.9x	0.77	x	7.39	x	97.38	x	0.76	x	0.7	=	265.33	(75)
Northeast 0.9x	0.77	x	8.26	x	97.38	x	0.76	x	0.7	] =	296.56	(75)
Northeast 0.9x	0.77	x	7.39	×	91.1	x	0.76	x	0.7	] =	248.21	(75)
Northeast 0.9x	0.77	x	8.26	x	91.1	x	0.76	x	0.7	=	277.43	(75)
Northeast 0.9x	0.77	x	7.39	×	72.63	x	0.76	x	0.7	] =	197.87	(75)
Northeast 0.9x	0.77	x	8.26	x	72.63	x	0.76	x	0.7	=	221.17	(75)
Northeast 0.9x	0.77	x	7.39	×	50.42	x	0.76	x	0.7	=	137.37	(75)
Northeast 0.9x	0.77	x	8.26	×	50.42	x	0.76	x	0.7	] =	153.54	(75)
Northeast 0.9x	0.77	x	7.39	×	28.07	x	0.76	x	0.7	=	76.47	(75)
Northeast 0.9x	0.77	x	8.26	×	28.07	x	0.76	x	0.7	=	85.47	(75)
Northeast 0.9x	0.77	x	7.39	x	14.2	x	0.76	x	0.7	] =	38.68	(75)
Northeast 0.9x	0.77	x	8.26	×	14.2	x	0.76	x	0.7	=	43.23	(75)
Northeast 0.9x	0.77	x	7.39	×	9.21	x	0.76	x	0.7	] =	25.1	(75)
Northeast 0.9x	0.77	x	8.26	×	9.21	x	0.76	x	0.7	=	28.06	(75)
Southeast 0.9x	0.77	x	3.5	x	36.79	x	0.76	x	0.7	=	47.48	(77)
Southeast 0.9x	0.77	x	5.28	×	36.79	x	0.76	x	0.7	=	71.62	(77)
Southeast 0.9x	0.77	x	3.5	×	62.67	x	0.76	x	0.7	=	80.87	(77)
Southeast 0.9x	0.77	x	5.28	x	62.67	x	0.76	x	0.7	=	122	(77)
Southeast 0.9x	0.77	x	3.5	×	85.75	x	0.76	x	0.7	=	110.65	(77)
Southeast 0.9x	0.77	x	5.28	×	85.75	x	0.76	x	0.7	=	166.93	(77)
Southeast 0.9x	0.77	x	3.5	x	106.25	x	0.76	x	0.7	=	137.1	(77)
Southeast 0.9x	0.77	x	5.28	x	106.25	x	0.76	x	0.7	=	206.83	(77)
Southeast 0.9x	0.77	x	3.5	x	119.01	x	0.76	x	0.7	=	153.57	(77)
Southeast 0.9x	0.77	x	5.28	x	119.01	x	0.76	x	0.7	=	231.67	(77)
Southeast 0.9x	0.77	x	3.5	x	118.15	x	0.76	x	0.7	] =	152.46	(77)
Southeast 0.9x	0.77	x	5.28	x	118.15	x	0.76	x	0.7	=	229.99	(77)
Southeast 0.9x	0.77	x	3.5	x	113.91	x	0.76	x	0.7	=	146.98	(77)
Southeast 0.9x	0.77	x	5.28	x	113.91	x	0.76	x	0.7	=	221.74	(77)
Southeast 0.9x	0.77	x	3.5	x	104.39	x	0.76	x	0.7	=	134.7	(77)
Southeast 0.9x	0.77	x	5.28	x	104.39	x	0.76	x	0.7	] =	203.21	(77)
Southeast 0.9x	0.77	x	3.5	x	92.85	x	0.76	x	0.7	=	119.81	(77)
Southeast 0.9x	0.77	x	5.28	x	92.85	x	0.76	x	0.7	=	180.75	(77)
Southeast 0.9x	0.77	x	3.5	×	69.27	×	0.76	×	0.7	] =	89.38	(77)
Southeast 0.9x	0.77	x	5.28	×	69.27	×	0.76	x	0.7	=	134.84	(77)
Southeast 0.9x	0.77	×	3.5	×	44.07	×	0.76	×	0.7	] =	56.87	(77)
Southeast 0.9x	0.77	x	5.28	×	44.07	×	0.76	x	0.7	=	85.79	(77)



O															
Southeast 0.9x	0.77	x	3.5	5	x	3	1.49	x	0.76	×	0.7		= [	40.63	(77)
Southeast 0.9x	0.77	x	5.2	8	x	3	1.49	x	0.76	x	0.7		= [	61.29	(77)
Southwest <sub>0.9x</sub>	0.77	x	8.2	6	x	3	6.79		0.76	x	0.7		= [	112.05	(79)
Southwest <sub>0.9x</sub>	0.77	x	8.2	6	x	6	2.67		0.76	x	0.7		= [	190.86	(79)
Southwest <sub>0.9x</sub>	0.77	x	8.2	6	x	8	5.75		0.76	×	0.7		= [	261.14	(79)
Southwest <sub>0.9x</sub>	0.77	x	8.2	6	x	10	06.25		0.76	×	0.7		= [	323.56	(79)
Southwest <mark>0.9</mark> x	0.77	x	8.2	6	x	11	19.01		0.76	×	0.7		= [	362.42	(79)
