Project Information	mber 2021 at 13:26				
	h:				
Assessed By:	Neil Ingham (STR	D010943)	Building Type:	End-terrace House	
Dwelling Details:					
NEW DWELLING	DESIGN STAGE		Total Floor Area: 1	100.05m²	
Site Reference :	11-12 Grenville Str	reet - GREEN	Plot Reference:	Unit 1	
Address :					
Client Details:					
Name:					
Address :					
This report covers	items included w	ithin the SAP calculations.			
•	e report of regulati				
1a TER and DER					
	ng system: Electricit	У			
Fuel factor: 1.55 (el	• /	(
-	kide Emission Rate	. ,	25.97 kg/m ²		
Dwelling Carbon Di 1b TFEE and DFE	oxide Emission Rat	e (DER)	20.45 kg/m ²	0	OK
	gy Efficiency (TFEE))	56.0 kWh/m ²		
•	ergy Efficiency (DFE	•	71.5 kWh/m²		
		/	71.5 KWI/III	F	ail
Excess energy = 1	5.49 kg/m² (27.7 %))			
2 Fabric U-values	• • •				
Element		Average	Highest		
External w	all	0.15 (max. 0.30)	0.15 (max. 0.70)	0	DK
Party wall		0.00 (max. 0.20)	-	0	DK
Floor		0.14 (max. 0.25)	0.14 (max. 0.70)	0	DK
Roof		0.14 (max. 0.20)	0.14 (max. 0.35)		ЭK
Openings		4.37 (max. 2.00)	5.30 (max. 3.30)	F	ail
2a Thermal bridg			· · · · ·		
Thermal b 3 Air permeability		om linear thermal transmittan	ces for each junction		
	ility at 50 pascals		5.00 (design val	ue)	
Maximum	inty at 00 paboaio		10.0		Ж
4 Heating efficien	ncy				
Main Heating					
		Heat pumps with radiators	or underfloor heating - elect	ric	
		Mitsubishi ECODAN 5kW			
Cocordon / h	eating system:	None			
	eating system:	NUTE			
Secondary n					
5 Cylinder insula	tion				
		Measured cylinder loss: 1.4	ŀ7 kWh/day		

Primary pipework insulated: 6 Controls	Yes		ок
8 Controis			
Space heating controls Hot water controls: Boiler interlock:	TTZC by plumbing and elec Cylinderstat Independent timer for DHW Yes		ОК ОК ОК ОК
7 Low energy lights	Tes		UK
Percentage of fixed lights with Minimum	low-energy fittings	100.0% 75.0%	ОК
8 Mechanical ventilation			
Not applicable			
9 Summertime temperature			
Overheating risk (Thames valle Based on:	ey):	Slight	ОК
Overshading: Windows facing: South East Windows facing: South West Windows facing: North West Roof windows facing: North We Ventilation rate:	est	Average or unknown 9.44m ² 3.39m ² 2.08m ² 1.85m ² 4.00	
10 Key features			
Party Walls U-value		0 W/m²K	

				User D	etails:						
Assessor Name:	Neil Ingha	m			Strom	a Num	ber:		STRO	010943	
Software Name:	Stroma FS	AP 2012	2		Softwa	are Vei	rsion:		Versio	n: 1.0.5.50	
			Р	roperty .	Address	: Unit 1					
Address :											
1. Overall dwelling dime	nsions:				()						
Basement					a(m²) 2.47	(1a) x	Av. Hei	ight(m)	(2a) =	Volume(m ³)	(3a)
]		
Ground floor				3		(1b) x	2	2.8	(2b) =	94.61	(3b)
First floor				3	3.79	(1c) x	3.	.45	(2c) =	116.58	(3c)
Total floor area TFA = (1a	ı)+(1b)+(1c)+	(1d)+(1e)	+(1r	n) 10	00.05	(4)					
Dwelling volume						(3a)+(3b)+(3c)+(3d)+(3e)+	.(3n) =	289.12	(5)
2. Ventilation rate:							-				
	main heating		condar eating	У	other	_	total			m ³ per hour	_
Number of chimneys	0	+	0	+	0	=	0	x 4	40 =	0	(6a)
Number of open flues	0	+	0	+	0] = [0	x 2	20 =	0	(6b)
Number of intermittent far	IS						3	x 1	0 =	30	(7a)
Number of passive vents						Ē	0	x 1	0 =	0	(7b)
Number of flueless gas fir	es					Г	0	x 4	40 =	0	(7c)
						L					-
						_			Air ch	anges per hou	ur -
Infiltration due to chimney						continuo fr	30		÷ (5) =	0.1	(8)
If a pressurisation test has be Number of storeys in th			a, procee	a to (17), (otherwise (continue fr	om (9) to (16)		0	(9)
Additional infiltration	e awoning (in							[(9)-	1]x0.1 =	0	(10)
Structural infiltration: 0.	25 for steel o	r timber fi	rame or	0.35 fo	r masoni	y constr	uction		1	0	(11)
if both types of wall are pro			onding to	the great	er wall are	a (after					4
deducting areas of openin If suspended wooden fl	- · · ·		ed) or 0.	1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, ent			, u) or o.		, oloo					0	(13)
Percentage of windows			ipped							0	(14)
Window infiltration		0	••		0.25 - [0.2	x (14) ÷ 1	00] =			0	(15)
Infiltration rate					(8) + (10)	+ (11) + (1	2) + (13) +	+ (15) =		0	(16)
Air permeability value, o	q50, expresse	ed in cubi	c metre	s per ho	our per s	quare m	etre of e	nvelope	area	5	(17)
If based on air permeabili	ty value, then	(18) = [(17	') ÷ 20]+(8	3), otherwi	se (18) = (16)		-		0.35	(18)
Air permeability value applies	if a pressurisati	on test has	been don	ne or a deg	gree air pe	rmeability	is being us	sed			_
Number of sides sheltered	b									0	(19)
Shelter factor					(20) = 1 -		9)] =			1	(20)
Infiltration rate incorporati	•				(21) = (18) x (20) =				0.35	(21)
Infiltration rate modified fo										l	
	Mar Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe	- i									l	
(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 F	actor (2	22a)m =	(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 infiltr	ation rat	e (allowi	ing for sh	nelter an	d wind s	speed) =	(21a) x	(22a)m				
	0.45	0.44	0.43	0.39	0.38	0.34	0.34	0.33	0.35	0.38	0.4	0.42	
			-	rate for t	he appli	cable ca	se					نے ا	,
		al ventila		a a alia NL (O	26) (00-		and the second) (00-)			0 (23a)
				endix N, (2)) = (23a)			0 (23b)
			-	iency in %	-					01.)		(00 c)	0 (23c)
			anical ve			at recove		HR) (248	a m = (2)	1	23b) × [[1 – (23c)	÷ 100] (24a)
(24a)m=						_		-		0	_	0	(24a)
			r	entilation			r	1	ŕ	r í	1		(24b)
(24b)m=			0		0		0	0	0	0	0	0	(240)
,				ntilation o then (240	•	•				.5 × (23t))		
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0	(24c)
d) If	natural	ventilatio	on or wh	ole hous	e positiv	/e input	ventilati	on from I	loft	!		•	I
i	if (22b)n	n = 1, th	en (24d)	m = (22	o)m othe	erwise (2	4d)m =	0.5 + [(2	2b)m² x	0.5]		-	
(24d)m=	0.6	0.6	0.59	0.58	0.57	0.56	0.56	0.55	0.56	0.57	0.58	0.59	(24d)
Effec	ctive air	change	rate - er	nter (24a) or (24t	o) or (24	c) or (24	d) in bo	x (25)			· · · · · · · · · · · · · · · · · · ·	
(25)m=	0.6	0.6	0.59	0.58	0.57	0.56	0.56	0.55	0.56	0.57	0.58	0.59	(25)
3. He	at losse	s and he	eat loss i	paramete	er:								
ELEN	IENT	Gros area		Openin m	-	Net Ar A ,r		U-val W/m2		A X U (W/		k-value kJ/m²·ł	
Doors			()			2.71	x	1.4		3.794	́л		(26)
Window	ws Type	e 1				9.44		/[1/(4.8)+	0.04] =	38.01			(27)
	ws Type					3.39		/[1/(4.8)+	0.04] =	13.65			(27)
	ws Type					2.08	=	/[1/(4.8)+	0.04] =	8.38			(27)
Rooflig						1.85	=	/[1/(5.3) +	-	9.805			(27b)
Floor	,							0.14		4.5458		110	3571.7 (28)
vvano	Tvne1	40	6			32.47							
	Type1	40.		0		40.6	×	0.15		6.09		9	365.4 (29)
Walls 7		99.0)8	17.6		40.6	x 3 x	0.15		6.09 12.22		9 60	4887.6 (29)
Walls ⊺ Roof	Type2	99.0 36.4)8 16			40.6 81.46 34.61	x 5 x	0.15		6.09		9	4887.6 (29) 311.49 (30)
Walls ∃ Roof Total a	Type2 area of e	99.0)8 16	17.6		40.6 81.46 34.61 208.6	x x x x 1	0.15		6.09 12.22 4.85		9 60 9	4887.6 (29) 311.49 (30) (31)
Walls ⊺ Roof Total a Party v	Type2 area of e vall	99.0 36.4 elements)8 16	17.6		40.6 81.46 34.61	x x x x 1	0.15		6.09 12.22		9 60	4887.6 (29) 311.49 (30) (31) 2356.65 (32)
Walls T Roof Total a Party v Interna	Type2 area of e vall al wall **	99.0 36.4 elements)8 16	17.6		40.6 81.46 34.61 208.6	x x x x 1 x	0.15		6.09 12.22 4.85		9 60 9	4887.6 (29) 311.49 (30) (31) 2356.65 (32) 13573.5 (32c)
Walls T Roof Total a Party v Interna	Type2 area of e vall al wall ** al floor	99.0 36.4)8 16	17.6		40.6 81.46 34.61 208.6 52.37	x x x x 1 x 1 x 8	0.15		6.09 12.22 4.85		9 60 9 45	4887.6 (29) 311.49 (30) (31) (31) 2356.65 (32) 13573.5 (32c) 1216.44 (32d)
Walls T Roof Total a Party v Interna Interna	Type2 area of e wall al wall ** al floor al ceiling	99.0 36.4)8 16 5, m ²	17.62		40.6 81.46 34.61 208.6 52.37 180.9 67.58 67.58	x x x x 1 x 1 x 8 3 3	0.15 0.15 0.14		6.09 12.22 4.85 0		9 60 9 45 75	4887.6 (29) 311.49 (30) (31) (31) 2356.65 (32) 13573.5 (32c) 1216.44 (32d) 608.22 (32e)

Fabric heat loss, W/K = S (A x U)	(26)(30) + (32) =	99.62
Heat capacity $Cm = S(A \times k)$	((28)(30) + (32) + (32a)(32e) =	26891
Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m ² K	$= (34) \div (4) =$	268 78

For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f

(33) (34) (35)

can be u	used inste	ad of a de	tailed calc	ulation.										
Therm	al bridg	es : S (L	x Y) cal	culated	using Ap	pendix l	<						15.01	(36)
if details	of therma	al bridging	are not kn	own (36) =	= 0.05 x (3	1)								
Total f	abric he	at loss							(33) +	(36) =			114.63	(37)
Ventila	ation hea	at loss ca	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=	57.41	57.03	56.66	54.93	54.6	53.09	53.09	52.81	53.67	54.6	55.26	55.95		(38)
Heat ti	ransfer o	coefficie	nt, W/K						(39)m	= (37) + (38)m			
(39)m=	172.04	171.67	171.3	169.56	169.24	167.73	167.73	167.45	168.31	169.24	169.89	170.58		
Heat lo	oss para	ameter (H	HLP), W	/m²K						Average = = (39)m ÷	Sum(39)₁. - (4)	12 /12=	169.56	(39)
(40)m=	1.72	1.72	1.71	1.69	1.69	1.68	1.68	1.67	1.68	1.69	1.7	1.7		
		!	Į	I	I	I	I	1	·	Average =	Sum(40)1.	₁₂ /12=	1.69	(40)
Numbe	er of day	ys in mo	nth (Tab	le 1a)	-	-	-							
	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 hea	ting ene	rgy requ	irement:								kWh/ye	ear:	
A													1	
if TF	A > 13.	upancy, 9, N = 1 9, N = 1		[1 - exp	(-0.0003	849 x (TF	FA -13.9)2)] + 0.0	0013 x (⁻	TFA -13.		74		(42)
Annua	l averag	ge hot wa al average								se target o		.27]	(43)
		litres per				-	-			0				
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wat	er usage i	in litres per	r day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)	-		•		1	
(44)m=	109.2	105.23	101.26	97.29	93.32	89.35	89.35	93.32	97.29	101.26	105.23	109.2		
										Total = Su	m(44) ₁₁₂ =	=	1191.3	(44)
Energy	content of	f hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	n x nm x C	0Tm / 3600) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m=	161.94	141.64	146.16	127.42	122.27	105.51	97.77	112.19	113.53	132.31	144.42	156.83		
										Total = Su	m(45) ₁₁₂ =	=	1561.98	(45)
	r	vater heati. 1	- ·	of use (no		r storage), I		boxes (46)) to (61)	· · · · ·			1	
(46)m= Water	24.29 storage	21.25	21.92	19.11	18.34	15.83	14.66	16.83	17.03	19.85	21.66	23.53		(46)
	-	ne (litres)) includir	ng any se	olar or W	/WHRS	storage	within sa	ame ves	sel		180	1	(47)
0		neating a		0 ,			0					100]	()
		o stored			-			• •	ers) ente	er '0' in ((47)			
	storage			,					,	,				
a) If m	nanufact	turer's de	eclared I	oss facto	or is kno	wn (kWł	n/day):				1.	47		(48)
Tempe	erature f	actor fro	m Table	2b							0.	54		(49)
Energy	y lost fro	om water	⁻ storage	, kWh/ye	ear			(48) x (49)) =		0.	79		(50)
		turer's de		•									1	
		age loss			e 2 (kW	h/litre/da	ıy)					0		(51)
		neating s from Ta		011 4.3								0	1	(50)
		actor fro		2b								0 0		(52) (53)
P \$				-							L	~	J	(00)

			r storage	e, kWh/y	ear			(47) x (51) x (52) x (53) =		0	(54))
	. ,	(54) in (0.	79	(55))
Water	storage	loss cal	culated	for each	month	-	-	((56)m =)	(55) × (41)	m		_	_	
(56)m=	24.61	22.23	24.61	23.81	24.61	23.81	24.61	24.61	23.81	24.61	23.81	24.61	(56))
If cylinde	er contain	s dedicate	d solar sto	orage, (57)	m = (56)m	x [(50) – ((H11)] ÷ (5	0), else (5	57)m = (56)	m where (H11) is fro	m Append	lix H	
(57)m=	24.61	22.23	24.61	23.81	24.61	23.81	24.61	24.61	23.81	24.61	23.81	24.61	(57))
Primar	y circuit	loss (ar	nnual) fro	om Table	e 3							0	(58))
Primar	y circuit	loss cal	lculated	for each	month (59)m =	(58) ÷ 36	65 × (41))m					
(mo	dified by	/ factor f	rom Tab	le H5 if t	there is s	solar wa	ter heati	ng and a	a cylinde	r thermo	stat)	i		
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26	(59))
Combi	loss ca	lculated	for each	month	(61)m =	(60) ÷ 3	65 × (41)m						
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(61))
Total h	neat req	uired for	water h	eating ca	alculated	l for eac	h month	(62)m =	= 0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	209.81	184.87	194.03	173.75	170.14	151.83	145.64	160.06	159.85	180.18	190.75	204.7	(62))
Solar DI	HW input	calculated	using App	endix G o	r Appendix	H (negati	ve quantity	y) (enter 'C)' if no sola	r contribut	on to wate	er heating)		
(add a	dditiona	I 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	t from w	ater hea	iter						_					
(64)m=	209.81	184.87	194.03	173.75	170.14	151.83	145.64	160.06	159.85	180.18	190.75	204.7		
								Out	put from w	ater heate	r (annual)₁	12	2125.61 (64))
Heat g	ains fro	m water	heating,	, kWh/m	onth 0.2	5 ´ [0.85	× (45)m	n + (61)n	n] + 0.8 >	(46)m	+ (57)m	+ (59)m]	
(65)m=	92.14	81.68	86.89	79.43	78.95	72.14	70.8	75.6	74.81	82.29	85.08	90.44	(65))
inclu	ude (57)	m in cal	culation	of (65)m	only if c	ylinder i	s in the o	dwelling	or hot w	ater is fr	om com	munity h	leating	
5. Int	ternal ga	ains (see	e Table 5	5 and 5a):									
Metab	olic gair	<u>ns (Table</u>	<u>e 5), Wat</u>	ts								-		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	137	137	137	137	137	137	137	137	137	137	137	137	(66))
Lightin	ig gains	(calcula	ted in Ap	ppendix	L, equat	ion L9 o	r L9a), a	lso see	Table 5					
(67)m=	23.12	20.53	16.7	12.64	9.45	7.98	8.62	11.21	15.04	19.1	22.29	23.76	(67))
Applia	nces ga	ins (calc	ulated ir	n Appen	dix L, eq	uation L	13 or L1	3a), also	o see Ta	ble 5				
(68)m=	256.41	259.07	252.36	238.09	220.07	203.14	191.82	189.16	195.87	210.14	228.16	245.1	(68))
Cookir	ng gains	(calcula	ated in A	ppendix	L, equa	tion L15	or L15a), also s	ee Table	5				
(69)m=	36.7	36.7	36.7	36.7	36.7	36.7	36.7	36.7	36.7	36.7	36.7	36.7	(69))
Pumps	and fa	ns gains	(Table §	5a)		-	-	-	-	-		_	_	
(70)m=	0	0	0	0	0	0	0	0	0	0	0	0	(70))
Losses	s e.g. ev	vaporatio	on (nega	tive valu	ies) (Tab	ole 5)							_	
(71)m=	-109.6	-109.6	-109.6	-109.6	-109.6	-109.6	-109.6	-109.6	-109.6	-109.6	-109.6	-109.6	(71))
Water	heating	gains (1	Table 5)										_	
(72)m=	123.85	121.55	116.79	110.32	106.11	100.2	95.17	101.61	103.9	110.6	118.17	121.56	(72))
Total i	internal	gains =				(66))m + (67)m	n + (68)m	+ (69)m +	(70)m + (7	1)m + (72)	m		
(73)m=	467.47	465.26	449.96	425.15	399.74	375.41	359.71	366.08	378.91	403.94	432.72	454.52	(73))
6. So	lar gains	s:												

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

Orientation:	Access Factor Table 6d	r	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Southeast 0.9x	0.77	x	9.44	×	36.79	x	0.85	x	0.7	=	143.22	(77)
Southeast 0.9x	0.77	x	9.44	x	62.67	x	0.85	x	0.7	=	243.95	(77)
Southeast 0.9x	0.77	x	9.44	x	85.75	x	0.85	x	0.7	=	333.79	(77)
Southeast 0.9x	0.77	x	9.44	x	106.25	x	0.85	x	0.7	=	413.58	(77)
Southeast 0.9x	0.77	x	9.44	x	119.01	x	0.85	x	0.7	=	463.24	(77)
Southeast 0.9x	0.77	x	9.44	x	118.15	x	0.85	x	0.7	=	459.89	(77)
Southeast 0.9x	0.77	x	9.44	x	113.91	x	0.85	x	0.7	=	443.39	(77)
Southeast 0.9x	0.77	x	9.44	x	104.39	x	0.85	x	0.7	=	406.33	(77)
Southeast 0.9x	0.77	x	9.44	x	92.85	x	0.85	x	0.7	=	361.42	(77)
Southeast 0.9x	0.77	x	9.44	×	69.27	x	0.85	x	0.7	=	269.62	(77)
Southeast 0.9x	0.77	x	9.44	×	44.07	x	0.85	x	0.7	=	171.54	(77)
Southeast 0.9x	0.77	x	9.44	×	31.49	x	0.85	x	0.7	=	122.56	(77)
Southwest0.9x	0.77	x	3.39	x	36.79		0.85	x	0.7	=	51.43	(79)
Southwest0.9x	0.77	x	3.39	×	62.67		0.85	x	0.7	=	87.61	(79)
Southwest0.9x	0.77	x	3.39	x	85.75		0.85	x	0.7	=	119.87	(79)
Southwest0.9x	0.77	x	3.39	x	106.25		0.85	x	0.7	=	148.52	(79)
Southwest0.9x	0.77	x	3.39	×	119.01		0.85	x	0.7	=	166.35	(79)
Southwest0.9x	0.77	x	3.39	x	118.15		0.85	x	0.7	=	165.15	(79)
Southwest0.9x	0.77	x	3.39	x	113.91		0.85	x	0.7	=	159.22	(79)
Southwest0.9x	0.77	x	3.39	×	104.39		0.85	x	0.7	=	145.92	(79)
Southwest0.9x	0.77	x	3.39	x	92.85		0.85	x	0.7	=	129.79	(79)
Southwest0.9x	0.77	x	3.39	x	69.27		0.85	x	0.7	=	96.82	(79)
Southwest0.9x	0.77	x	3.39	×	44.07		0.85	x	0.7	=	61.6	(79)
Southwest0.9x	-	x	3.39	×	31.49		0.85	x	0.7	=	44.01	(79)
Northwest 0.9x	-	x	2.08	x	11.28	x	0.85	x	0.7	=	9.68	(81)
Northwest 0.9x		x	2.08	×	22.97	x	0.85	x	0.7	=	19.7	(81)
Northwest 0.9x	-	x	2.08	x	41.38	x	0.85	x	0.7	=	35.49	(81)
Northwest 0.9x		x	2.08	×	67.96	x	0.85	x	0.7	=	58.28	(81)
Northwest 0.9x		x	2.08	x	91.35	x	0.85	x	0.7	=	78.34	(81)
Northwest 0.9x		x	2.08	x	97.38	x	0.85	x	0.7	=	83.52	(81)
Northwest 0.9x		x	2.08	x	91.1	x	0.85	x	0.7	=	78.13	(81)
Northwest 0.9x		x	2.08	x	72.63	x	0.85	x	0.7	=	62.29	(81)
Northwest 0.9x	-	x	2.08	×	50.42	x	0.85	x	0.7	=	43.24	(81)
Northwest 0.9x		x	2.08	×	28.07	x	0.85	x	0.7	=	24.07	(81)
Northwest 0.9x		x	2.08	×	14.2	x	0.85	x	0.7	=	12.18	(81)
Northwest 0.9x		x	2.08	×	9.21	x	0.85	x	0.7	=	7.9	(81)
Rooflights 0.9x		x	1.85	×	18.86	x	0.63	x	0.7	=	13.85	(82)
Rooflights 0.9x		x	1.85	×	39.78	x	0.63	x	0.7	=	29.21	(82)
Rooflights 0.9x	1	x	1.85	×	74.42	x	0.63	x	0.7	=	54.64	(82)

	_					_									_
Rooflight		1	X	1.8	35	×	125	5.11	×	0.63	× L	0.7	=	91.87	(82)
Rooflight	ts 0.9x	1	X	1.8	35	x	169	9.75	x	0.63	x	0.7	=	124.64	(82)
Rooflight	ts <mark>0.9x</mark>	1	х	1.8	35	x	181	1.43	x	0.63	x	0.7	=	133.22	(82)
Rooflight	ts <mark>0.9x</mark>	1	x	1.8	35	x	169	9.55	x	0.63	x	0.7	=	124.5	(82)
Rooflight	ts <u>0.9</u> x	1	x	1.8	35	x	134	1.35	x	0.63	×	0.7	=	98.65	(82)
Rooflight	ts <mark>0.9x</mark>	1	x	1.8	35	x	91.	.71	×	0.63	x	0.7	=	67.34	(82)
Rooflight	ts <mark>0.9x</mark>	1	x	1.8	35	x	49.	.39	x	0.63	x	0.7	=	36.27	(82)
Rooflight	ts <mark>0.9x</mark>	1	x	1.8	35	x	23.	.99	x	0.63	x	0.7	=	17.62	(82)
Rooflight	ts <u>0.9</u> x	1	x	1.8	35	x	15.	.23	x	0.63	_ × [0.7	=	11.18	(82)
Solar ga	ains in w	vatts, ca	alculated	l for eac	h month				(83)m :	= Sum(74)m .	(82)m				
(83)m=	218.17	380.47	543.78	712.25	832.58	841	.78	805.24	713.1	9 601.8	426.78	262.94	185.66		(83)
Total ga	ains – in	ternal a	nd solai	r (84)m =	= (73)m	+ (83	3)m , v	watts							
(84)m=	685.65	845.73	993.74	1137.4	1232.32	121	7.2 1	1164.95	1079.	27 980.71	830.72	695.66	640.18		(84)
7. Mea	in intern	al temp	erature	(heating	season)									
Tempe	erature c	luring h	eating p	eriods in	n the livi	ng ar	rea fro	om Tab	ole 9,	Th1 (°C)				21	(85)
Utilisat	ion facto	or for ga	ains for	living are	ea, h1,m	(see	e Tab	le 9a)							
	Jan	Feb	Mar	Apr	May	Ju	un	Jul	Au	g Sep	Oct	Nov	Dec		
(86)m=	1	0.99	0.98	0.95	0.88	0.7	75	0.59	0.65	0.86	0.97	0.99	1		(86)
Mean i	internal	tempera	ature in	living ar	ea T1 (fo	Sllow	steps	s 3 to 7	' in Ta	uble 9c)		•			
(87)m=	21	21	21	21	21	2	i	21	21	21	21	21	21		(87)
L		luring h	oating r	u Antiode in	rest of	dwol	lling f	rom To		Th2 (°C)	1		1		
· · -	19.53	19.53	19.53	19.54	19.55	19.	<u> </u>	19.56	19.5		19.55	19.54	19.54		(88)
Ľ															. ,
				rest of d	<u> </u>		<u> </u>		,	0.77	0.00	0.00		l	(90)
(89)m=	1	0.99	0.98	0.93	0.83	0.6	03	0.42	0.48	0.77	0.96	0.99	1		(89)
Mean i	internal	tempera	ature in	the rest	of dwell	ng T	2 (fol	low ste	ps 3 t	o 7 in Tab	le 9c)			1	
(90)m=	19.53	19.53	19.53	19.54	19.55	19.	.56	19.56	19.5		19.55	19.54	19.54		(90)
										1	fLA = Livii	ng area ÷ (4	4) =	0.22	(91)
Mean i	internal	tempera	ature (fo	or the wh	ole dwe	lling)) = fLA	A x T1	+ (1 –	fLA) × T2					
(92)m=	19.86	19.86	19.86	19.87	19.87	19.	.88	19.88	19.8	8 19.88	19.87	19.87	19.86		(92)
Apply a	adjustm	ent to th	ne mear	interna	l temper	ature	e from	n Table	4e, w	here appro	opriate				
(93)m=	19.86	19.86	19.86	19.87	19.87	19.	.88	19.88	19.8	8 19.88	19.87	19.87	19.86		(93)
8. Spa	ce heati	ng requ	uirement	t i											
				•		ned a	at step	o 11 of	Table	9b, so tha	t Ti,m=	(76)m an	d re-calo	ulate	
the util			-	using Ta	1			ll	A		0.4	Neur	Dee		
Litilieat	Jan ion facto	Feb	Mar	Apr	May	J	un	Jul	Au	g Sep	Oct	Nov	Dec		
(94)m=	1	0.99	0.98	0.94	0.84	0.6	66	0.46	0.52	0.79	0.96	0.99	1		(94)
				4)m x (8-				01.0	0.02		0.00	0.00			
	<u> </u>	838.24	971.77	1067.5	1036.22	799	9.58	534.95	558.	6 779.52	797.43	690.23	638.38		(95)
L		ge exte	rnal tem	ı perature						I	1	1	1	I	
(96)m=	4.3	4.9	6.5	8.9	11.7	14	-	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat Ic	oss rate	for mea	an interr	al temp	erature,	Lm ,	W =[(39)m :	x [(93])m– (96)m]			I	
(97)m= 2	2676.25	2567.75	2288.5	1860	1382.88	885	5.54	550.09	582.9	972.22	1569.04	2169.14	2671.94		(97)

							ergy /h/year			Emiss kg CO	ion fac t 2/kWh	tor	Emissions kg CO2/yea	
12a. C	O2 em	issions -	– Individ	ual heati	ing syste	ems inclu	uding mi	cro-CHP						
Total de	eliverec	energy	for all u	ses (211)(221)	+ (231)	+ (232).	(237b)	=			[3941.62	(338)
Electric	ity for li	ghting										[408.29	(232)
Total el	ectricity	/ for the	above, I	⟨Wh/yea	r			sum	of (230a).	(230g) =		[0	(231)
Electric	ity for p	oumps, fa	ans and	electric	keep-ho	t								
Water h	neating	fuel use	d										1193.33	
Space	heating	fuel use	ed, main	system	1								2340	_
Annua										k	Wh/year		kWh/year	
、 - <i>/</i> ··· [I = Sum(2				1193.33	(219)
	= (64)		kWh/mo) ÷ (217) 108.93		95.51	85.24	81.76	89.86	89.74	101.15	107.09	114.92		
(217)m=		178.12	178.12	178.12	178.12	178.12	178.12	178.12	178.12	178.12	178.12	178.12		(217)
r.		ater hea											178.12	(216)
[209.81	184.87	194.03	173.75	170.14	151.83	145.64	160.06	159.85	180.18	190.75	204.7		-
Water I Output	-		ter (calc	ulated al	bove)									_J `
(,L	ů	Ū	Ů	Ů	Ů	ů	Ů				215) _{15,1012}		0	(215)
•		•	econdar 00 ÷ (20 0	y), kWh/ 8) 0	month	0	0	0	0	0	0	0		_
L								Tota	l (kWh/yea	ar) =Sum(2	211) _{15,1012}	=	2340	(211)
(211)m	= {[(90 456.27)111 X (20 357.6	4)] } X I 301.42	00 ÷ (20 175.57	79.36	0	0	0	0	176.64	327.63	465.52		(211)
(211)m						0	0	0	0	574.00	1004.02	1512.97		(014)
Space [heatin 1482.9	g require 1162.23	i İ	alculate	d above) 257.92)	0	0	0	574.08	1064.92	1512.97		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/yea	ar
Efficie	ncy of s	seconda	ry/suppl	ementar	y heating	g systen	n, %						0	(208)
Efficie	ncy of r	nain spa	ace heat	ing syste	em 1								325.01	(206)
Fractio	on of to	tal heatii	ng from	main sys	stem 1			(204) = (20	02) × [1 –	(203)] =		[1	(204)
Fractio	on of sp	ace hea	at from m	nain syst	em(s)			(202) = 1 -	- (201) =				1	(202)
-	heatir on of sp	-	at from s	econdar	y/supple	mentary	v system					[0	(201)
9a. Ene	ergy rec	luiremer	nts – Indi	ividual h	eating s	ystems i	ncluding	micro-C	HP)					-
Space	heatin	g require	ement in	kWh/m²	/year								76.01	(99)
L							Į	Tota	l per year	(kWh/year) = Sum(9	8)15,912 =	7605.16	(98)
(98)m=	1482.9	1162.23	979.64	570.6	257.92	0	0	0	0	574.08	1064.82	1512.97		
Space	heatin	a reauire	ement fo	r each n	nonth. k\	Nh/mon	th = 0.02	24 x [(97))m – (95)ml x (4	1)m			

Space heating (main system 1)	(211) x	0.519	=	1214.46	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.519	=	619.34	(264)
Space and water heating	(261) + (262) + (263) + (2	264) =		1833.8	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	0	(267)
Electricity for lighting	(232) x	0.519	=	211.9	(268)
Total CO2, kg/year		sum of (265)(271) =		2045.7	(272)
Dwelling CO2 Emission Rate		(272) ÷ (4) =		20.45	(273)
EI rating (section 14)				81	(274)

oproved Document L1A, 2013 Finted on 23 November 2021	•	a FSAP 2012 program, Version: 1.0.5.5	0
Project Information:			
ssessed By: Neil Inghar	n (STRO010943)	Building Type: Flat	
Dwelling Details:			
EW DWELLING DESIGN ST	AGE	Total Floor Area: 94.4m ²	
ite Reference : 11-12 Grer	nville Street - GREEN	Plot Reference: Unit 2	
ddress :			
Client Details:			
ame:			
ddress :			
his report covers items incl	uded within the SAP calculations.		
is not a complete report of			
1a TER and DER			
uel for main heating system: E	Electricity		
uel factor: 1.55 (electricity)			
arget Carbon Dioxide Emissio welling Carbon Dioxide Emiss		26.94 kg/m² 28.67 kg/m²	Fail
xcess emissions = 1.73 kg/m ²		28.07 Kg/III-	Fall
1b TFEE and DFEE	(0.4 /0)		
arget Fabric Energy Efficiency	(TFEE)	58.0 kWh/m ²	
welling Fabric Energy Efficien		107.1 kWh/m²	
			Fail
xcess energy = 49.07 kg/m ² (84.6 %)		
2 Fabric U-values			
Element		Highest	01/
External wall	0.30 (max. 0.30) 0.00 (max. 0.20)	0.30 (max. 0.70)	OK OK
Party wall Floor	0.00 (max. 0.20) 0.15 (max. 0.25)	- 0.15 (max. 0.70)	OK
Roof	(no roof)	0.10 (max. 0.70)	UN
Openings	4.71 (max. 2.00)	4.80 (max. 3.30)	Fail
2a Thermal bridging			
U U	ulated using user-specified y-value of	0.15	
3 Air permeability			
Air permeability at 50 pa Maximum	scals	10.00 (design value) 10.0	ок
4 Heating efficiency			
Main Heating system:			
	Heat pumps with radiators of Mitsubishi ECODAN 5kW	or underfloor heating - electric	
Secondary heating syste	em: None		
5 Cylinder insulation			

Hot water Storage:

	Measured cylinder loss Permitted by DBSCG:	•	ОК
Primary pipework insulated:	Yes	2.10 kwi/day	OK
6 Controls	105		OR
Space heating controls Hot water controls:	TTZC by plumbing and Cylinderstat Independent timer for l		ОК ОК ОК
Boiler interlock:	Yes		OK
7 Low energy lights			
Percentage of fixed lights with Minimum	low-energy fittings	100.0% 75.0%	ОК
8 Mechanical ventilation			
Not applicable			
9 Summertime temperature			
Overheating risk (Thames valle Based on:	ey):	Slight	ОК
Overshading: Windows facing: North East Windows facing: North West Windows facing: South West Ventilation rate:		Average or unknown 10.89m ² 5.44m ² 6.21m ² 4.00	
10 Key features			
Party Walls U-value		0 W/m²K	