Southwest <sub>0.9x</sub>	0.77	×	8.2	6	x	11	18.15		0.76	×	0.7		= [	359.8	(79)
Southwest <sub>0.9x</sub>	0.77	x	8.2	6	x	1	13.91		0.76	×	0.7		= [	346.88	(79)
Southwest0.9x	0.77	×	8.2	6	x	10	04.39		0.76	×	0.7		= Г	317.9	(79)
Southwest0.9x	0.77	x	8.2	6	x	9	2.85		0.76	x	0.7		- [	282.76	(79)
Southwest0.9x	0.77	x	8.2	6	x	6	9.27		0.76	×	0.7		- [	210.94	(79)
Southwest0.9x	0.77	×	8.2	6	x	4	4.07		0.76	×	0.7		- Ī	134.21	(79)
Southwest <sub>0.9x</sub>	0.77	×	8.2	6	x	3	1.49		0.76	×	0.7		= Ī	95.89	(79)
													-		
Solar gains in	watts. calc	culated	for eacl	n montl	า			(83)m	= Sum(74)m	.(82)m					
(83)m= 296.25	<u>i ' i</u>		1059.59	1274.7	_	804.13		1074		597.1	358.77	250.9	8		(83)
Total gains – i	nternal and	d solar	(84)m =	: (73)m	+ (8	83)m	, watts								
(84)m= 724.67	952.49 1	188.73	1445.96	1635.54	16	640.45	1562.13	140	2.7 1215.29	963.28	3 753.15	666.7	7		(84)
7. Mean inter	rnal tempe	rature (	heating	seaso	n)						-				
Temperature		· · · ·			í	area f	rom Tab	ole 9	Th1 (°C)				Г	21	(85)
Utilisation fac	-	• •			-				( •)				L		(/
Jan	Feb		-		Ť										
Juli				Mav		lun l	hul	Δι	ia Sen	Oct	Nov	De	~		
(86)m = 0.99		Mar 0.91	Apr 0.75	May 0.54	-	Jun 0.37	Jul 0.27	Ai 0.3		Oct	-	De 1	с		(86)
(86)m= 0.99	0.97	0.91	0.75	0.54	(	0.37	0.27	0.3	1 0.54	Oct 0.87	Nov 0.98	De 1	с		(86)
Mean interna	0.97 Il temperati	0.91 ure in li	0.75 ving are	0.54 ea T1 (1	(	0.37 w ste	0.27 ps 3 to 7	0.3 ' in T	1 0.54 able 9c)	0.87	0.98	1			. ,
	0.97 Il temperati	0.91	0.75	0.54	(	0.37	0.27	0.3	1 0.54 able 9c)	-	0.98				(86) (87)
Mean interna	0.97 al temperati 20.36	0.91 ure in li 20.67	0.75 ving are 20.91	0.54 ea T1 (1 20.99	follo	0.37 w ste 21	0.27 ps 3 to 7 21	0.3 ' in T 2 <sup>.</sup>	1 0.54 able 9c) 20.99	0.87	0.98	1			. ,
Mean interna (87)m= 20.09	0.97 Il temperati 20.36 during hea	0.91 ure in li 20.67	0.75 ving are 20.91	0.54 ea T1 (1 20.99	follo follo	0.37 w ste 21	0.27 ps 3 to 7 21	0.3 ' in T 2 <sup>.</sup>	1 0.54 able 9c) 20.99 , Th2 (°C)	0.87	0.98	1	3		. ,
Mean interna (87)m= 20.09 Temperature	0.97 Il temperati 20.36 during hea 20.08	0.91 ure in li 20.67 ating pe 20.08	0.75 iving are 20.91 eriods ir 20.08	0.54 ea T1 (1 20.99 n rest o 20.08	follo f dw	0.37 w ste 21 velling	0.27 ps 3 to 7 21 from Ta 20.09	0.3 ' in T 2' ble 9 20.0	1 0.54 able 9c) 20.99 , Th2 (°C)	0.87	0.98	1	3		(87)
Mean interna (87)m= 20.09 Temperature (88)m= 20.07	0.97 Il temperati 20.36 during hea 20.08	0.91 ure in li 20.67 ating pe 20.08	0.75 iving are 20.91 eriods ir 20.08	0.54 ea T1 (1 20.99 n rest o 20.08	follo f dw 2 , h2,	0.37 w ste 21 velling	0.27 ps 3 to 7 21 from Ta 20.09	0.3 ' in T 2' ble 9 20.0	1         0.54           able 9c)         20.99           , Th2 (°C)	0.87	0.98	1	3		(87)
Mean interna ( $(87)m=$ 20.09 Temperature ( $(88)m=$ 20.07 Utilisation fac ( $(89)m=$ 0.99	0.97 al temperations 20.36 during heat 20.08 ctor for gain 0.97	0.91 ure in li 20.67 ating pe 20.08 ns for re 0.89	0.75 20.91 eriods ir 20.08 est of dv 0.71	0.54 ea T1 († 20.99 n rest o 20.08 welling, 0.49	follo f dw f dw h2,	0.37 w ste 21 velling 0.09 m (se 0.32	0.27 ps 3 to 7 21 from Ta 20.09 ee Table 0.21	0.3 7 in T 2 <sup>-</sup> 1ble 9 20.0 9a) 0.2	1     0.54       able 9c)     20.99       20.99     20.99       9     20.08       5     0.47	0.87 20.83 20.08 0.83	0.98 20.39 20.08	1 20.03 20.08	3		(87)
Mean interna (87)m= 20.09 Temperature (88)m= 20.07 Utilisation fac (89)m= 0.99 Mean interna	0.97 I temperation 20.36 during heat 20.08 ctor for gain 0.97	0.91 ure in li 20.67 ating pe 20.08 ns for re 0.89 ure in t	0.75 iving are 20.91 eriods ir 20.08 est of dv 0.71 he rest	0.54 ea T1 (1 20.99 n rest o 20.08 welling, 0.49 of dwel	follo f dw f dw h2, h2, ling	0.37 w ste 21 velling 0.09 m (se 0.32 T2 (fo	0.27 ps 3 to 7 21 from Ta 20.09 ee Table 0.21 pllow ste	0.3 7 in T 27 ble 9 20.0 9a) 0.2 :ps 3	1     0.54       able 9c)     20.99       1, Th2 (°C)     20.08       20.08     20.08       5     0.47       to 7 in Table	0.87 20.83 20.08 0.83 e 9c)	0.98 20.39 20.08 0.98	1 20.03 20.08 0.99	3		(87)
Mean interna ( $(87)m=$ 20.09 Temperature ( $(88)m=$ 20.07 Utilisation fac ( $(89)m=$ 0.99	0.97 I temperation 20.36 during heat 20.08 ctor for gain 0.97	0.91 ure in li 20.67 ating pe 20.08 ns for re 0.89	0.75 20.91 eriods ir 20.08 est of dv 0.71	0.54 ea T1 († 20.99 n rest o 20.08 welling, 0.49	follo f dw f dw h2, h2, ling	0.37 w ste 21 velling 0.09 m (se 0.32	0.27 ps 3 to 7 21 from Ta 20.09 ee Table 0.21	0.3 7 in T 2 <sup>-</sup> 1ble 9 20.0 9a) 0.2	1       0.54         able 9c)       20.99         20.99       20.08         9       20.08         5       0.47         to 7 in Table         99       20.08	0.87 20.83 20.08 0.83 0.83 <b>9 9 c )</b> 19.91	0.98 20.39 20.08	1 20.03 20.08 0.99	3	0.52	(87) (88) (89) (90)
Mean interna (87)m= $20.09$ Temperature (88)m= $20.07$ Utilisation fac (89)m= $0.99$ Mean interna (90)m= $18.87$	0.97 I temperation 20.36 during heat 20.08 ctor for gain 0.97 I temperation 19.26	0.91 ure in li 20.67 ating pe 20.08 ns for ro 0.89 ure in t 19.69	0.75 20.91 eriods ir 20.08 est of dv 0.71 he rest 19.99	0.54 ea T1 (1 20.99 n rest o 20.08 welling, 0.49 of dwel 20.07	follo f dw f dw h2, h2, ( u ling 2	0.37 w ste 21 velling 0.09 m (se 0.32 T2 (fc	0.27 ps 3 to 7 21 from Ta 20.09 ee Table 0.21 ollow ste 20.09	0.3 7 in T 27 ble § 20.1 9a) 0.2 0.2 0.2	1       0.54         able 9c)       20.99         20.99       20.08         9       20.08         5       0.47         to 7 in Table       109         109       20.08         100       100         100       100	0.87 20.83 20.08 0.83 0.83 <b>9 9 c )</b> 19.91	0.98 20.39 20.08 0.98 19.32	1 20.03 20.08 0.99	3	0.52	(87) (88) (89)