				User D	etails:						
Assessor Name:	Neil Ingha	m			Strom	a Num	ber:		STRO	010943	
Software Name:	Stroma FS	AP 2012			Softwa	are Ver	sion:		Versio	n: 1.0.5.50	
			P	roperty /	Address:	Unit 2					
Address :											
1. Overall dwelling dimer	nsions:			•	(2)		A 11*			M - L	
Ground floor				-	a(m²) 5.96	(1a) x	Av. Hei		(2a) =	52.67	(3a)
First floor]]
				3		(1b) x	3.2	25	(2b) =	127.47	(3b)
Second floor				3	9.22	(1c) x	3.0	05	(2c) =	119.62	(3c)
Total floor area TFA = (1a)+(1b)+(1c)+	(1d)+(1e)+	(1n) 9	94.4	(4)					
Dwelling volume						(3a)+(3b))+(3c)+(3d))+(3e)+	.(3n) =	299.75	(5)
2. Ventilation rate:					- 41		4-4-1				
	main heating		ondar ating	у 	other		total			m ³ per hour	
Number of chimneys	0	+	0	+	0	=	0	x 4	40 =	0	(6a)
Number of open flues	0	+	0	+	0] = [0	x 2	20 =	0	(6b)
Number of intermittent far	IS						4	x 1	0 =	40	(7a)
Number of passive vents							0	x 1	0 =	0	(7b)
Number of flueless gas fir	es						0	x 4	40 =	0	(7c)
									Air ch	anges per ho	ur
Infiltration due to chimney						antinua fu	40		÷ (5) =	0.13	(8)
If a pressurisation test has be Number of storeys in th			proceed	1 to (17), c	otherwise c	continue tr	om (9) to (1	16)		0	(9)
Additional infiltration	e awoning (n	-)						[(9)-	1]x0.1 =	0	(10)
Structural infiltration: 0.2	25 for steel o	r timber fra	me or	0.35 for	masonr	y constr	uction		1	0	(11)
if both types of wall are pre			nding to	the greate	er wall are	a (after					J
deducting areas of opening If suspended wooden fl			l) or 0.	1 (seale	d), else	enter 0				0	(12)
If no draught lobby, enter		•	, 01 0.	1 (00010	a), 0100					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, o	q50, expresse	ed in cubic	metre	s per ho	our per so	quare m	etre of er	nvelope	area	10	(17)
If based on air permeabilit	ty value, then	(18) = [(17)	÷ 20]+(8	3), otherwi	se (18) = (16)				0.63	(18)
Air permeability value applies	if a pressurisati	on test has be	en don	e or a deg	ree air pei	rmeability	is being us	ed			_
Number of sides sheltered	ł				(20) 1	0 07E v (4	0)1			0	(19)
Shelter factor		1			(20) = 1 -		9)] =			1	(20)
Infiltration rate incorporati	-				(21) = (18)) x (20) =				0.63	(21)
Infiltration rate modified fo			lun	Jul	Δυσ	Sep	Oct	Nov	Dec		
	I _ '	May	Jun	Jui	Aug	Seh		NUV	Dec		
Monthly average wind spectrum (22)m= 5.1 5	4.9 4.4	e / 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
		ч.0	5.5	5.0	5.1	-	- 1 .0	- 1 .J	-1.1		

	actor (2	22a)m =	(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 sł	nelter an	d wind s	peed) =	(21a) x	(22a)m				_	
	0.81	0.79	0.78	0.7	0.68	0.6	0.6	0.59	0.63	0.68	0.71	0.74		
			-	rate for t	he appli	cable ca	se					-	- 	
		al ventila		andix NL (0	26) (00		austion /		muiaa (22h) (22a)			0	(23a)
						a) × Fmv (e) = (23a)			0	(23b)
			•	-	•	or in-use f			,			(00)	0	(23c)
· · ·		i	i	i		I	<u> </u>	<u>1 </u>	ŕ	r í		1 – (23c)) ÷ 100] 1	(24a)
(24a)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24a)
· · ·		1	1			heat rec	<u> </u>	r Ó	ŕ	r i	, 		1	(0.45)
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24b)
,					•	/e input v				F (00h	`			
	n (22b)n 0	n < 0.5 >	(230), t	nen (240	c) = (230)	o); otherv	r È	C) = (220)	$\frac{5}{10}$ m + 0.	5 × (230	, 		1	(24c)
(24c)m=	÷	-	-	÷	-	0	0		_	0	0	0		(240)
,						ve input v erwise (2				0.51				
(24d)m=	0.83	0.81	0.8	0.74	0.73	0.68	0.68	0.67	0.7	0.73	0.75	0.78	1	(24d)
	tive air	change	rate - er	L hter (24a) or (24	L c) or (24	l d) in hoy	(25)			ļ	1	
(25)m=	0.83	0.81	0.8	0.74	0.73	0.68	0.68	0.67	0.7	0.73	0.75	0.78	1	(25)
		L	L	1		1	1	1	1	1			1	
-3 Hea	at losse	s and he	at loss i	harameti	ar.									
									_				-	
ELEN		Gros area	SS	Openin m	gs	Net Ar A ,r		U-valı W/m2		A X U (W/ł	<)	k-value kJ/m²⊷		A X k kJ/K
		Gros	SS	Openin	gs		n²				<)			
ELEN Doors		Gros area	SS	Openin	gs	A ,r	m²	W/m2	2K	(W/I	<) 			kJ/K
ELEN Doors Windov	IENT	Gros area	SS	Openin	gs	A ,r 2.59	m ² x	W/m2 3.9	2K = 0.04] =	(W/I 10.101	<) 			kJ/K (26)
ELEN Doors Windov Windov	IENT ws Type	Gros area e 1 e 2	SS	Openin	gs	A ,r 2.59	m ² x 3 x ¹ 3 x ¹	W/m2 3.9 /[1/(4.8)+	2K = = = = = = = = = = = = = = = = = = =	(W/H 10.101 43.85	<) 			kJ/K (26) (27)
ELEN Doors Windov Windov	IENT ws Type ws Type	Gros area e 1 e 2	SS	Openin	gs	A ,r 2.59 10.89 5.44	n ² x 3 x ¹ x ¹ x ¹	W/m2 3.9 /[1/(4.8)+ /[1/(4.8)+	2K = = = = = = = = = = = = = = = = = = =	(W/H 10.101 43.85 21.91	<>			kJ/K (26) (27) (27)
ELEN Doors Windov Windov Windov	IENT ws Type ws Type ws Type	Gros area e 1 e 2	ss (m²)	Openin	gs ,2	A ,r 2.59 10.89 5.44 6.21	n ² x x ¹ .	W/m2 3.9 /[1/(4.8)+ /[1/(4.8)+ /[1/(4.8)+	2K 0.04] = 0.04] = 0.04] =	(W/k 10.101 43.85 21.91 25.01				kJ/K (26) (27) (27) (27)
ELEN Doors Windov Windov Windov Floor	IENT ws Type ws Type ws Type Type1	Gros area 9 1 9 2 9 3	24	Openin m	gs 1 ²	A ,r 2.59 10.89 5.44 6.21 15.96	n ² x x ¹ . x ¹ . x ¹ . x ¹ . x ¹ . x ² x	W/m2 3.9 /[1/(4.8)+ /[1/(4.8)+ /[1/(4.8)+ 0.15	2K 0.04] = 0.04] = 0.04] = 0.04] =	(W/I 10.101 43.85 21.91 25.01 2.394				kJ/K (26) (27) (27) (27) (28)
ELEN Doors Windov Windov Floor Walls T Walls T	IENT ws Type ws Type ws Type Type1 Type2	Gros area 9 1 9 2 9 3 98.2	24 27	Openin m 18.9	gs 1 ²	A ,r 2.59 10.89 5.44 6.21 15.96 79.32	n ² x x ¹ . x ¹ . x ¹ . x ¹ . x ² x x x x ³ .	W/m2 3.9 /[1/(4.8)+ /[1/(4.8)+ /[1/(4.8)+ 0.15 0.3	2K 0.04] = 0.04] = 0.04] = 0.04] = =	(W/I 10.101 43.85 21.91 25.01 2.394 23.8	<>			kJ/K (26) (27) (27) (27) (28) (28) (29)
ELEN Doors Windov Windov Floor Walls T Walls T	IENT ws Type ws Type ws Type Type1 Type2 rea of e	Gros area 2 2 3 98.2 22.8	24 27	Openin m 18.9	gs 1 ²	A ,r 2.59 10.89 5.44 6.21 15.96 79.32 16.66	n ² x x ¹ . 2 x ¹ . 3 x ¹ . 5 x 2 x 5 x 7 x	W/m2 3.9 /[1/(4.8)+ /[1/(4.8)+ /[1/(4.8)+ 0.15 0.3	2K 0.04] = 0.04] = 0.04] = 0.04] = =	(W/I 10.101 43.85 21.91 25.01 2.394 23.8	<>			kJ/K (26) (27) (27) (27) (28) (29) (29)
ELEN Doors Windov Windov Floor Walls T Walls T Total a	IENT ws Type ws Type ws Type Type1 Type2 rea of e vall	Gros area 2 2 3 98.2 22.8	24 27	Openin m 18.9	gs 1 ²	A ,r 2.59 10.89 5.44 6.21 15.96 79.32 16.66 137.0	n ² x 1. x 1. x 1. x 1. x 2. x x x 3. x 7. 8. x	W/m2 3.9 /[1/(4.8)+ /[1/(4.8)+ /[1/(4.8)+ [0.15] 0.3 0.28	2K 0.04] = 0.04] = 0.04] = 0.04] = = = =	(W/H 10.101 43.85 21.91 25.01 2.394 23.8 4.66				kJ/K (26) (27) (27) (27) (28) (29) (29) (31)
ELEN Doors Window Window Floor Walls T Walls T Total a Party w Party c * for wind	IENT ws Type ws Type ws Type Type1 Type2 rea of e vall ceiling dows and	Gros area 4 1 4 2 4 3 98.2 22.8 Ilements	24 (m ²) 27 , m ² 20ws, use e	Openin m 18.92 6.21	gs 2 2 mdow U-va	A ,r 2.59 10.89 5.44 6.21 15.96 79.32 16.66 137.0 118.1 39.22	n ² x x ¹	W/m2 3.9 /[1/(4.8)+ /[1/(4.8)+ /[1/(4.8)+ [0.15] 0.3 0.28 0	2K 0.04] = 0.04] = 0.04] = 0.04] = = = =	(W/H 10.101 43.85 21.91 25.01 2.394 23.8 4.66 0				kJ/K (26) (27) (27) (27) (28) (29) (29) (31) (32)
ELEN Doors Window Window Floor Walls T Walls T Total a Party w Party c * for wind ** include	IENT ws Type ws Type ws Type Type1 Type2 rea of e vall eeiling dows and e the area	Gros area 2 2 3 98.2 22.8 elements	24 (m ²) 27 , m ² 20ws, use e	Openin m 18.92 6.21	gs 2 2 mdow U-va	A ,r 2.59 10.89 5.44 6.21 15.96 79.32 16.66 137.0 118.1 39.22	n ² x x x x x x x x x x x x x x x x x x x	W/m2 3.9 /[1/(4.8)+ /[1/(4.8)+ /[1/(4.8)+ [0.15] 0.3 0.28 0	2K 0.04] = 0.04] = 0.04] = 0.04] = = = (1/U-value)	(W/H 10.101 43.85 21.91 25.01 2.394 23.8 4.66 0		kJ/m²-		kJ/K (26) (27) (27) (27) (28) (29) (29) (31) (32) (32b)
ELEN Doors Window Window Floor Walls T Walls T Total a Party w Party c * for wind * for wind * for wind	IENT ws Type ws Type ws Type Type1 Type2 rea of e vall eeiling dows and e the area heat los	Gros area 2 2 3 98.2 22.8 elements	24 (m ²) 24 , m ² 57 , m ² 50 50 50 50 50 50 50 50 50 50 50 50 50	Openin m 18.92 6.21	gs 2 2 mdow U-va	A ,r 2.59 10.89 5.44 6.21 15.96 79.32 16.66 137.0 118.1 39.22	n ² x x x x x x x x x x x x x x x x x x x	W/m2 3.9 /[1/(4.8)+ /[1/(4.8)+ /[1/(4.8)+ [0.15] 0.3 0.28 0 0 0 0 0	$\begin{array}{c} K \\ \hline 0.04 \\ = \\ 0.04 \\ = \\ 0.04 \\ = \\ 0.04 \\ = \\ \end{bmatrix}$	(W/H 10.101 43.85 21.91 25.01 2.394 23.8 4.66 0	s given in	kJ/m²-	K	kJ/K (26) (27) (27) (27) (28) (29) (29) (31) (32) (32b) (32b)
ELEN Doors Window Window Floor Walls T Walls T Total a Party w Party c * for wind ** include Fabric Heat ca	IENT ws Type ws Type ws Type Type1 Type2 rea of e vall eeiling dows and e the area heat los apacity	Gros area 4 1 4 2 4 3 98.2 22.8 22.8 elements 7 roof window as on both as on both 5 S, W/K = Cm = S(24 24 27 37 37 37 37 37 37 37 37 37 37 37 37 37	Openin m 18.9 6.21	gs ² ndow U-va Is and par	A ,r 2.59 10.89 5.44 6.21 15.96 79.32 16.66 137.0 118.1 39.22	n ² x x x x x x x x x x x x x x x x x x x	W/m2 3.9 /[1/(4.8)+ /[1/(4.8)+ /[1/(4.8)+ [0.15] 0.3 0.28 0 0 0 0 0	$\begin{array}{c} K \\ \hline \\ 0.04 \end{bmatrix} = \\ 0.04 \end{bmatrix} = \\ 0.04 \end{bmatrix} = \\ \hline \\ 0.04 \end{bmatrix} = \\ = \\ \hline \\ = \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\$	(W/I 10.101 43.85 21.91 25.01 2.394 23.8 4.66 0	[]]	kJ/m²-	K	kJ/K (26) (27) (27) (27) (28) (29) (29) (31) (32) (32b) (32b)
ELEN Doors Window Window Floor Walls T Walls T Otal a Party w Party o * for wind ** include Fabric Heat ca Therma For desig	IENT ws Type ws Type ws Type rype1 Type2 rea of e vall eeiling dows and e the area heat los apacity al mass gn assess	Gros area 4 1 4 2 4 3 98.2 22.8 22.8 elements 1 roof wind as on both as on both as on both as on both 5, W/K = Cm = S(parame sments wh	24 (m ²) 24 37 , m ² 50ws, use e sides of ir = S (A x (A x k) ter (TMF	Openin m 18.92 6.21 effective winternal walk U) $P = Cm + \frac{1}{2}$ tails of the	gs 2 2 ndow U-va Is and par - TFA) ir	A ,r 2.59 10.89 5.44 6.21 15.96 79.32 16.66 137.0 118.1 39.22 alue calculations	n ² x 1. x 1. x 1. x 1. x 2. x x x x x x x x x x x x x x x x x x x	W/m2 3.9 /[1/(4.8)+ /[1/(4.8)+ /[1/(4.8)+ [0.15 0.3 0.28 0 0 formula 1 (26)(30)	$\begin{array}{c} K \\ \hline 0.04 \\ = \\ 0.04 \\ = \\ 0.04 \\ = \\ \\ 0.04 \\ = \\ \\ = \\ \\ = \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ $	(W/k 10.101 43.85 21.91 25.01 2.394 23.8 4.66 0 <i>ue)+0.04]</i> a (30) + (32 tive Value))) ()) () () () () () () ()	kJ/m²-	K	kJ/K (26) (27) (27) (27) (28) (29) (29) (31) (32) (32b) (32b) (32b) (33) (32b)

Total fabric heat loss (33) + (36) = 152.28 (33) Ventilation heat loss calculated monthly (38)m = 0.33 × (25)m × (5) (38)m = 0.33 × (25)m × (5) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (38)m= 81.72 80.47 79.24 73.47 72.39 67.37 66.44 69.3 72.39 74.58 76.86 (38) (39)m= 234 232.75 231.52 225.75 224.67 219.65 219.72 221.59 224.67 226.86 229.14 Average Sum(30)
$ \frac{Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec}{(38)m} = \frac{Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec}{(38)m} = \frac{Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec}{(39)m} = \frac{Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec}{(41)m} = Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec} Mar Apr Mar Ap$
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $
Little
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $
Average = Sum(39)tr/12= 225.75 (36 Heat loss parameter (HLP), W/m²K (40)m = $(39)m \div (4)$ (40)m = (2.48) 2.47 2.45 2.39 2.38 2.38 2.4 2.43 Average = Sum(30)tr/12= 2.39 (40) Number of days in month (Table 1a) Average = Sum(40)tr/12= 2.39 (40) (41)m= 31 28 31 30 31 (41)m= 31 28 31 30 31 (41)m= 31 28 31 30 31 30 31 30 31 30 31 30 31 30 31 30 31 30 31 30 31
Heat loss parameter (HLP), W/m²K (40)m = (39)m ÷ (4) Number of days in month (Table 1a) Average = Sum(40),, /12 = 2.39 (40)m = (39)m ÷ (4) (41)m = Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (41)m = 31 28 31 30 31 30 31 30 31 30 31 Mar Apr May Jun Jul Aug Sep Oct Nov Dec (41 4. 4.
Average = Sum(40) $t_{t2}/12=$ (40) $t_{t2}/12=$ (41)Number of days in month (Table 1a)(41)m=JanFebMarAprMayJunJulAugSepOctNovDec(41)m=3128313031303130313031(41) 4. Water heating energy requirement:KWh/year: 4. Water heating energy requirement:KWh/year:Assumed occupancy, N if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) if TFA £ 13.9, N = 1(42)Annual average hot water usage in litres per day Vd, average = (25 x N) + 36 Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold)97.88(43)MarAprMayJunJulAugSepOctNovDecJanFebMarAprMayJunJulAugSepOctNovDecJanFebMarAprMayJunJulAugSepOctNovDecJanFebMarAprMayJunJulAugSepOctNovDecJanFebMarAprMayJunJulAugSepOctNovDecJanFebMarApr<
Number of days in month (Table 1a) $(41)m=$ $\boxed{Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec}{31 28 31 30 31 30 31 30 31 30 31 30 31 30 31 30 31(41)m=\boxed{Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec}{31 28 31 30 31 30 31 30 31 30 31 30 31(41)4. Water heating energy requirement:KWh/year:Assumed occupancy, Nif TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9)if TFA £ 13.9, N = 1\boxed{2.68}(42)Annual average hot water usage in litres per day Vd, average = (25 x N) + 36Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target ofnot more that 125 litres per person per day (all water use, hot and cold)\boxed{Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec}Hot water usage in litres per day for each month Vd, m = factor from Table 1c x (43)\boxed{Total = Sum(44)_{1-12} = 1174.57}Total = Sum(44)_{1-12} = 1174.57\boxed{44}$
(41)m=31283130313
4. Water heating energy requirement: kWh/year: Assumed occupancy, N 2.68 (42 if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) if TFA ± 13.9, N = 1 (42 Annual average hot water usage in litres per day Vd, average = $(25 \times N) + 36$ 97.88 (43 Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of 97.88 (43 In more that 125 litres per person per day (all water use, hot and cold) Image: Sep Oct Nov Dec Oct Nov Dec Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43) Image: Sep Oct Nov Dec Image: Sep Oct Nov Dec Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43) Image: Sep Oct Nov Dec Image: Sep Oct Nov Dec Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43) Image: Sep Oct Nov Dec Image: Sep Oct Nov Dec Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43) Image: Sep Oct Nov Dec Image: Sep Oct Nov Dec Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43) Image: Sep Oct Nov Dec Image: Sep Oct Nov Dec Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43) Image: Sep Oct Nov Dec Image: Sep Oct Nov Dec
Assumed occupancy, N 2.68 (42 if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) if TFA £ 13.9, N = 1 (42) Annual average hot water usage in litres per day Vd, average = $(25 \times N) + 36$ 97.88 (43) Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Hot water usage in litres per day for each month Vd, m = factor from Table 1c x (43) (44)m= 107.67 103.75 99.84 95.92 92.01 88.09 88.09 92.01 95.92 99.84 103.75 107.67 Total = Sum(44) ₁₋₁₂ = 1174.57 (44) 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)
Assumed occupancy, N 2.68 (42 if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) if TFA £ 13.9, N = 1 (42) Annual average hot water usage in litres per day Vd, average = $(25 \times N) + 36$ 97.88 (43) Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Hot water usage in litres per day for each month Vd, m = factor from Table 1c x (43) (44)m= 107.67 103.75 99.84 95.92 92.01 88.09 88.09 92.01 95.92 99.84 103.75 107.67 Total = Sum(44) ₁₋₁₂ = 1174.57 (44) 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)
Assumed occupancy, N 2.68 (42 if TFA > 13.9, N = 1 + 1.76 x [1 - exp(-0.000349 x (TFA -13.9)2)] + 0.0013 x (TFA -13.9) if TFA £ 13.9, N = 1 (42) Annual average hot water usage in litres per day Vd, average = $(25 \times N) + 36$ 97.88 (43) Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Hot water usage in litres per day for each month Vd, m = factor from Table 1c x (43) (44)m= 107.67 103.75 99.84 95.92 92.01 88.09 88.09 92.01 95.92 99.84 103.75 107.67 Total = Sum(44) ₁₋₁₂ = 1174.57 (44) 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)
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 = $(25 \times N) + 36$ Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43) (44)m= 107.67 103.75 99.84 95.92 92.01 88.09 88.09 92.01 95.92 99.84 103.75 107.67 Total = Sum(44) ₁₁₂ = 1174.57 (44) 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)
if TFA £ 13.9, N = 1 Annual average hot water usage in litres per day Vd,average = $(25 \times N) + 36$ 97.88 (43) Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold) <u>Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec</u> Hot water usage in litres per day for each month Vd, m = factor from Table 1c x (43) (44)m= 107.67 103.75 99.84 95.92 92.01 88.09 88.09 92.01 95.92 99.84 103.75 107.67 Total = Sum(44) ₁₁₂ = 1174.57 (44) 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)
Reduce the annual average hot water usage by 5% if the dwelling is designed to achieve a water use target of not more that 125 litres per person per day (all water use, hot and cold) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Hot water usage in litres per day for each month Vd,m = factor from Table 1c x (43) (44)m= 107.67 103.75 99.84 95.92 92.01 88.09 92.01 95.92 99.84 103.75 107.67 Total = Sum(44) 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)
not more that 125 litres per person per day (all water use, hot and cold) $ \begin{array}{c ccccccccccccccccccccccccccccccccccc$
JanFebMarAprMayJunJulAugSepOctNovDecHot water usage in litres per day for each month Vd, $m = factor from Table 1c x (43)$ (44)m=107.67103.7599.8495.9292.0188.0992.0195.9299.84103.75107.67Total = Sum(44)Total = Sum(44)Lange content of hot water used - calculated monthly = 4.190 x Vd, m x nm x DTm / 3600 kWh/month (see Tables 1b, 1c, 1d)
Hot water usage in litres per day for each month Vd, $m = factor from Table 1c x (43)$ (44) $m = 107.67 103.75 99.84 95.92 92.01 88.09 88.09 92.01 95.92 99.84 103.75 107.67$ Total = Sum(44) ₁₁₂ = 1174.57 (44) 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)
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$
$Total = Sum(44)_{112} = 1174.57$ (44) 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)
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)
(45)m= 159.67 139.65 144.1 125.63 120.55 104.02 96.39 110.61 111.93 130.45 142.39 154.63
$Total = Sum(45)_{112} = 1540.04$ <i>If instantaneous water heating at point of use (no hot water storage), enter 0 in boxes (46) to (61)</i> $(45)_{112} = 1540.04$
(46)m= 23.95 20.95 21.62 18.85 18.08 15.6 14.46 16.59 16.79 19.57 21.36 23.19 (46)
Water storage loss:
Storage volume (litres) including any solar or WWHRS storage within same vessel 180 (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): 1.47 (48
Temperature factor from Table 2b 0.54 (49)
Energy lost from water storage, kWh/year (48) x (49) = 0.79 (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
Energy lost from water storage, kWh/year $(47) \times (51) \times (52) \times (53) =$ 0 (54) Enter (50) or (54) in (55) 0.79 (55)

Water	storage	loss cal	culated	for each	month			((56)m = (55) × (41)	m				
(56)m=	24.61	22.23	24.61	23.81	24.61	23.81	24.61	24.61	23.81	24.61	23.81	24.61		(56)
If cylind	er contain	s dedicate	d solar sto	rage, (57)	m = (56)m	x [(50) – (H11)] ÷ (50	0), else (57	7)m = (56)	m where (H11) is fro	m Append	ix H	
(57)m=	24.61	22.23	24.61	23.81	24.61	23.81	24.61	24.61	23.81	24.61	23.81	24.61		(57)
Primar	y circuit	loss (ar	nnual) fro	om Table	e 3							0		(58)
Primar	y circuit	loss cal	culated	for each	month (59)m = ((58) ÷ 36	5 × (41)	m					
(mo	dified by	factor f	rom Tab	le H5 if t	here is s	solar wat	ter heatir	ng and a	cylinde	r thermo	stat)			
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)
Combi	loss ca	lculated	for each	month	(61)m =	(60) ÷ 36	65 × (41))m						
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0		(61)
Total h	neat req	uired for	water h	eating ca	alculated	l for eacl	h month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m	
(62)m=	207.54	182.89	191.97	171.96	168.42	150.35	144.26	158.48	158.26	178.32	188.72	202.5		(62)
Solar DI	HW input	calculated	using App	endix G o	Appendix	H (negati	ve quantity	(enter '0'	if no sola	r contribut	ion to wate	er heating)		
(add a	dditiona	l lines if	FGHRS	and/or \	WWHRS	applies	, see Ap	pendix C	S)					
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output	t from w	ater hea	ter	_	-	-	-			-	-	-		
(64)m=	207.54	182.89	191.97	171.96	168.42	150.35	144.26	158.48	158.26	178.32	188.72	202.5		_
								Outp	out from wa	ater heate	r (annual)₁	12	2103.68	(64)
Heat g	ains fro	m water	heating,	, kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)m] + 0.8 >	(46)m	+ (57)m	+ (59)m]	
(65)m=	91.39	81.02	86.21	78.83	78.38	71.65	70.35	75.08	74.28	81.67	84.41	89.71		(65)
inclu	ude (57)	m in calo	culation	of (65)m	only if c	ylinder i	s in the c	dwelling	or hot w	ater is fr	om com	munity h	eating	
5. In	ternal ga	ains (see	e Table 5	5 and 5a):									
Metab	<u>olic gain</u>	<u>is (Table</u>	<u>5), Wat</u>	ts										
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m=	134.06	134.06	134.06	134.06	134.06	134.06	134.06	134.06	134.06	134.06	134.06	134.06		(66)
Lightin	g gains	(calcula	ted in Ap	opendix	l equat	ion I 9 oi								
(67)m=	22.02	19.55			_, oquat		r L9a), a	lso see T	Table 5					
Applia			15.9	12.04	9	7.6	r L9a), a 8.21	lso see 10.67	Table 5 14.32	18.19	21.23	22.63		(67)
(68)m=	nces ga				9	7.6	· · · ·	10.67	14.32		21.23	22.63		(67)
	nces ga 246.94				9	7.6	8.21	10.67	14.32		21.23 219.74	22.63 236.05		(67) (68)
Cookir	246.94	ins (calc 249.51	ulated in 243.05	Append 229.3	9 dix L, eq 211.95	7.6 uation L 195.64	8.21 13 or L1:	10.67 3a), also 182.18	14.32 see Ta 188.64	ble 5 202.39	I			
Cookir (69)m=	246.94	ins (calc 249.51	ulated in 243.05	Append 229.3	9 dix L, eq 211.95	7.6 uation L 195.64	8.21 13 or L13 184.74	10.67 3a), also 182.18	14.32 see Ta 188.64	ble 5 202.39	I			
(69)m=	246.94 ng gains 36.41	ins (calc 249.51 (calcula	ulated in 243.05 ited in A 36.41	Append 229.3 ppendix 36.41	9 dix L, eq 211.95 L, equat	7.6 uation L 195.64 ion L15	8.21 13 or L13 184.74 or L15a)	10.67 3a), also 182.18), also se	14.32 see Ta 188.64 ee Table	ble 5 202.39 5	219.74	236.05		(68)
(69)m=	246.94 ng gains 36.41	ins (calc 249.51 (calcula 36.41	ulated in 243.05 ited in A 36.41	Append 229.3 ppendix 36.41	9 dix L, eq 211.95 L, equat	7.6 uation L 195.64 ion L15	8.21 13 or L13 184.74 or L15a)	10.67 3a), also 182.18), also se	14.32 see Ta 188.64 ee Table	ble 5 202.39 5	219.74	236.05		(68)
(69)m= Pumps (70)m=	246.94 ng gains 36.41 s and fai	ins (calc 249.51 (calcula 36.41 ns gains 0	ulated ir 243.05 ited in A 36.41 (Table \$ 0	Appendix 229.3 ppendix 36.41 5a)	9 dix L, eq 211.95 L, equat 36.41	7.6 uation L 195.64 ion L15 36.41	8.21 13 or L13 184.74 or L15a) 36.41	10.67 3a), also 182.18), also se 36.41	14.32 see Ta 188.64 ee Table 36.41	ble 5 202.39 5 36.41	219.74 36.41	236.05 36.41		(68) (69)
(69)m= Pumps (70)m=	246.94 ng gains 36.41 s and fai 0 s e.g. ev	ins (calc 249.51 (calcula 36.41 ns gains 0	ulated ir 243.05 Inted in A 36.41 (Table 5 0 on (nega	Appendix 229.3 ppendix 36.41 5a) 0	9 dix L, eq 211.95 L, equat 36.41	7.6 uation L 195.64 ion L15 36.41	8.21 13 or L13 184.74 or L15a) 36.41	10.67 3a), also 182.18), also se 36.41	14.32 see Ta 188.64 ee Table 36.41	ble 5 202.39 5 36.41	219.74 36.41	236.05 36.41		(68) (69)
(69)m= Pumps (70)m= Losses (71)m=	246.94 ng gains 36.41 s and fai 0 s e.g. ev -107.25	ins (calc 249.51 (calcula 36.41 ns gains 0 vaporatic	ulated ir 243.05 ated in A 36.41 (Table \$ 0 on (nega -107.25	Appendix 229.3 ppendix 36.41 5a) 0 tive valu	9 dix L, eq 211.95 L, equat 36.41 0 es) (Tab	7.6 uation L 195.64 iion L15 36.41 0 le 5)	8.21 13 or L13 184.74 or L15a) 36.41 0	10.67 3a), also 182.18), also se 36.41 0	14.32 see Ta 188.64 ee Table 36.41	ble 5 202.39 5 36.41 0	219.74 36.41 0	236.05 36.41 0		(68) (69) (70)
(69)m= Pumps (70)m= Losses (71)m=	246.94 ng gains 36.41 s and fai 0 s e.g. ev -107.25	ins (calc 249.51 (calcula 36.41 ns gains 0 vaporatic -107.25	ulated ir 243.05 ated in A 36.41 (Table \$ 0 on (nega -107.25	Appendix 229.3 ppendix 36.41 5a) 0 tive valu	9 dix L, eq 211.95 L, equat 36.41 0 es) (Tab	7.6 uation L 195.64 iion L15 36.41 0 le 5)	8.21 13 or L13 184.74 or L15a) 36.41 0	10.67 3a), also 182.18), also se 36.41 0	14.32 see Ta 188.64 ee Table 36.41	ble 5 202.39 5 36.41 0	219.74 36.41 0	236.05 36.41 0		(68) (69) (70)
(69)m= Pumps (70)m= Losses (71)m= Water (72)m=	246.94 ng gains 36.41 s and fat 0 s e.g. ev -107.25 heating 122.83	ins (calc 249.51 (calcula 36.41 ns gains 0 vaporatic -107.25 gains (T	ulated ir 243.05 ited in A 36.41 (Table 5 0 in (nega -107.25 Table 5) 115.87	Appendix 229.3 ppendix 36.41 5a) 0 tive valu -107.25	9 dix L, eq 211.95 L, equat 36.41 0 es) (Tab -107.25	7.6 uation L 195.64 iion L15 36.41 0 le 5) -107.25 99.51	8.21 13 or L13 184.74 or L15a) 36.41 0 -107.25	10.67 3a), also 182.18), also se 36.41 0 -107.25 100.91	14.32 see Ta 188.64 ee Table 36.41 0 -107.25 103.17	ble 5 202.39 5 36.41 0 -107.25	219.74 36.41 0 -107.25 117.23	236.05 36.41 0 -107.25 120.58		(68) (69) (70) (71)
(69)m= Pumps (70)m= Losses (71)m= Water (72)m=	246.94 ng gains 36.41 s and fat 0 s e.g. ev -107.25 heating 122.83	ins (calc 249.51 (calcula 36.41 ns gains 0 vaporatic -107.25 gains (T 120.57	ulated ir 243.05 ited in A 36.41 (Table 5 0 in (nega -107.25 Table 5) 115.87	Appendix 229.3 ppendix 36.41 5a) 0 tive valu -107.25	9 dix L, eq 211.95 L, equat 36.41 0 es) (Tab -107.25	7.6 uation L 195.64 iion L15 36.41 0 le 5) -107.25 99.51	8.21 13 or L13 184.74 or L15a) 36.41 0 -107.25 94.55	10.67 3a), also 182.18), also se 36.41 0 -107.25 100.91	14.32 see Ta 188.64 ee Table 36.41 0 -107.25 103.17	ble 5 202.39 5 36.41 0 -107.25	219.74 36.41 0 -107.25 117.23	236.05 36.41 0 -107.25 120.58		(68) (69) (70) (71)