Mean interna (87)m= 20.09 Temperature (88)m= 20.07 Utilisation fac (89)m= 0.99 Mean interna (90)m= 18.87 Mean interna	0.97 I temperate 20.36 during hea 20.08 tor for gain 0.97 I temperate 19.26 I temperate	0.91 ure in li 20.67 ating pe 20.08 ns for re 0.89 ure in ti 19.69 ure (for	0.75 ving are 20.91 eriods ir 20.08 est of dv 0.71 he rest 19.99	0.54 ea T1 (1 20.99 n rest o 20.08 welling, 0.49 of dwel 20.07	follo f dw f dw h2, h2, ing 2 elling	0.37 w ste 21 velling 0.09 m (se 0.32 T2 (fo 0.09 g) = fl	0.27 ps 3 to 7 21 from Ta 20.09 ee Table 0.21 ollow ste 20.09	0.3 7 in T 2 ble § 20.0 9a) 0.2 ps 3 20.0 + (1	1       0.54         able 9c)       20.99         20.99       20.08         0       20.08         5       0.47         to 7 in Table       20.08         10       20.08         5       0.47         10       20.08         5       0.47         10       7 in Table         10       20.08	0.87 20.83 20.08 0.83 e 9c) 19.91 _A = Liv	0.98 20.39 20.08 0.98 19.32 ing area ÷ (4	1 20.03 20.08 0.99 18.79	3	0.52	(87) (88) (89) (90) (91)
Mean interna (87)m= $20.09$ Temperature (88)m= $20.07$ Utilisation fac (89)m= $0.99$ Mean interna (90)m= $18.87$ Mean interna (92)m= $19.5$	0.97 al temperate 20.36 during hea 20.08 20.08 ctor for gain 0.97 al temperate 19.26 al temperate 19.83	0.91 ure in li 20.67 ating pe 20.08 ns for ro 0.89 ure in ti 19.69 ure (for 20.2	0.75 iving are 20.91 eriods ir 20.08 est of dv 0.71 he rest 19.99 the wh 20.46	0.54 ea T1 (f 20.99 n rest o 20.08 welling, 0.49 of dwel 20.07 ole dwe 20.54	follo f dw f dw f dw ling 2 elling 2	2.37 w ste 21 velling 0.09 m (se 0.32 T2 (fc 0.09 g) = fl 0.56	0.27 ps 3 to 7 21 from Ta 20.09 ee Table 0.21 ollow ste 20.09 _A × T1 20.56	0.3 ' in T 2' ble § 20.1 9a) 0.2 ps 3 20.1 + (1 20.3	1       0.54         able 9c)       20.99         20.99       20.08         5       0.47         to 7 in Table       10         109       20.08         100       10	0.87 20.83 20.08 0.83 e 9c) 19.91 _A = Liv 20.38	0.98 20.39 20.08 0.98 19.32 ing area ÷ (4	1 20.03 20.08 0.99	3	0.52	(87) (88) (89) (90)
Mean interna (87)m= $20.09$ Temperature (88)m= $20.07$ Utilisation fac (89)m= $0.99$ Mean interna (90)m= $18.87$ Mean interna (92)m= $19.5$ Apply adjustr	0.97 I temperate 20.36 during hea 20.08 tor for gain 0.97 I temperate 19.26 I temperate 19.83 ment to the	0.91 ure in li 20.67 ating pe 20.08 ns for re 0.89 ure in ti 19.69 ure (for 20.2 e mean	0.75 ving are 20.91 eriods ir 20.08 est of dv 0.71 he rest 19.99 the wh 20.46 internal	0.54 ea T1 (1 20.99 n rest o 20.08 welling, 0.49 of dwel 20.07 ole dwe 20.54 tempe	follo follo f dw f dw 2 , h2, , 1 ing 2 elling 2 z ratu	2.37 w ste 21 velling 0.09 m (se 0.32 T2 (fc 0.09 g) = fl 0.56 ure fro	0.27 ps 3 to 7 21 from Ta 20.09 ee Table 