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

Orientation:	Access Factor Table 6d	r	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast 0.9x	0.77	x	10.89	x	11.28	×	0.85	x	0.7	=	50.66	(75)
Northeast 0.9x	0.77	x	10.89	x	22.97	×	0.85	x	0.7	=	103.13	(75)
Northeast 0.9x	0.77	x	10.89	x	41.38	×	0.85	x	0.7	=	185.8	(75)
Northeast 0.9x	0.77	x	10.89	x	67.96	×	0.85	x	0.7	=	305.14	(75)
Northeast 0.9x	0.77	x	10.89	x	91.35	×	0.85	x	0.7	=	410.17	(75)
Northeast 0.9x	0.77	x	10.89	x	97.38	×	0.85	x	0.7	=	437.29	(75)
Northeast 0.9x	0.77	x	10.89	x	91.1	x	0.85	x	0.7	=	409.07	(75)
Northeast 0.9x	0.77	x	10.89	x	72.63	×	0.85	x	0.7	=	326.12	(75)
Northeast 0.9x	0.77	x	10.89	x	50.42	×	0.85	x	0.7	=	226.41	(75)
Northeast 0.9x	0.77	x	10.89	x	28.07	×	0.85	x	0.7	=	126.03	(75)
Northeast 0.9x	0.77	x	10.89	x	14.2	x	0.85	x	0.7	=	63.75	(75)
Northeast 0.9x	0.77	x	10.89	x	9.21	×	0.85	x	0.7	=	41.37	(75)
Southwest0.9x	0.77	x	6.21	x	36.79		0.85	x	0.7	=	94.21	(79)
Southwest0.9x	0.77	x	6.21	x	62.67		0.85	x	0.7	=	160.48	(79)
Southwest0.9x	0.77	x	6.21	x	85.75		0.85	x	0.7	=	219.58	(79)
Southwest0.9x	0.77	x	6.21	x	106.25		0.85	x	0.7	=	272.07	(79)
Southwest0.9x	0.77	x	6.21	x	119.01		0.85	x	0.7	=	304.74	(79)
Southwest0.9x	0.77	x	6.21	x	118.15		0.85	x	0.7	=	302.54	(79)
Southwest0.9x	0.77	x	6.21	x	113.91		0.85	x	0.7	=	291.68	(79)
Southwest0.9x	0.77	x	6.21	x	104.39		0.85	x	0.7	=	267.3	(79)
Southwest0.9x	0.77	x	6.21	x	92.85		0.85	x	0.7	=	237.76	(79)
Southwest0.9x	0.77	x	6.21	x	69.27		0.85	x	0.7	=	177.37	(79)
Southwest0.9x	0.77	x	6.21	x	44.07		0.85	x	0.7	=	112.85	(79)
Southwest0.9x	0.77	x	6.21	x	31.49		0.85	x	0.7	=	80.63	(79)
Northwest 0.9x	0.77	x	5.44	x	11.28	x	0.85	x	0.7	=	25.31	(81)
Northwest 0.9x	0.77	x	5.44	x	22.97	x	0.85	x	0.7	=	51.52	(81)
Northwest 0.9x	0.77	x	5.44	x	41.38	x	0.85	x	0.7	=	92.82	(81)
Northwest 0.9x	0.77	x	5.44	x	67.96	x	0.85	x	0.7	=	152.43	(81)
Northwest 0.9x	0.77	x	5.44	x	91.35	×	0.85	x	0.7	=	204.9	(81)
Northwest 0.9x	0.77	x	5.44	x	97.38	x	0.85	x	0.7	=	218.44	(81)
Northwest 0.9x	0.77	x	5.44	x	91.1	x	0.85	x	0.7	=	204.35	(81)
Northwest 0.9x	0.77	x	5.44	x	72.63	x	0.85	x	0.7	=	162.91	(81)
Northwest 0.9x	0.77	x	5.44	x	50.42	×	0.85	x	0.7	=	113.1	(81)
Northwest 0.9x	0.77	x	5.44	x	28.07	×	0.85	x	0.7	=	62.96	(81)
Northwest 0.9x	0.77	x	5.44	x	14.2	×	0.85	x	0.7	=	31.85	(81)
Northwest 0.9x	0.77	x	5.44	×	9.21	×	0.85	x	0.7	=	20.67	(81)

Solar gains in watts, calculated for each month(83)m = Sum(74)m (82)m													
(83)m=	170.19	315.13	498.2	729.64	919.81	958.27	905.1	756.33	577.26	366.35	208.44	142.67	(83)
Total gains – internal and solar (84)m = (73)m + (83)m , watts													
(84)m=	625.2	767.98	936.24	1143.7	1309.33	1324.23	1255.82	1113.31	946.61	759.92	629.86	585.15	(84)

7. Me	an inter	nal tem	per <u>ature</u>	(heating	se <u>ason</u>)								
							from Tal	ole 9, Th	1 (°C)				21	(85)
Utilisa	ation fac	tor for g	ains for	living are	ea, h1,m	(see Ta	ible 9a)					I		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(86)m=	1	0.99	0.98	0.95	0.89	0.77	0.64	0.71	0.89	0.98	0.99	1		(86)
Mean	interna	l temper	ature in	living are	ea T1 (fo	ollow ste	ps 3 to 7	7 in Tabl	e 9c)	-				
(87)m=	21	21	21	21	21	21	21	21	21	21	21	21		(87)
Temp	erature	during h	neating p	eriods ir	n rest of	dwelling	from Ta	able 9, T	h2 (°C)		-	-		
(88)m=	19.03	19.04	19.05	19.09	19.09	19.12	19.12	19.13	19.11	19.09	19.08	19.06		(88)
Utilisa	ation fac	tor for g	ains for	rest of d	welling,	h2,m (se	e Table	9a)						
(89)m=	0.99	0.99	0.97	0.93	0.83	0.63	0.42	0.49	0.8	0.96	0.99	1		(89)
Mean	interna	l temper	ature in	the rest	of dwelli	ng T2 (f	ollow ste	eps 3 to	7 in Tabl	e 9c)	-	-		
(90)m=	19.03	19.04	19.05	19.09	19.09	19.12	19.12	19.13	19.11	19.09	19.08	19.06		(90)
									1	LA = Livin	g area ÷ (4	4) =	0.35	(91)
Mean	interna	l temper	ature (fo	or the wh	ole dwe	lling) = f	LA × T1	+ (1 – fL	.A) × T2					
(92)m=	19.72	19.73	19.73	19.75	19.76	19.78	19.78	19.78	, 19.77	19.76	19.75	19.74		(92)
Apply	adjustr	nent to t	he mear	internal	temper	ature fro	m Table	4e, whe	ere appro	opriate				
(93)m=	19.72	19.73	19.73	19.75	19.76	19.78	19.78	19.78	19.77	19.76	19.75	19.74		(93)
8. Sp	ace hea	iting requ	uirement	1										
				mperatui using Ta		ed at st	ep 11 of	Table 9	b, so tha	t Ti,m=(76)m an	d re-calc	ulate	
ine ui	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa		tor for g			ividy	oun	Uui	/ nug		000	1107	000		
(94)m=	0.99	0.99	0.98	0.94	0.85	0.69	0.51	0.58	0.84	0.97	0.99	1		(94)
Usefu	ul gains,	hmGm	, W = (94	4)m x (84	4)m									
(95)m=	621.8	760.04	914.83	1075.17	1115.97	913.71	639.12	649.47	797.7	733.91	624.03	582.58		(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)
	· · · · · · · · · · · · · · · · · · ·	r	r	· ·	-	i	<u> </u>	x [(93)m	r í í	ř	1		l	()
(97)m=		3450.71	3063.22		1810.65	1137.8	698.5	740.15	1256.82		2869.74	3560.97		(97)
-	r	<u> </u>	î	i				24 x [(97	<u> </u>		<u> </u>		1	
(98)m=	2222.1	1808.12	1598.41	990.2	516.84	0	0	0	0	984.97	1616.91	2215.92		
								Tota	ll per year	(kWh/yea	r) = Sum(9	8)15,912 =	11953.48	(98)
Space	e heatin	g require	ement in	kWh/m ²	/year								126.63	(99)
9a. En	ergy reo	quiremer	nts – Ind	ividual h	eating s	ystems i	ncluding	j micro-C	CHP)					
-	e heatil	-	at from s	econdar	v/sunnle	mentary	svetem						0	(201)
				nain syst		memary	System	(202) = 1 ·	– (201) =				1	(202)
				main syst	. ,				02) × [1 –	(203)] =			1	(202)
			•	-				(204) - (2	02) ~ [1	(200)] =			-	
	-			ing syste			o 0/					i	327.94	(206)
Enicle	SHUY OF	Seconda	ii y/suppl	ementar	y neating	y system	ı, <i>1</i> 0						0	(208)

1	i		· · · · ·	i				i			i		l	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/yea	ar
Space	T T		r · · ·	alculate	1								l	
		1808.12		990.2	516.84	0	0	0	0	984.97	1616.91	2215.92		
(211)m	<u> </u>		<u>,</u>	00 ÷ (20	, <u> </u>					000.05	400.00	075 70	l	(211)
	677.6	551.37	487.41	301.95	157.61	0	0	0 Tota	0	300.35	493.06 211) _{15,1012}	675.72	0045.07	(211)
Speed	- haating	r fuel (e	aaandar		month			1010					3645.07	(211)
•)m x (20			y), kWh/)8)	monun									
(215)m=		0	0	0	0	0	0	0	0	0	0	0		
I	I							Tota	l (kWh/yea	ar) =Sum(2	215) _{15,1012}	=	0	(215)
Water	heating													
Output				ulated a							1		I	
	207.54	182.89	191.97	171.96	168.42	150.35	144.26	158.48	158.26	178.32	188.72	202.5		
	ncy of wa		1	470.40	470.40	470.40	470.40	470.40	470.40	470.40	470.40	470.40	178.12	(216)
	178.12	178.12	178.12	178.12	178.12	178.12	178.12	178.12	178.12	178.12	178.12	178.12		(217)
	r water h 1 = (64)r	-												
(219)m=		102.67	107.78	96.54	94.55	84.41	80.99	88.97	88.85	100.11	105.95	113.69		
								Tota	l = Sum(2	19a) ₁₁₂ =			1181.01	(219)
	I totals									k	Wh/year	,	kWh/year	-
-	-			system	1								3645.07	
Water	heating	fuel use	d										1181.01	
Electric	city for p	umps, fa	ans and	electric	keep-ho	t								
Total e	lectricity	for the	above, l	kWh/yea	r			sum	of (230a).	(230g) =	:		0	(231)
Electric	city for lig	ghting											388.8	(232)
Total d	elivered	energy	for all u	ses (211)(221)	+ (231)	+ (232).	(237b)	=				5214.88	(338)
12a. (CO2 emi	issions -	– Individ	ual heat	ing syste	ems inclu	uding mi	cro-CHF)					
						_	Ŭ							
							e rgy /h/year			kg CO	i on fac 2/kWh	tor	Emissions kg CO2/yea	
Snace	heating	(main s	vstem 1)			1) x			0.5		=	1891.79	(261)
•	heating	·		/			́ 5) х					=		(263)
-	-	(Second	iary)							0.5			0	
	heating						9) x	. (000) . (004	0.5	19	=	612.94	(264)
Space	and wat	er heati	ng				1) + (262) ·	+ (263) + (264) =				2504.74	(265)
Electric	city for p	umps, fa	ans and	electric	keep-ho	t (23 ⁻	1) x			0.5	19	=	0	(267)
Electric	city for lig	ghting				(232	2) x			0.5	19	=	201.79	(268)
Total C	02, kg/y	year							sum o	of (265)(271) =		2706.52	(272)
Dwelli	ng CO2	Emissi	on Rate	•					(272)	÷ (4) =			28.67	(273)
El ratir	ng (sectio	on 14)											74	(274)
														_

Approved Document L1A Printed on 23 November		troma FSAP 2012 program, Version: 1.0.5.5	0
Project Information:			
Assessed By: Neil	Ingham (STRO010943)	Building Type: Flat	
Dwelling Details:			
NEW DWELLING DESIG	SN STAGE	Total Floor Area: 48.28m ²	
Site Reference : 11-1	2 Grenville Street - GREEN	Plot Reference: Unit 3	
Address :			
Client Details:			
Name:			
Address :			
This report covers item	s included within the SAP calculation	ns.	
-	ort of regulations compliance.		
1a TER and DER			
Fuel for main heating sys			
Fuel factor: 1.55 (electric	• •		
Target Carbon Dioxide E	, ,	34.6 kg/m ²	01/
Dwelling Carbon Dioxide 1b TFEE and DFEE	Emission Rate (DER)	33.75 kg/m²	OK
Target Fabric Energy Eff	iciency (TEEE)	65.8 kWh/m²	
Dwelling Fabric Energy E	• • •	109.8 kWh/m ²	
с о <i>г</i>			Fail
Excess energy = 44.01 k	‹g/m² (66.9 %)		
2 Fabric U-values			
Element	Average	Highest	
External wall	0.25 (max. 0.30)	0.30 (max. 0.70)	OK
Party wall Floor	0.00 (max. 0.20) 0.11 (max. 0.25)	- 0.11 (max. 0.70)	OK OK
Roof	(no roof)	0.11 (max. 0.70)	UK
Openings	4.10 (max. 2.00)	4.80 (max. 3.30)	Fail
2a Thermal bridging			
	g calculated using user-specified y-valu	e of 0.15	
3 Air permeability	Čeni i stali i		
Air permeability at	50 pascals	10.00 (design value)	
Maximum		10.0	OK
4 Heating efficiency			
Main Heating syst	em:		
		ors or underfloor heating - electric	
	Mitsubishi ECODAN 5k	vv	
Secondary heating	g system: None		
5 Cylinder insulation			
Hot water Storage		-	014
	Permitted by DBSCG: 2	2. TU KVVN/day	OK

Primary pipework insulated:	Yes		ОК
6 Controls			
Space heating controls Hot water controls: Boiler interlock:	TTZC by plumbing and el Cylinderstat Independent timer for DH Yes		ОК ОК ОК ОК
7 Low energy lights	165		OR
Percentage of fixed lights with le	ow-energy fittings	100.0% 75.0%	ОК
8 Mechanical ventilation			
Not applicable			
9 Summertime temperature			
Overheating risk (Thames valle	y):	Not significant	ОК
Based on: Overshading: Windows facing: North East Windows facing: South East Ventilation rate:		Average or unknown 7.36m² 1.84m² 8.00	
10 Key features			
Party Walls U-value Floors U-value		0 W/m²K 0.11 W/m²K	

			User D	etails:						
Assessor Name:	Neil Ingham			Stroma	a Numi	ber:		STRO	010943	
Software Name:	Stroma FSAP 201	12		Softwa	are Ver	sion:		Versio	on: 1.0.5.50	
		Pr	operty A	Address:	Unit 3					
Address :										
1. Overall dwelling dimen	SIONS:		A	(100.2)		A., 11a	and the terms		V a lu um a (m 3)	
Ground floor			Area 4		(1a) x	Av. He i	.95	(2a) =	Volume(m ³) 142.43	(3a)
Total floor area TFA = (1a))+(1b)+(1c)+(1d)+(1e	ə)+(1n)) 4	8.28	(4)					
Dwelling volume					(3a)+(3b)	+(3c)+(3d)+(3e)+	.(3n) =	142.43	(5)
2. Ventilation rate:	•		-	- 41		4 - 4 - 1				
Number of chimneys		econdary neating 0	/] + [0 0] = [total	x 4	40 =	m ³ per hour	(6a)
Number of open flues	0 +	0] + [0] = [0	×	20 =	0	(6b)
Number of intermittent fan	s				, r	3	x ′	10 =	30	(7a)
Number of passive vents						0	x ′	10 =	0	_ (7b)
Number of flueless gas fire	es				Г	0	x 4	40 =	0	_](7c)
					L]			J
								Air ch	anges per hou	ur —
Infiltration due to chimneys If a pressurisation test has been					ontinue fro	30 om (9) to (÷ (5) =	0.21	(8)
Number of storeys in the	e dwelling (ns)								0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0.2 if both types of wall are pre deducting areas of opening	sent, use the value corres				•	uction			0	(11)
If suspended wooden flo	oor, enter 0.2 (unsea	led) or 0. ⁻	1 (seale	d), else	enter 0				0	(12)
If no draught lobby, ente	er 0.05, else enter 0								0	(13)
Percentage of windows	and doors draught s	tripped							0	(14)
Window infiltration				0.25 - [0.2		· ·			0	(15)
Infiltration rate	50 overead in out	-:		(8) + (10) -		<i>·</i> · · <i>·</i>			0	(16)
Air permeability value, q If based on air permeability	•		•	•	•	elle ol e	nvelope	alea	10	(17)
Air permeability value applies	·					is being us	sed		0.71	(18)
Number of sides sheltered			0	,	,	Ū			0	(19)
Shelter factor				(20) = 1 - [0.075 x (1	9)] =			1	(20)
Infiltration rate incorporatin	ng shelter factor			(21) = (18)	x (20) =				0.71	(21)
Infiltration rate modified for	r monthly wind speed	d								
Jan Feb M	/lar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe	ed from Table 7								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 = (22)	ım ÷ 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 sh	nelter an	d wind s	peed) =	(21a) x	(22a)m					
	0.91	0.89	0.87	0.78	0.76	0.68	0.68	0.66	0.71	0.76	0.8	0.83		
		<i>ctive air</i> al ventila	-	rate for t	he appli	cable ca	se							
				endix N, (2	3b) = (23a	a) x Fmv (e	equation (N	(15)) . other	wise (23b) = (23a)			0	(23a) (23b)
				iency in %						, (,			0	(23c)
			-	-	-					2h)m + (23b) x [1 – (23c)	-	(200)
(24a)m=		0		0	0	0	0	0	0	0	0	0	. 100]	(24a)
		d mecha	L anical ve	entilation	without	heat rec	L coverv (N	L /IV) (24b)m = (22	I 2b)m + (;	1 23b)			
(24b)m=		0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If	whole h	use ex	tract ver	ntilation c	or positiv	e input v	ventilatio	n from c	utside			I		
,				hen (240	•	•				5 × (23b)			
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
,				ole hous m = (22t	•					0.5]				
(24d)m=	0.91	0.89	0.88	0.81	0.79	0.73	0.73	0.72	0.75	0.79	0.82	0.85		(24d)
Effe	ctive air	change	rate - er	nter (24a) or (24b	o) or (24	c) or (24	d) in box	: (25)		-			
(25)m=	0.91	0.89	0.88	0.81	0.79	0.73	0.73	0.72	0.75	0.79	0.82	0.85		(25)
3. He	at losse	s and he	eat loss i	paramete	er:									
	IENT	Gros		Openin		Net Ar	ea	U-valu	le	AXU		k-value)	AXk
		area	(m²)	. m		A ,r	n²	W/m2	К	(W/I	K)	kJ/m²∙ł	<	kJ/K
Doors						2.59	x	1.6	=	4.144				(26)
Windo	ws Type	e 1				7.36	x1/	/[1/(4.8)+	0.04] =	29.64				(27)
Windo	ws Type	92				1.84	x1/	/[1/(4.8)+	0.04] =	7.41				(27)
Floor						48.28	3 X	0.11	=	5.3108				(28)
Walls	Type1	31.6	3	9.2		22.43	3 X	0.3		6.73				(29)
Walls	Type2	33.4	3	2.59		30.84	L X	0.22	= [6.9			7	(29)
Total a	area of e	lements	, m²			113.3	4							(31)
Party	wall					55.39) X	0] = [0				(32)
Party of	ceiling					48.28	3						i –	(32b)
				effective wi Internal wal			ated using	formula 1,	/[(1/U-valu	ıe)+0.04] a	as given in	paragraph	3.2	
Fabric	heat los	s, W/K :	= S (A x	U)				(26)(30)	+ (32) =				60.13	3 (33)
Heat c	apacity	Cm = S((Axk)						((28)	(30) + (32	2) + (32a)	(32e) =	6476.0)2 (34)
Therm	al mass	parame	ter (TMF	⁻ = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250	(35)
	-	sments wh ad of a de		tails of the ulation.	constructi	ion are not	t known pr	ecisely the	indicative	e values of	TMP in T	able 1f		
Therm	al bridg	es : S (L	x Y) cal	culated u	using Ap	pendix ł	<						17	(36)
			are not kn	own (36) =	= 0.05 x (3	1)				(2.2)				
	abric he									(36) =			77.13	3 (37)
Ventila		1		d monthly				•		= 0.33 × (l	
(29)~	Jan	Feb 42.04	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(38)
(38)m=	42.79		41.31	37.86	37.21	34.21	34.21	33.65	35.37	37.21	38.52	39.89		(30)
			-	444.00	444.04	444.04	444.04	440 70		=(37) + (37)	-	447.04		
(39)m=	119.92	119.17	118.44	114.99	114.34	111.34	111.34	110.78	112.5	114.34 Average =	115.65	117.01	11/1 @	2age 2 ₀ (3 , 9)
Stroma	FSAP 201	∠ version:	1.0.5.50	(SAP 9.92)	- nttp://ww	ww.stroma	.com			worage =	Jun(39)	12/12=	114.\$	age 2 or 70