0.21 ollow ste 20.09 _A × T1 20.56 m Table	0.3 ' in T 2 ble § 20.0 9a) 0.2 ps 3 20.0 + (1 20.3 + (1 20.3 + (1 20.3 + (1 20.3 + (1 20.3 + (1 20.3 + (1) 20.3 + (1) + (1) 20.3 + (1) 20.3 + (1) 20.3 + (1)	1       0.54         able 9c)       20.99         20.99       20.08         0       20.08         5       0.47         to 7 in Table       100         09       20.08         ft       - fLA) × T2         56       20.55         where approx	0.87 20.83 20.08 0.83 e 9c) 19.91 A = Liv 20.38 priate	0.98 20.39 20.08 0.98 19.32 ing area ÷ (4 19.87	1 20.03 20.08 0.99 18.75 19.43	3 3 3 3	0.52	(87) (88) (89) (90) (91) (92)
Mean interna (87)m= $20.09$ Temperature (88)m= $20.07$ Utilisation fac (89)m= $0.99$ Mean interna (90)m= $18.87$ Mean interna (92)m= $19.5$ Apply adjustr (93)m= $19.5$	0.97           al temperation           20.36           aduring heat           20.08           ctor for gain           0.97           al temperation           19.26           al temperation           19.83           ment to the           19.83	0.91 ure in li 20.67 ating pe 20.08 ns for re 0.89 ure in ti 19.69 ure (for 20.2 e mean 20.2	0.75 iving are 20.91 eriods ir 20.08 est of dv 0.71 he rest 19.99 the wh 20.46	0.54 ea T1 (f 20.99 n rest o 20.08 welling, 0.49 of dwel 20.07 ole dwe 20.54	follo follo f dw f dw 2 , h2, , 1 ing 2 elling 2 z ratu	2.37 w ste 21 velling 0.09 m (se 0.32 T2 (fc 0.09 g) = fl 0.56	0.27 ps 3 to 7 21 from Ta 20.09 ee Table 0.21 ollow ste 20.09 _A × T1 20.56	0.3 ' in T 2' ble § 20.1 9a) 0.2 ps 3 20.1 + (1 20.3	1       0.54         able 9c)       20.99         20.99       20.08         0       20.08         5       0.47         to 7 in Table       100         09       20.08         ft       - fLA) × T2         56       20.55         where approx	0.87 20.83 20.08 0.83 e 9c) 19.91 _A = Liv 20.38	0.98 20.39 20.08 0.98 19.32 ing area ÷ (4 19.87	1 20.03 20.08 0.99 18.79	3 3 3 3	0.52	(87) (88) (89) (90) (91)
Mean interna (87)m= $20.09$ Temperature (88)m= $20.07$ Utilisation fac (89)m= $0.99$ Mean interna (90)m= $18.87$ Mean interna (92)m= $19.5$ Apply adjustr (93)m= $19.5$ 8. Space hea	0.97 al temperate 20.36 during hea 20.08 20.08 ctor for gain 0.97 al temperate 19.26 al temperate 19.83 ment to the 19.83 ating requir	0.91 ure in li 20.67 ating pe 20.08 ns for re 0.89 ure in ti 19.69 ure (for 20.2 e mean 20.2 ement	0.75 ving are 20.91 eriods in 20.08 est of dv 0.71 he rest 19.99 the wh 20.46 internal 20.46	0.54 ea T1 (1 20.99 n rest o 20.08 welling, 0.49 of dwel 20.07 ole dwe 20.54 tempe 20.54	follo follo f dw f dw 2 , h2, , h2, ( ling 2 ellin 2 2 ratu 2	21 21 21 21 21 20.09 m (se 0.32 T2 (fc 20.09 g) = fl 20.56 ire fro 20.56	0.27 ps 3 to 7 21 from Ta 20.09 ee Table 0.21 ollow ste 20.09 _A × T1 20.56 m Table 20.56	0.3 ' in T 2 ble § 20.0 9a) 0.2 ps 3 20.0 + (1 20.0 4e, y 20.0	1       0.54         able 9c)       20.99         20.99       20.08         0       20.08         5       0.47         to 7 in Table       100         09       20.08         6       20.55         where appro       20.55	0.87 20.83 20.08 0.83 e 9c) 19.91 A = Liv 20.38 priate 20.38	0.98 20.39 20.08 0.98 19.32 ing area ÷ (4 19.87	1 20.03 20.08 0.99 18.75 19.43 19.43	3 3 3 3 3		(87) (88) (89) (90) (91) (92)
Mean interna (87)m= $20.09$ Temperature (88)m= $20.07$ Utilisation fac (89)m= $0.99$ Mean interna (90)m= $18.87$ Mean interna (92)m= $19.5$ Apply adjustr (93)m= $19.5$ 8. Space heat Set Ti to the	0.97 al temperations 20.36 during heat 20.08 20.08 ctor for gain 0.97 al temperations 19.26 al temperations 19.83 ment to the 19.83 atting requirements mean inter	0.91 ure in li 20.67 ating pe 20.08 ns for re 0.89 ure in ti 19.69 ure (for 20.2 mean 20.2 ement nal tem	0.75 iving are 20.91 eriods ir 20.08 est of dv 0.71 he rest 19.99 the wh 20.46 internal 20.46	0.54 ea T1 (1 20.99 n rest o 20.08 welling, 0.49 of dwel 20.07 ole dwe 20.54 tempe 20.54	follo follo f dw f dw 2 , h2, , h2, ( ling 2 ellin 2 2 ratu 2	21 21 21 21 21 20.09 m (se 0.32 T2 (fc 20.09 g) = fl 20.56 ire fro 20.56	0.27 ps 3 to 7 21 from Ta 20.09 ee Table 0.21 ollow ste 20.09 _A × T1 20.56 m Table 20.56	0.3 ' in T 2 ble § 20.0 9a) 0.2 ps 3 20.0 + (1 20.0 4e, y 20.0	1       0.54         able 9c)       20.99         20.99       20.08         0       20.08         5       0.47         to 7 in Table       100         09       20.08         6       20.55         where appro       20.55	0.87 20.83 20.08 0.83 e 9c) 19.91 A = Liv 20.38 priate 20.38	0.98 20.39 20.08 0.98 19.32 ing area ÷ (4 19.87	1 20.03 20.08 0.99 18.75 19.43 19.43	3 3 3 3 3		(87) (88) (89) (90) (91) (92)
Mean interna (87)m= $20.09$ Temperature (88)m= $20.07$ Utilisation fac (89)m= $0.99$ Mean interna (90)m= $18.87$ Mean interna (92)m= $19.5$ Apply adjustr (93)m= $19.5$ 8. Space heat Set Ti to the the utilisation	0.97 al temperate 20.36 during hea 20.08 ctor for gain 0.97 al temperate 19.26 al temperate 19.83 ment to the 19.83 ating requir mean inter factor for	0.91 ure in li 20.67 ating pe 20.08 ns for re 0.89 ure in ti 19.69 ure (for 20.2 emean 20.2 ement nal tem gains u	0.75 iving are 20.91 eriods in 20.08 est of dv 0.71 he rest 19.99 the wh 20.46 internal 20.46	0.54 ea T1 (1 20.99 n rest o 20.08 welling, 0.49 of dwel 20.07 ole dwe 20.54 tempe 20.54 tempe 20.54	follo follo f dw 2 f dw 2 r 1 c ling 2 c ling 2 c r atu 2 c r atu 2 c c c c c c c c c c c c c c c c c c	2.37 w ste 21 velling 0.09 m (se 0.32 T2 (fc 0.09 g) = fl 0.56 vre fro 0.56 at ste	0.27 ps 3 to 7 21 from Ta 20.09 ee Table 0.21 ollow ste 20.09 -A × T1 20.56 m Table 20.56	0.3 ' in T 2 ble § 20.0 9a) 0.2 ps 3 