Heat lo	oss para	meter (H	HLP), W	′m²K					(40)m	= (39)m ÷	(4)			
(40)m=	2.48	2.47	2.45	2.38	2.37	2.31	2.31	2.29	2.33	2.37	2.4	2.42		
Numbe	ar of day		nth (Tab	L		I			,	Average =	Sum(40)1.	.12 /12=	2.38	(40)
Numbe	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 requ	irement:								kWh/ye	ear:	
if TF				[1 - exp	(-0.0003	849 x (TF	⁻ A -13.9)2)] + 0.(0013 x (⁻	TFA -13.		64		(42)
Annua <i>Reduce</i>	l averag	e hot wa al average	hot water	usage by		lwelling is	designed	(25 x N) to achieve		se target o		.14		(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	er usage il	n litres per	day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)	-					
(44)m=	80.45	77.53	74.6	71.68	68.75	65.83	65.83	68.75	71.68	74.6	77.53	80.45		_
Enerav (content of	hot water	used - cal	culated m	onthlv = 4.	190 x Vd.r	m x nm x [)))))))))))))))))))			m <mark>(44)</mark> 112 = ables 1b. 1		877.69	(44)
(45)m=	119.31	104.35	107.68	93.88	90.08	77.73	72.03	82.65	83.64	97.48	106.4	115.55		
(-10)11-	110.01	104.00	107.00	00.00	00.00	11.10	72.00	02.00			m(45) ₁₁₂ =		1150.79	(45)
lf instan	taneous w	vater heatii	ng at point	of use (no	o hot water	r storage),	enter 0 in	boxes (46			(- ,	I		
(46)m=	17.9	15.65	16.15	14.08	13.51	11.66	10.8	12.4	12.55	14.62	15.96	17.33		(46)
	storage		includir		alar or M		etorado	within sa	amo vos	sol		400		(47)
-		. ,		• •	velling, e		-			501		180		(47)
	•	•			•			ombi boil	ers) ente	er '0' in (47)			
	storage													
,					or is kno	wn (kWł	n/day):				1.	47		(48)
•			m Table								0.	54		(49)
•••			storage		ear loss fact	or is not		(48) x (49)) =		0.	79		(50)
,				•	le 2 (kW)		(51)
	-	-	ee secti	on 4.3										
		from Ta		0h								0		(52)
			m Table					(17) (54)	(50) (50))		(53)
•••		m water (54) in (5	storage	, KVVN/ye	ear			(47) x (51)) X (52) X (53) =	0.) 70		(54) (55)
	. ,	. , .	culated t	for each	month			((56)m = (55) × (41)ı	m	0.	19		(00)
(56)m=	24.61	22.23	24.61	23.81	24.61	23.81	24.61	24.61	23.81	24.61	23.81	24.61		(56)
								0), else (5					ix H	(00)
(57)m=	24.61	22.23	24.61	23.81	24.61	23.81	24.61	24.61	23.81	24.61	23.81	24.61		(57)
			I		I									(58)
		•	nual) fro culated			59)m = ((58) ÷ 36	65 × (41)	m		L'			(00)
	•						. ,	ng and a		r thermo	stat)			
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)

Combi	loss ca	lculated	for ea	ch	month ((61)m =	(60)) ÷ 36	65 × (41)	m								
(61)m=	0	0	0		0	0		0	0	0		0	0	0		0		(61)
Total h	eat req	uired for	water	he	ating ca	alculated	l fo	or eacl	n month	(62)r	n =	0.85 × ((45)m ·	+ (46)m	+ (5	57)m +	(59)m + (61)m	
(62)m=	167.18	147.59	155.5	5	140.2	137.95	1:	24.06	119.9	130.	52	129.97	145.3	5 152.7	'3 1	163.42		(62)
Solar DH	HW input	calculated	using A	ppe	endix G or	Appendix	(H)	(negativ	ve quantity	v) (ente	er '0'	' if no sola	r contrib	ution to w	ater h	heating)		
(add a	dditiona	al lines if	FGHR	S a	and/or \	WWHRS	ap	oplies	see Ap	pend	ix G	G)						
(63)m=	0	0	0		0	0		0	0	0		0	0	0		0		(63)
Output	from w	ater hea	ter															
(64)m=	167.18	147.59	155.5	5	140.2	137.95	1:	24.06	119.9	130.	52	129.97	145.3	5 152.7	'3 1	163.42		
						-					Outp	out from wa	ater hea	ter (annua	al) ₁₁₂		1714.42	(64)
Heat g	ains fro	m water	heatin	ıg,	kWh/m	onth 0.2	5 ´	[0.85	× (45)m	+ (6	1)m	n] + 0.8 ×	(46)r	n + (57)	m +	(59)m]	
(65)m=	77.97	69.29	74.1		68.28	68.25	6	62.91	62.25	65.7	78	64.87	70.71	72.44	4	76.72		(65)
inclu	de (57)	m in calo	culation	n o	f (65)m	only if c	ylir	nder is	s in the c	dwelli	ng	or hot w	ater is	from co	mm	unity h	leating	
5. Int	ernal g	ains (see	e Table	e 5	and 5a):												
	Ŭ	ns (Table																
motab	Jan	Feb	Ma		Apr	May		Jun	Jul	Au	р	Sep	Oct	No	v	Dec		
(66)m=	81.98	81.98	81.98	-	81.98	81.98	-	31.98	81.98	81.9	-	81.98	81.98	81.98	3	81.98		(66)
Liahtin	a aains	(calcula	ted in	Αρι	pendix	L. equat	ion	1 L9 01	⁻ L9a). a	lso s	ee T	Table 5						
(67)m=	12.75	11.32	9.21	Ť	6.97	5.21	<u> </u>	4.4	4.75	6.1		8.29	10.53	12.29	9	13.1		(67)
	nces da	ins (calc	ulated	 in	Append	l Jixlea	L Uat	tion I	13 or I 1:	3a) a	also	see Tal	ble 5	_				
(68)m=	142.77	144.25	140.5	-	132.57	122.54	r –	13.11	106.81	105.		109.06	117.0 ⁻	1 127.0	4 1	136.47		(68)
		calcula		_														
(69)m=	31.2	31.2	31.2	-i	31.2	2, equal	-	31.2	31.2	, ais 31.		31.2	31.2	31.2		31.2	l	(69)
		1				01.2		01.2	01.2	01.	-	0112	01.2	01.2		0112		()
(70)m=		ns gains			a) 0	0	<u> </u>	0	0	0		0	0	0		0	l	(70)
									0	0		0	0	0		0		(10)
	-65.58	aporatic	-65.58			, , 	—		65 59	C.F.	50	65 59	CE ES	CE E	<u> </u>	<u>65 50</u>	I	(71)
(71)m=					-65.58	-65.58		65.58	-65.58	-65.	58	-65.58	-65.58	-65.5	8.	-65.58		(71)
		gains (T		ŕ	04.00	04.70		7.07	00.00	00		00.4	05.04	100.0		100.44	I	(70)
(72)m=	104.79	103.11	99.6		94.83	91.73	8	37.37	83.66	88.4		90.1	95.04			103.11		(72)
		gains =	1	.				. ,	· ,			+ (69)m + (I	(70)
(73)m=	307.9	306.27	296.9	1	281.96	267.07	2	52.47	242.82	247.	51	255.05	270.1	7 287.5	3 3	300.28		(73)
	lar gain	S: calculated		alar	flux from	Table Co.	d		otod oguo	tionat		n vort to th		oble orien	totion			
		Access F		Jiai	Area		anu	Flu			0.00		e applic	FF	itatioi	1.	Gains	
Unerna		Table 6d			m²				× ole 6a		Т	g_ able 6b		Table 6	с		(W)	
Northea	ast o ov [0.77		v	7.0		~		4.00	_ [0.05	٦ .	0.7	7			(75)
Northea	L	0.77		x	7.3		x	r	1.28	X		0.85		0.7		=	34.24	-
	Ļ	0.77		x	7.3		x		2.97	X		0.85		0.7		=	69.7	(75)
Northea	Ļ	0.77		x	7.3		X	<u> </u>	1.38	×		0.85	×	0.7		=	125.58	(75)
Northea	Ļ	0.77		x	7.3	36	x		7.96	X		0.85	×	0.7		_ =	206.23	(75)
Northea	ast 0.9x	0.77		x	7.3	36	x	9	1.35	х		0.85	×	0.7	7	=	277.22	(75)

	Northeast 0.9x 0.77 x 7.36 x 97.38 x 0.85 x 0.7 = 295.54 (75)																
Northea	ist <mark>0.9x</mark>	0.77	x	7.3	36	x	9	7.38	x	0	.85	x	0.7		=	295.54	(75)
Northea	ist <mark>0.9x</mark>	0.77	x	7.3	36	x	<u></u>	91.1	x	0	.85	×	0.7		=	276.47	(75)
Northea	ist <mark>0.9x</mark>	0.77	x	7.3	36	x	7	2.63	x	0	.85	×	0.7		=	220.41	(75)
Northea	ist <mark>0.9x</mark>	0.77	x	7.3	36	x	5	0.42	x	0	.85	x	0.7		=	153.02	(75)
Northea	ist <mark>0.9x</mark>	0.77	x	7.3	36	x	2	8.07	x	0	.85	x	0.7		=	85.18	(75)
Northea	ist <mark>0.9x</mark>	0.77	x	7.3	36	x	· ·	14.2	x	0	.85	×	0.7		=	43.08	(75)
Northea	ist <mark>0.9x</mark>	0.77	x	7.3	36	x	Ģ	9.21	x	0	.85	×	0.7		=	27.96	(75)
Southea	ast <mark>0.9x</mark>	0.77	x	1.8	34	x	3	6.79	x	0	.85	×	0.7		=	27.92	(77)
Southea	ast <mark>0.9x</mark>	0.77	x	1.8	34	x	6	2.67	x	0	.85	x	0.7		=	47.55	(77)
Southea	ast <mark>0.9x</mark>	0.77	x	1.8	34	x	8	5.75	x	0	.85	x	0.7		=	65.06	(77)
Southea	ast <mark>0.9x</mark>	0.77	x	1.8	34	x	10	06.25	x	0	.85	x	0.7		=	80.61	(77)
Southea	ast <mark>0.9x</mark>	0.77	x	1.8	34	x	1	19.01	x	0	.85	×	0.7		=	90.29	(77)
Southea	ast <mark>0.9x</mark>	0.77	x	1.8	34	x	1	18.15	x	0	.85	×	0.7		=	89.64	(77)
Southea	ast <mark>0.9x</mark>	0.77	x	1.8	34	x	1	13.91	x	0	.85	×	0.7		=	86.42	(77)
Southea	ast <mark>0.9x</mark>	0.77	x	1.8	34	x	10	04.39	x	0	.85	x	0.7		=	79.2	(77)
Southea	ast <mark>0.9x</mark>	0.77	x	1.8	34	x	9	2.85	x	0	.85	×	0.7		=	70.45	(77)
Southea	ast <mark>0.9x</mark>	0.77	x	1.8	34	x	6	9.27	x	0	.85	×	0.7		=	52.55	(77)
Southea	ast <mark>0.9x</mark>	0.77	x	1.8	34	x	4	4.07	x	0	.85	×	0.7		=	33.44	(77)
Southea	ast <mark>0.9x</mark>	0.77	x	1.8	34	x	3	1.49	x	0	.85	x	0.7		=	23.89	(77)
	_								-								_
Solar g	ains in	watts, ca	alculated	for eac	h montl	h			(83)m	n = Sum	(74)m	.(82)m					
(83)m=	62.16	117.25	190.64	286.84	367.51	3	85.18	362.9	299	.61 2	23.46	137.73	3 76.52	51.8	85		(83)
Total g	ains – ii	nternal a	nd solar	(84)m =	- = (73)m	+ (83)m	, watts		•			•				
(84)m=	370.06	423.52	487.55	568.8	634.58	6	37.65	605.71	547	.12 4	78.51	407.9	364.05	352	.13		(84)
7. Me	an inter	nal temp	perature	(heating	seaso	n)			•				•				
			eating p	` U			area f	rom Tal	ole 9	, Th1 ((°C)					21	(85)
Utilisa	tion fac	tor for g	ains for I	iving are	ea, h1,r	n (s	ее Та	ble 9a)							l		
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec																	
(86)m=	0.99	0.99	0.98	0.96	0.9		0.79	0.67	0.7		0.89	0.97	0.99	0.9			(86)
Mean	interna	l temper	ature in	livina ar	•a T1 (i	follo	w ste	ns 3 to 7	۔ 7 in T	ahle C			-!			I	
(87)m=	21	21	21	21	21		21	21	2		21	21	21	2	1		(87)
		= :										= -					

Mean internal temperature (for the whole dwelling) = $fLA \times T1 + (1 - fLA) \times T2$

Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C)

19.1

0.84

Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)

19.1

19.14

0.66

19.14

19.09

Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)

0.93

19.09

(92)m=	20.11	20.11	20.12	20.13	20.14	20.16	20.16	20.16	20.15	20.14	20.13	20.12	(92)	

19.14

0.51

19.14

19.12

0.81

19.12

19.1

0.95

19.1

19.08

0.99

19.08

 $fLA = Living area \div (4) =$

19.07

0.99

19.07

19.14

0.44

19.14

Apply adjustment to the mean internal temperature from Table 4e, where appropriate

19.03

0.99

19.03

19.04

0.99

19.04

19.05

0.97

19.05

(88)m=

(89)m=

(90)m=

(88)

(89)

(90)

(91)