20.0 + (1 20.3 4e, ' 20.0 Tabl	1       0.54         able 9c)       20.99         20.99       20.08         0       20.08         5       0.47         to 7 in Table       9         20.08       ft         - fLA) × T2       6         20.55       where appro         56       20.55	0.87 20.83 20.08 0.83 e 9c) 19.91 A = Liv 20.38 priate 20.38	0.98 20.39 20.08 0.98 19.32 ing area ÷ (4 19.87 19.87	1 20.03 20.08 0.99 18.79 19.43 19.43 19.43	3 3 3 3 3 3 3 3		(87) (88) (89) (90) (91) (92)
Mean interna (87)m= $20.09$ Temperature (88)m= $20.07$ Utilisation fac (89)m= $0.99$ Mean interna (90)m= $18.87$ Mean interna (92)m= $19.5$ Apply adjustr (93)m= $19.5$ 8. Space heat Set Ti to the	0.97 al temperations of the second s	0.91 ure in li 20.67 ating pe 20.08 ns for re 0.89 ure in ti 19.69 ure (for 20.2 emean 20.2 ement nal terr gains u Mar	0.75 iving are 20.91 eriods ir 20.08 est of dv 0.71 he rest 19.99 the wh 20.46 internal 20.46 internal 20.46	0.54 ea T1 (1 20.99 n rest o 20.08 welling, 0.49 of dwel 20.07 ole dwe 20.54 tempe 20.54	follo follo f dw 2 f dw 2 r 1 c ling 2 c ling 2 c r atu 2 c r atu 2 c c c c c c c c c c c c c c c c c c	21 21 21 21 21 20.09 m (se 0.32 T2 (fc 20.09 g) = fl 20.56 ire fro 20.56	0.27 ps 3 to 7 21 from Ta 20.09 ee Table 0.21 ollow ste 20.09 _A × T1 20.56 m Table 20.56	0.3 ' in T 2 ble § 20.0 9a) 0.2 ps 3 20.0 + (1 20.0 4e, y 20.0	1       0.54         able 9c)       20.99         20.99       20.08         9       20.08         5       0.47         to 7 in Table       10         9       20.08         6       20.55         where appro       20.55         9       20.55	0.87 20.83 20.08 0.83 e 9c) 19.91 A = Liv 20.38 priate 20.38	0.98 20.39 20.08 0.98 19.32 ing area ÷ (4 19.87 19.87	1 20.03 20.08 0.99 18.75 19.43 19.43	3 3 3 3 3 3 3 3		(87) (88) (89) (90) (91) (92)

Utilisa	ition fac	tor for g	ains, hm	:							-		_
(94)m=	0.99	0.97	0.89	0.72	0.52	0.35	0.24	0.28	0.51	0.84	0.97	0.99	(94)



Usefu	ul gains,	hmGm	, W = (94	4)m x (84	4)m									
(95)m=	717.81	919.61	1060.89	1045.87	844.29	572.16	380.71	399.47	614.64	810.29	734.3	662.46		(95)
Mont	hly aver	age exte	rnal tem	perature	e from Ta	able 8					-			
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat	loss rate	e for me	an interr	nal tempe	erature,	Lm , W =	=[(39)m :	x [(93)m	– (96)m	]	-			
(97)m=	1483.59	1454.97	1333.33	1119.42	855.08	573.15	380.81	399.71	621.67	945.96	1237.68	1479.45		(97)
•	e heatin	g require	ement fo	r each n	honth, k	Wh/mont	th = 0.02	24 x [(97	)m – (95	)m] x (4	1)m	·1		
(98)m=	569.74	359.76	202.7	52.96	8.03	0	0	0	0	100.94	362.43	607.84		-
								Tota	l per year	(kWh/year	r) = Sum(9	8)15,912 =	2264.4	(98)
Spac	e heatin	g require	ement in	ı kWh/m²	/year								23.46	(99)
9a. En	ergy rec	quiremer	nts – Ind	ividual h	eating s	ystems i	ncluding	micro-C	CHP)					-
	e heatir				<u> </u>	-	Ŭ		,					
Fract	ion of sp	ace hea	at from s	econdar	y/supple	mentary	' system						0	(201)
Fract	ion of sp	ace hea	at from m	nain syst	em(s)			(202) = 1 -	- (201) =			ĺ	1	(202)
Fract	ion of to	tal heati	ng from	main sys	stem 1			(204) = (2	02) × [1 –	(203)] =		ĺ	1	(204)
Efficie	encv of i	main spa	ace heat	ing syste	em 1							l	90.4	(206)
	-			ementar		a system	ז %					l	0	(208)
LINCK				<b>i</b>			i							]
Snoo	Jan	Feb	Mar Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/yea	r
Spac	569.74	g require 359.76	202.7	52.96	8.03	)	0	0	0	100.94	362.43	607.84		
(0.4.4)						0	0	0	0	100.94	302.43	007.04		
(211)n		i i i i i i i i i i i i i i i i i i i	1	100 ÷ (20						444.00	400.00			(211)
	630.25	397.96	224.22	58.58	8.88	0	0	0 Toto	0	111.66	400.92	672.38		
-		/	_					TOLA	i (KVVII/yea	ar) – Sum(2	211) <sub>15,1012</sub>	-	2504.86	(211)
•		• •		y), kWh/	month									
= {[(98 (215)m=		0	00 ÷ (20	0	0	0	0	0	0	0	0	0		
(213)11-	0	0	0	0	0	0	0	-	-	-	215) <sub>15,1012</sub>		0	(215)
	la a <b>a 4</b> 1 m a	_						1014	. (		<b>- 10 /</b> 15,1012		0	(213)
	heating		iter (calc	ulated a	hove)									
ouipu	211.55	186.48	195.9	173.94	168.4	148.32	142.1	158.41	160.16	182.16	192.53	206.48		
Efficie	ncy of w	ater hea	ater									·	80.3	(216)
(217)m=	87.42	86.68	85.14	82.45	80.71	80.3	80.3	80.3	80.3	83.63	86.62	87.61		」 (217)
Fuel fo	r water	heating,	kWh/m	onth								<u> </u>		
. ,			<u>) ÷ (217)</u>				1	1				1		
(219)m=	241.99	215.14	230.09	210.96	208.65	184.71	176.96	197.27	199.45	217.81	222.27	235.7		-
								Tota	I = Sum(2 <sup>-</sup>	19a) <sub>112</sub> =			2541.01	(219)
	al totals									k	Wh/year	Г	kWh/year	1
Space	neating	tuel use	ed, main	system	1								2504.86	ļ
Water	heating	fuel use	d										2541.01	]
Electri	city for p	oumps, f	ans and	electric	keep-ho	t						-		
centra	al heatin	ıg pump	:									30		(230c)
		- a panip	-											()



boiler with a fan-assisted flue			45		(230e)
Total electricity for the above, kWh/year	sum of	(230a)(230g) =	[	75	(231)
Electricity for lighting			[	394.57	(232)
12a. CO2 emissions – Individual heating systems	including micro-CHP				
	<b>Energy</b> kWh/year	<b>Emission fac</b> kg CO2/kWh	tor	<b>Emissions</b> kg CO2/yea	r
Space heating (main system 1)	(211) x	0.216	= [	541.05	(261)
Space heating (secondary)	(215) x	0.519	= [	0	(263)
Water heating	(219) x	0.216	= [	548.86	(264)
Space and water heating	(261) + (262) + (263) + (264	4) =	[	1089.91	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	= [	38.93	(267)
Electricity for lighting	(232) x	0.519	= [	204.78	(268)
Energy saving/generation technologies Total CO2, kg/year		sum of (265)(271) =	[	1333.61	(272)
Dwelling CO2 Emission Rate		(272) ÷ (4) =	[	13.81	(273)
El rating (section 14)			[	87	(274)