0.55

(02)~	20.11	20.11	20.12	20.13	20.14	20.16	20.46	20.16	20.15	20.14	20.13	20.42		(93)
(93)m=	20.11				20.14	20.16	20.16	20.16	20.15	20.14	20.13	20.12		(33)
			uirement		ro obtair	od at et	on 11 of	Table Of	a co tha	t Ti m_('	76)m an	d re-calc	ulato	
			or gains	•		ieu al Sie	ерттог	Table 91	J, SU IIIA	t 11,111=(<i>i</i> 0)111 att	u re-caic	ulate	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	ation fac	tor for g	ains, hm	:	· · · · ·									
(94)m=	0.99	0.99	0.98	0.95	0.88	0.74	0.58	0.64	0.86	0.97	0.99	0.99		(94)
Usefu	ıl gains,	hmGm	, W = (94	4)m x (84	4)m									
(95)m=	367.29	418.54	476.69	539.18	556.77	471.2	349.24	350.89	412.74	393.64	359.76	349.89		(95)
Mont	nly avera	age exte	rnal tem	perature	e from Ta	able 8							l	
(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)
			an intern	-	i	1	<u> </u>						l	()
(97)m=		1812.79	1612.6	1291.89	964.89	618.57	395.89	416.43	680.5	1090.67		1863.27		(97)
•		<u> </u>	ement fo		1	1	i	- (<u>``</u>	<u> </u>	ŕ			
(98)m=	1137.1	936.93	845.12	541.95	303.65	0	0	0	0	518.59	826.05	1125.96		
								Tota	l per year	(kWh/year) = Sum(9	8)15,912 =	6235.33	(98)
Space	e heatin	g require	ement in	kWh/m ²	²/year								129.15	(99)
9a. En	ergy rec	luiremer	nts – Indi	ividual h	eating s	ystems i	ncluding	micro-C	CHP)					
Spac	e heatir	ng:												
Fract	on of sp	ace hea	at from se	econdar	y/supple	mentary	system						0	(201)
Fract	ion of sp	ace hea	at from m	nain syst	em(s)			(202) = 1 -	- (201) =				1	(202)
Fract	on of to	tal heati	ng from	main sys	stem 1			(204) = (20	02) × [1 –	(203)] =			1	(204)
Efficie	ency of r	main spa	ace heati	ing syste	em 1								319.5	(206)
Efficie	ency of s	seconda	ry/supple	ementar	y heatin	g system	ı, %						0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	 ear
Space			ement (c		,								,	
	1137.1	936.93	845.12	541.95	303.65	0	0	0	0	518.59	826.05	1125.96		
(211)m	n = {[(98)m x (20	94)]}x 1	00 ÷ (20)6)	•								(211)
、 ,	355.9	293.25	264.51	169.62	, 95.04	0	0	0	0	162.31	258.54	352.41		
								Tota	l (kWh/yea	ar) =Sum(2	211) _{15,1012}	=	1951.59	(211)
Spac	e heatin	g fuel (s	econdar	y), kWh/	month									
•			00 ÷ (20											
(215)m=	0	0	0	0	0	0	0	0	0	0	0	0		
								Tota	l (kWh/yea	ar) =Sum(2	2 15) _{15,1012}	=	0	(215)
Water	heating	J												
Output			ter (calc								r		1	
	167.18	147.59	155.55	140.2	137.95	124.06	119.9	130.52	129.97	145.35	152.73	163.42		_
Efficie	ncy of w	ater hea	iter										178.12	(216)
(217)m=	178.12	178.12	178.12	178.12	178.12	178.12	178.12	178.12	178.12	178.12	178.12	178.12		(217)
			kWh/mo											
(219)m (219)m=		m x 100 82.86) ÷ (217) 87.33	m 78.71	77.45	69.65	67.31	73.28	72.96	81.6	85.74	91.74		
(<u>~ 13)</u> 111=	55.00	02.00	01.00	10.11	11.40	03.00	07.01		I = Sum(2		00.74	51.74	962.48	(219)
Δnnur	I totals								2000		Wh/year		kWh/yea	
		fuel use	ed, main	system	1					ĸ	a ny yedi		1951.59	'
,	3		,											

				_
Water heating fuel used			962.48]
Electricity for pumps, fans and electric keep-hot				
Total electricity for the above, kWh/year	sum of (2	30a)(230g) =	0	(231)
Electricity for lighting			225.11	(232)
Total delivered energy for all uses (211)(221) +	(231) + (232)(237b) =		3139.18	(338)
12a. CO2 emissions – Individual heating systems	s including micro-CHP			
	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/yea	ır
Space heating (main system 1)	(211) x	0.519 =	1012.88	(261)
Space heating (secondary)	(215) x	0.519 =	0	(263)
Water heating	(219) x	0.519 =	499.53	(264)
Space and water heating	(261) + (262) + (263) + (264)	=	1512.4	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519 =	0	(267)
Electricity for lighting	(232) x	0.519 =	116.83	(268)
Total CO2, kg/year	s	sum of (265)(271) =	1629.23	(272)
Dwelling CO2 Emission Rate	(272) ÷ (4) =	33.75	(273)
EI rating (section 14)			77	(274)

	ent L1A, 2013 Editior rember 2021 at 13:26	-	na FSAP 2012 program, Vers	sion: 1.0.5.50
Project Information	on:			
Assessed By:	Neil Ingham (STR	O010943)	Building Type:	Flat
Dwelling Details:				
NEW DWELLING	DESIGN STAGE		Total Floor Area: 48	3.28m²
Site Reference :	11-12 Grenville St	reet - GREEN	Plot Reference:	Unit 4
Address :				
Client Details:				
Name:				
Address :				
•	rs items included w ete report of regulat	ithin the SAP calculations. ions compliance.		
1a TER and DEF	र			
	ing system: Electricit	у		
Fuel factor: 1.55 (• •	(TED)		
-	oxide Emission Rate Dioxide Emission Rat	. ,	30.93 kg/m² 31.68 kg/m²	Fail
-	$= 0.75 \text{ kg/m}^2 (2.4 \%)$. ,	51.00 kg/m=	i ali
1b TFEE and DF	U (
Target Fabric Ene	rgy Efficiency (TFEE)	53.6 kWh/m²	
Dwelling Fabric Er	nergy Efficiency (DF	EE)	100.2 kWh/m ²	
F	10 50 1 - (Fail
	46.56 kg/m² (86.8 %))		
2 Fabric U-value Element		Average	Highost	
External		Average 0.26 (max. 0.30)	Highest 0.30 (max. 0.70)	ОК
Party wa		0.00 (max. 0.20)	-	OK
Floor		(no floor)		-
Roof		(no roof)		
Openings	3	4.14 (max. 2.00)	4.80 (max. 3.30)	Fail
2a Thermal brid				
		sing user-specified y-value c	f 0.15	
3 Air permeabili				
Air permeal Maximum	bility at 50 pascals		10.00 (design val 10.0	
			10.0	OK
4 Heating efficie				
Main Heatir	ng system:	Heat pumps with radiators Mitsubishi ECODAN 5kW	or underfloor heating - electri	с
Secondary	heating system:	None		
5 Cylinder insul	ation			

5 Cylinder insulation

Hot water Storage:

	Measured cylinder loss:		OK
Deine en anie europeie in europeie de	Permitted by DBSCG: 2	.10 kwn/day	OK
Primary pipework insulated:	Yes		OK
6 Controls			
Space heating controls	TTZC by plumbing and e	electrical services	OK
Hot water controls:	Cylinderstat		OK
	Independent timer for D	HW	OK
Boiler interlock:	Yes		ОК
7 Low energy lights			
Percentage of fixed lights with	low-energy fittings	100.0%	
Minimum	0, 0	75.0%	ОК
8 Mechanical ventilation			
Not applicable			
9 Summertime temperature			
Overheating risk (Thames vall	ey):	Not significant	ОК
Based on:			
Overshading:		Average or unknown	
Windows facing: North East		6.3m ²	
Windows facing: South East		1.84m²	
Windows facing: South West		1.89m ²	
Ventilation rate:		8.00	
10 Key features			
		0 14// 21/	

Party Walls U-value

0 W/m²K

			User D	etails:						
Assessor Name:	Neil Ingham			Stroma	a Num	ber:		STRO	010943	
Software Name:	Stroma FSAP 20	12		Softwa	are Ver	sion:		Versio	on: 1.0.5.50	
		Pr	operty A	Address:	Unit 4					
Address :										
1. Overall dwelling dimen	ISIONS:		A	(100.2)		A., 11a	ark (ma)		\/_l.um_c(m_3)	
Ground floor			Area 4	. ,	(1a) x	Av. He i	ignt(m) .75	(2a) =	Volume(m ³) 132.77	(3a)
Total floor area TFA = (1a))+(1b)+(1c)+(1d)+(1	e)+(1n)) 4	8.28	(4)					
Dwelling volume					(3a)+(3b)	+(3c)+(3d)+(3e)+	.(3n) =	132.77	(5)
2. Ventilation rate:			_	a the an		totol				
Number of chimneys		secondary heating 0	/] + [other] = [total	x 4	40 =	m ³ per hour	(6a)
Number of open flues	0 +	0] + [0	」 = [0	× 2	20 =	0	(6b)
Number of intermittent fan	s				- E	3	× ′	10 =	30	(7a)
Number of passive vents						0	x ^	10 =	0	(7b)
Number of flueless gas fire	es					0	X 4	40 =	0	(7c)
								Air ch	anges per hou	ur
Infiltration due to chimneys	s, flues and fans = $($	6a)+(6b)+(7a	a)+(7b)+(7	7c) =		30		÷ (5) =	0.23	(8)
If a pressurisation test has be		ded, proceed	to (17), c	otherwise c	continue fro	om (9) to (16)			7
Number of storeys in the Additional infiltration	e aweiling (ns)						[(9)-	-1]x0.1 =	0	(9) (10)
Structural infiltration: 0.2	25 for steel or timber	frame or	0.35 for	masonr	v constr	uction	[(0)		0	(11)
if both types of wall are pre deducting areas of opening	sent, use the value corre				•], ,
If suspended wooden flo		aled) or 0.7	1 (seale	d), else	enter 0				0	(12)
If no draught lobby, ente									0	(13)
Percentage of windows	and doors draught s	stripped		0.25 - [0.2	x(14) + 1	001 -			0	(14)
Window infiltration Infiltration rate				(8) + (10) ·		· ·	L (15) –		0	(15)
Air permeability value, q	150 expressed in cu	hic metres				<i>·</i> · · <i>·</i>		area	0	(16) (17)
If based on air permeabilit	· ·		•	•	•		nvelope	arca	10 0.73	(17)
Air permeability value applies	•					is being us	sed		0.75	
Number of sides sheltered	I								0	(19)
Shelter factor				(20) = 1 - [0.075 x (1	9)] =			1	(20)
Infiltration rate incorporatir	ng shelter factor			(21) = (18)	x (20) =				0.73	(21)
Infiltration rate modified fo	r monthly wind spee	ed						i	1	
Jan Feb M	Mar Apr May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe									1	
(22)m= 5.1 5 4	4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (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 infiltr	ation rat	e (allowi	ng for sh	elter an	d wind s	peed) =	(21a) x	(22a)m					
	0.93	0.91	0.89	0.8	0.78	0.69	0.69	0.67	0.73	0.78	0.82	0.85		
		<i>ctive air</i> al ventila	-	rate for t	he appli	cable ca	se							
				endix N, (2	3b) = (23a	a) x Fmv (e	equation (N	(5)) other	wise (23b) = (23a)			0	(23a) (23b)
			0 11	iency in %	, (, (• •	,, .	,) (200)			0	(230) (23c)
			-	-	_					2h)m + (23b) x [1 – (23c)	-	(200)
(24a)m=	r			0	0	0	0	0	0	0	0	0	. 100]	(24a)
		l d mech:	I anical ve	entilation	without	heat rec	:overv (N	L /\V) (24b)m = (22	I 2b)m + ()	1 23b)			
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24b)
	whole h	use ex	tract ver	ntilation c	or positiv	e input v	/entilatic	n from c	outside			1		
,				hen (240	•	•				5 × (23b)			
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
				ole hous m = (22t						0.5]		-		
(24d)m=	0.93	0.91	0.9	0.82	0.8	0.74	0.74	0.73	0.76	0.8	0.83	0.86		(24d)
Effe	ctive air	change	rate - er	nter (24a) or (24b	o) or (24	c) or (24	d) in box	(25)					
(25)m=	0.93	0.91	0.9	0.82	0.8	0.74	0.74	0.73	0.76	0.8	0.83	0.86		(25)
3 He	at losse	s and he	at loss i	paramete	٥r٠									
ELEN		Gros		Openin		Net Ar	ea	U-valu	le	AXU		k-value	<i>,</i>	AXk
		area		m		A ,r		W/m2		(W/	K)	kJ/m²·ł		kJ/K
Doors						2.59	x	1.6	=	4.144				(26)
Windov	ws Type	e 1				6.3	x1/	/[1/(4.8)+	0.04] =	25.37				(27)
Window	ws Type	2				1.84	x1/	/[1/(4.8)+	0.04] =	7.41				(27)
Windo	ws Type	e 3				1.89	x1/	/[1/(4.8)+	0.04] =	7.61				(27)
Walls ⁻	Гуре1	45.2	25	10.03	3	35.22	2 X	0.3	=	10.57				(29)
Walls ⁻	Гуре2	31.1	6	2.59		28.57	' x	0.22		6.39	ו ד		$\exists \square$	(29)
Total a	rea of e	lements	, m²			76.41								(31)
Party v	vall					35.87	, X	0	=	0				(32)
Party c	eiling					48.28	3		เ				i –	(32b)
				effective wil nternal wall			ated using	formula 1	/[(1/U-valu	ie)+0.04] a	as given in	paragraph	3.2	
Fabric	heat los	ss, W/K :	= S (A x	U)				(26)(30)	+ (32) =				61.49	(33)
Heat c	apacity	Cm = S((Axk)						((28)	(30) + (32	2) + (32a).	(32e) =	4610.93	3 (34)
Therm	al mass	parame	ter (TMF	⊃ = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250	(35)
	•	sments wh ad of a de		tails of the ulation.	constructi	ion are not	t known pr	ecisely the	indicative	e values of	TMP in T	able 1f		
Therm	al bridg	es : S (L	x Y) cal	culated u	using Ap	pendix ł	<						11.46	(36)
			are not kn	own (36) =	= 0.05 x (3	1)								
	abric he								(33) +	(36) =			72.95	(37)
Ventila		1	1	monthly						= 0.33 × (r		I	
(00)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(20)
(38)m=	40.68	39.95	39.23	35.88	35.25	32.33	32.33	31.79	33.45	35.25	36.52	37.85		(38)
			· · · · · · · · · · · · · · · · · · ·	400.00	400.5	405.00	405.00	404-4	. ,	=(37) + (37)		440.0		
(39)m=	113.63	112.9	112.18	108.83	108.2	105.28	105.28	104.74	106.4	108.2	109.47	110.8	100 00	(20)
Stroma I	-SAP 201	2 Version:	1.0.5.50	(SAP 9.92)	 http://ww 	ww.stroma	.com		,	Average =	Sum(39)1	12 / 12=	100.022	age 2 o ^{f 39)}

Heat lo	oss para	ameter (H	HLP), W	/m²K					(40)m	= (39)m ÷	- (4)			
(40)m=	2.35	2.34	2.32	2.25	2.24	2.18	2.18	2.17	2.2	2.24	2.27	2.29		
Numbe	er of day	r vs in mo	nth (Tab	l <u> </u>				!	,	Average =	Sum(40)1.	12 /12=	2.25	(40)
Numbe	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 hea	ting ene	rgy requ	irement:								kWh/ye	ear:	
if TF				: [1 - exp	o(-0.0003	349 x (TF	FA -13.9)2)] + 0.(0013 x (⁻	TFA -13		64		(42)
Reduce	the annua	al average	hot water	usage by		welling is	designed	(25 x N) to achieve		se target o		.14		(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	-		-		Vd,m = fa			 I					l	
(44)m=	80.45	77.53	74.6	71.68	68.75	65.83	65.83	68.75	71.68	74.6	77.53	80.45		
Energy	content of	hot water	used - cal	culated m	onthly $= 4$.	190 x Vd,r	m x nm x [OTm / 3600			m(44) ₁₁₂ = ables 1b, 1		877.69	(44)
(45)m=	119.31	104.35	107.68	93.88	90.08	77.73	72.03	82.65	83.64	97.48	106.4	115.55		
lf instan	taneous v	vətor hoati	na at noin	t of use (n		r storage)	ontor 0 in	boxes (46		Total = Su	m(45) ₁₁₂ =	=	1150.79	(45)
	17.9	15.65	- ·		13.51			1	i	14.62	15.00	17.00	l	(46)
(46)m= Water	storage		16.15	14.08	13.51	11.66	10.8	12.4	12.55	14.02	15.96	17.33		(40)
Storag	e volum	ne (litres)) includir	ng any s	olar or W	WHRS	storage	within sa	ame ves	sel		180		(47)
If com	munity h	neating a	and no ta	ank in dw	velling, e	enter 110) litres in	(47)						
			hot wate	er (this ir	ncludes i	nstantar	neous co	ombi boil	ers) ente	er '0' in ((47)			
	storage		eclared I	oss fact	or is kno	wn (k\//ł	n/dav).					47		(48)
			m Table				vuay).					47 54		(40)
•			r storage		ear			(48) x (49)) =			54 70		(43)
			-	•	loss fact	or is not			, –		0.	79		(30)
		-			le 2 (kW	h/litre/da	ay)					0		(51)
		from Ta	see secti ble 2a	on 4.3								0	l	(52)
			m Table	2b								0 0		(52)
•			r storage		ear			(47) x (51)) x (52) x (53) =		0		(54)
		(54) in (5	-	, ,						,		79		(55)
Water	storage	loss cal	culated	for each	month			((56)m = (55) × (41)	m				
(56)m=	24.61	22.23	24.61	23.81	24.61	23.81	24.61	24.61	23.81	24.61	23.81	24.61		(56)
If cylinde	er contain	s dedicate	d solar sto	rage, (57)	m = (56)m	x [(50) – (H 11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	ix H	
(57)m=	24.61	22.23	24.61	23.81	24.61	23.81	24.61	24.61	23.81	24.61	23.81	24.61		(57)
Primar	y circuit	loss (ar	nnual) fro	om Table	e 3							0		(58)
Primar	y circuit	loss cal	culated	for each	month (• •	65 × (41)			<u> </u>			
		r	1	r	r	r		ng and a	· ·	i	, 		I	(50)
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)

Combi	loss ca	lculated	for ea	ch	month ((61)m =	(60	D) ÷ 36	65 × (41))m								
(61)m=	0	0	0		0	0		0	0	0		0	0	0		0		(61)
Total h	eat req	uired for	water	he	ating ca	alculated	d fo	or eacl	n month	(62)ı	n =	0.85 × ((45)m ·	+ (46)m	+ (57	')m +	(59)m + (61)m	
(62)m=	167.18	147.59	155.5	5	140.2	137.95	1	24.06	119.9	130.	52	129.97	145.3	5 152.73	3 16	63.42		(62)
Solar DH	HW input	calculated	using A	ppe	ndix G or	Appendix	ĸН	(negati	ve quantity	/) (ent	er '0'	' if no sola	r contrib	ution to wa	ater he	eating)		
(add a	dditiona	al lines if	FGHR	RS a	and/or V	WWHRS	S ap	oplies	, see Ap	pend	ix G	G)					_	
(63)m=	0	0	0		0	0		0	0	0		0	0	0		0		(63)
Output	from w	ater hea	iter															
(64)m=	167.18	147.59	155.5	5	140.2	137.95	1	24.06	119.9	130.	52	129.97	145.3	5 152.73	3 16	63.42		
			•								Outp	out from wa	ater hea	ter (annua	l) ₁₁₂		1714.42	(64)
Heat g	ains fro	m water	heatir	ng,	kWh/m	onth 0.2	5 ´	[0.85	× (45)m	+ (6	1)m	n] + 0.8 x	(46)r	n + (57)ı	m + (59)m	1]	
(65)m=	77.97	69.29	74.1	Τ	68.28	68.25	6	62.91	62.25	65.	78	64.87	70.71	72.44	7	6.72		(65)
inclu	de (57)	m in calo	culatio	n o	f (65)m	only if c	ylin	nder i	s in the c	dwell	ing	or hot w	ater is	from co	mmu	nity h	eating	
5. Int	ernal a	ains (see	e Table	e 5	and 5a):					-						-	
	Ŭ	ns (Table																
metab	Jan	Feb	Ma		Apr	May	Γ	Jun	Jul	Au	Ja	Sep	Oct	Nov	,	Dec	1	
(66)m=	81.98	81.98	81.98	-	81.98	81.98	-	31.98	81.98	81.9	-	81.98	81.98			1.98		(66)
	u a aains	(calcula	ted in	Ap	pendix	equat	tion	190	riga) a	lso s	ee T	L Table 5		1			1	
(67)m=	12.73	11.3	9.19	<u> </u>	6.96	5.2	1	4.39	4.75	6.1		8.28	10.51	12.27	1	3.08	1	(67)
		l ins (calc															I	
(68)m=	142.77	144.25	140.5	_	132.57	122.54	<u> </u>	13.11	106.81	105.		109.06	117.0	1 127.04	1 13	36.47	1	(68)
														1 127.0-			l	(00)
	31.2	(calcula 31.2	31.2	-i	31.2	L, equa	-	31.2	31.2	, ais 31.		31.2	31.2	31.2		31.2	1	(69)
(69)m=						31.2		31.2	31.2	31.	2	31.2	31.2	31.2	3	01.2	J	(03)
•		ns gains	r i		,		-	•			1						1	(70)
(70)m=	0	0	0		0	0		0	0	0		0	0	0		0	J	(70)
		/aporatic	<u> </u>	- T		, ,	1	,					1	-1			1	
(71)m=	-65.58	-65.58	-65.5		-65.58	-65.58	-(65.58	-65.58	-65.	58	-65.58	-65.58	-65.58	-6	5.58	J	(71)
Water		gains (T		ŕ			_										1	
(72)m=	104.79	103.11	99.6		94.83	91.73	8	37.37	83.66	88.4	11	90.1	95.04	100.61	1 10)3.11	ļ	(72)
Total i	nterna	gains =	-				_	(66)	m + (67)m	ı + (68)m +	+ (69)m + ((70)m +	(71)m + (7	'2)m			
(73)m=	307.88	306.25	296.9)	281.95	267.06	2	52.46	242.81	247	.5	255.03	270.1	5 287.52	2 30	0.26		(73)
	lar gain																	
-		calculated	-	olar			and			tions t	0 CO	onvert to th	e applic		ation.			
Orienta		Access F Table 6d			Area m ²			Flu	x ole 6a		т	g_ able 6b		FF Table 60			Gains (W)	
	-							1 ai					_		,	-	(VV)	-
Northea	L	0.77		x	6.3		x	11.28		x		0.85	x	0.7		=	29.31	(75)
Northea	ast <mark>0.9</mark> x	0.77		x	6.3		x	22.97		x		0.85	x	0.7		=	59.66	(75)
Northea	ast <mark>0.9x</mark>	0.77 ×		x	6.3		x	41.38		x		0.85	x	0.7		=	107.49	(75)
Northea	ast <mark>0.9x</mark>	0.77		x	6.	3	x	6	7.96	x		0.85	x	0.7		=	176.53	(75)
Northea	ast <mark>0.9x</mark>	0.77		x	6.	3	x	9	1.35	x		0.85	x	0.7		=	237.29	(75)

_				-				_				_
Northeast 0.9x	0.77	×	6.3	x	97.38	x	0.85	×	0.7	=	252.98	(75)
Northeast 0.9x	0.77	x	6.3	x	91.1	x	0.85	×	0.7	=	236.65	(75)
Northeast 0.9x	0.77	x	6.3	x	72.63	x	0.85	x	0.7	=	188.66	(75)
Northeast 0.9x	0.77	x	6.3	x	50.42	x	0.85	×	0.7	=	130.98	(75)
Northeast 0.9x	0.77	x	6.3	x	28.07	x	0.85	×	0.7	=	72.91	(75)
Northeast 0.9x	0.77	×	6.3	x	14.2	x	0.85	x	0.7	=	36.88	(75)
Northeast 0.9x	0.77	×	6.3	×	9.21	x	0.85	x	0.7	=	23.94	(75)
Southeast 0.9x	0.77	x	1.84	×	36.79	x	0.85	×	0.7	=	27.92	(77)
Southeast 0.9x	0.77	x	1.84	x	62.67	x	0.85	x	0.7	=	47.55	(77)
Southeast 0.9x	0.77	x	1.84	_ ×	85.75	X	0.85	×	0.7	=	65.06	(77)
Southeast 0.9x	0.77	x	1.84	x	106.25	x	0.85	×	0.7	=	80.61	(77)
Southeast 0.9x	0.77	x	1.84	×	119.01	x	0.85	×	0.7	=	90.29	(77)
Southeast 0.9x	0.77	x	1.84	Ī×	118.15	Īx	0.85	× آ	0.7	=	89.64	(77)
Southeast 0.9x	0.77	×	1.84] ×	113.91	x	0.85	- ×	0.7	=	86.42	(77)
Southeast 0.9x	0.77	x	1.84] ×	104.39] x	0.85	۲ × آ	0.7	= =	79.2	(77)
Southeast 0.9x	0.77	x	1.84	Ī×	92.85] x	0.85	۲×	0.7	=	70.45	(77)
Southeast 0.9x	0.77	×	1.84	İ x	69.27] x	0.85	۲ × آ	0.7	=	52.55	(77)
Southeast 0.9x	0.77	x	1.84] ×	44.07] x	0.85	۲ × آ	0.7	= =	33.44	(77)
Southeast 0.9x	0.77	×	1.84	İ ×	31.49] ×	0.85	۲ × آ	0.7	=	23.89	(77)
Southwest _{0.9x}	0.77	×	1.89	, x	36.79	i	0.85	- X	0.7	=	28.67	(79)
Southwest _{0.9x}	0.77	x	1.89] ×	62.67	i	0.85	۲ × آ	0.7	=	48.84	(79)
Southwest _{0.9x}	0.77	×	1.89	İ ×	85.75	i	0.85	۲ × آ	0.7	=	66.83	(79)
Southwest _{0.9x}	0.77	x	1.89] ×	106.25	i	0.85	- X	0.7	=	82.8	(79)
Southwest _{0.9x}	0.77	×	1.89] ×	119.01	Ī	0.85	۲ × آ	0.7	=	92.75	(79)
Southwest _{0.9x}	0.77	×	1.89] ×	118.15	Ī	0.85	×	0.7		92.08	(79)
Southwest _{0.9x}	0.77	x	1.89	Ī×	113.91	Ī	0.85	×	0.7	=	88.77	(79)
Southwest _{0.9x}	0.77	x	1.89	×	104.39]	0.85	x	0.7	=	81.35	(79)
Southwest _{0.9x}	0.77	x	1.89	×	92.85]	0.85	x	0.7	=	72.36	(79)
Southwest _{0.9x}	0.77	x	1.89	×	69.27]	0.85	x	0.7	=	53.98	(79)
Southwest0.9x	0.77	x	1.89	_ ×	44.07]	0.85	x	0.7	=	34.34	(79)
0	0.77	x	1.89	×	31.49	Ī	0.85	×	0.7	=	24.54	(79)
Southwest _{0.9x}	0.11	^										
Southwest0.9x	0.11	^		-		J						
Solar gains in			for each mon			(83)m	ı = Sum(74)m	.(82)m				
Solar gains in (83)m= 85.9	watts, calc	ulated	for each mon 339.95 420.3	3 4	34.69 411.85	(83)m 349	ı = Sum(74)m	. <mark>(82)m</mark> 179.44	4 104.66	72.36]	(83)
Solar gains in (83)m= 85.9 Total gains – i	watts, calc 156.05 2 nternal and	ulated 39.38 d solar	for each mon 339.95 420.3 (84)m = (73)r	3 4 n + (34.69 411.85 83)m , watts	349	n = Sum(74)m .22 273.79	179.44]	
Solar gains in (83)m= 85.9	watts, calc 156.05 2 nternal and	ulated	for each mon 339.95 420.3	3 4 n + (34.69 411.85	1	n = Sum(74)m .22 273.79			72.36 372.62]	(83) (84)
Solar gains in (83)m= 85.9 Total gains – i	watts, calc 156.05 2 nternal and 462.31 5	ulated 39.38 d solar	for each mon 339.95 420.3 (84)m = (73)r 621.9 687.3	3 4 n + (9 6	34.69 411.85 83)m , watts	349	n = Sum(74)m .22 273.79	179.44]	
Solar gains in (83)m= 85.9 Total gains – i (84)m= 393.78 7. Mean inter	watts, calc 156.05 2 nternal and 462.31 5 nal temper	ulated 39.38 d solar 36.28 ature (for each mon 339.95 420.3 (84)m = (73)r 621.9 687.3 heating sease	3 4 m + (9 6 on)	34.69 411.85 83)m , watts	349 596	n = Sum(74)m .22 273.79 .72 528.82	179.44			21	
Solar gains in (83)m= 85.9 Total gains – i (84)m= 393.78 7. Mean inter Temperature	watts, calc 156.05 2 nternal and 462.31 5 nal temper during hea	ulated 39.38 3 solar 36.28 ating pe	for each mon 339.95 420.3 (84)m = (73)r 621.9 687.3 heating sease	3 4 m + (9 6 on)	34.69 411.85 83)m , watts 87.16 654.66 area from Tal	349 596	n = Sum(74)m .22 273.79 .72 528.82	179.44			21	(84)
Solar gains in (83)m= 85.9 Total gains – i (84)m= 393.78 7. Mean inter Temperature	watts, calc 156.05 2 nternal and 462.31 5 nal temper during hea	ulated 39.38 3 solar 36.28 ating pe	for each mon 339.95 420.3 (84)m = (73)r 621.9 687.3 heating seaso eriods in the li	3 4 n + (9 6 on) ving ,m (s	34.69 411.85 83)m , watts 87.16 654.66 area from Tal	349 596 ble 9	n = Sum(74)m .22 273.79 .72 528.82	179.44	392.18		21	(84)
Solar gains in (83)m= 85.9 Total gains – i (84)m= 393.78 7. Mean inter Temperature Utilisation fac	watts, calc 156.05 2 nternal and 462.31 5 nal temper during hea ctor for gair Feb	ulated 39.38 d solar 36.28 rature (ating pe	for each mon 339.95 420.3 (84)m = (73)r 621.9 687.3 heating sease eriods in the li ving area, h1	3 4 m + (9 6 on) ving ,m (s y	34.69 411.85 83)m , watts 87.16 654.66 area from Tal see Table 9a)	349 596 ble 9	a = Sum(74)m .22 273.79 .72 528.82 , Th1 (°C) ug Sep	179.44	392.18	372.62	21	(84)
Solar gains in (83)m= 85.9 Total gains – i (84)m= 393.78 7. Mean inter Temperature Utilisation fac (86)m= 0.99	watts, calc 156.05 2 nternal and 462.31 5 nal temper during hea ctor for gair Feb 0.99	ulated 39.38 d solar 36.28 ating pe ating pe as for li Mar 0.98	for each mon 339.95 420.3 (84)m = (73)r 621.9 687.3 heating sease eriods in the li ving area, h1 Apr Ma 0.94 0.87	3 4 m + (9 6 on) ving ,m (s y	34.69 411.85 83)m , watts 87.16 654.66 area from Tal see Table 9a) Jun Jul	349 596 ble 9 Ai	a = Sum(74)m .22 273.79 .72 528.82 , Th1 (°C) ug Sep 57 0.86	179.44 449.6 Oct	392.18	372.62 Dec	21	(84)
Solar gains in (83)m= 85.9 Total gains – i (84)m= 393.78 7. Mean inter Temperature Utilisation fac (86)m= 0.99	watts, calc 156.05 2 nternal and 462.31 5 nal temper during hea ctor for gair Feb 0.99	ulated 39.38 d solar 36.28 ating pe ating pe as for li Mar 0.98	for each mon 339.95 420.3 (84)m = (73)r 621.9 687.3 heating sease eriods in the li ving area, h1 Apr Ma 0.94 0.87	3 4 m + (9 6 on) ving ,m (s y	34.69 411.85 83)m , watts 87.16 654.66 area from Tal see Table 9a) Jun Jul 0.75 0.62	349 596 ble 9 Ai	a = Sum(74)m .22 273.79 .72 528.82 , Th1 (°C) ug Sep 57 0.86 Table 9c)	179.44 449.6 Oct	392.18	372.62 Dec	21	(84)

Temp	erature	during h	neating p	eriods ir	n rest of	dwelling	from Ta	ble 9, T	h2 (°C)					
=m(88)	19.11	19.12	19.13	19.17	19.18	19.22	19.22	19.22	19.2	19.18	19.16	19.14		(88)
Utilisa	ation fac	tor for g	ains for	rest of d	welling,	h2,m (se	e Table	9a)						
(89)m=	0.99	0.98	0.97	0.92	0.81	0.61	0.4	0.47	0.77	0.94	0.98	0.99		(89)
Mean	interna	l temper	ature in	the rest	of dwell	ing T2 (f	ollow ste	eps 3 to 1	7 in Tabl	e 9c)				
(90)m=	19.11	19.12	19.13	19.17	19.18	19.22	19.22	19.22	19.2	19.18	19.16	19.14		(90)
									f	LA = Livin	g area ÷ (4	4) =	0.55	(91)
Mean	interna	l temper	ature (fo	or the wh	ole dwe	lling) = fl	LA x T1	+ (1 – fL	.A) × T2					
(92)m=	20.14	20.15	20.15	20.17	20.17	20.19	20.19	20.19	, 20.18	20.17	20.17	20.16		(92)
Apply	adjustn	nent to t	he mear	internal	temper	ature fro	m Table	4e, whe	ere appro	opriate				
(93)m=	20.14	20.15	20.15	20.17	20.17	20.19	20.19	20.19	20.18	20.17	20.17	20.16		(93)
8. Spa	ace hea	ting requ	uirement	t										
Set Ti to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a														
uie ui	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa			ains, hm		Iviay	Jun	Jui	Aug	Ocp	001	1407	Dee		
(94)m=	0.99	0.99	0.97	0.93	0.85	0.7	0.53	0.59	0.83	0.95	0.99	0.99		(94)
Usefu	I gains,	hmGm	, W = (94	4)m x (84	4)m									
(95)m=	390.39	455.54	520.96	580.75	584.3	478.29	345.99	351.79	437.08	429.22	386.59	369.94		(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)
			an intern	· · ·		î			· /	-				
(97)m=			1531.39			588.64	378.09	397.43	647.42	1035.9	1430.39	1768.19		(97)
-			ement fo	1	1	1	i	1			-	10100		
(98)m=	1048.84	850.6	751.76	464.96	247.44	0	0	0	0	451.37	751.54	1040.3		
								lota	l per year	(kWh/year) = Sum(98	8)15,912 =	5606.81	(98)
Space	e heatin	g require	ement in	kWh/m ²	?/year								116.13	(99)
9a. En	ergy rec	luiremer	nts – Indi	ividual h	eating s	ystems i	ncluding	micro-C	CHP)					
•	e heatir	-			, .							,		-
			at from so			mentary							0	(201)
Fracti	on of sp	ace hea	at from m	nain syst	em(s)			(202) = 1 ·	- (201) =				1	(202)
Fracti	on of to	tal heati	ng from	main sys	stem 1			(204) = (2	02) × [1 – ((203)] =			1	(204)
Efficie	ency of r	main spa	ace heat	ing syste	em 1								318.57	(206)
Efficie	ency of s	seconda	ry/suppl	ementar	y heatin	g systen	ז, %						0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
Space	e heatin	g require	ement (c	alculate	d above)								
	1048.84	850.6	751.76	464.96	247.44	0	0	0	0	451.37	751.54	1040.3		
(211)m	n = {[(98)m x (20	04)] } x 1	00 ÷ (20)6)									(211)
	329.24	267.01	235.98	145.95	77.67	0	0	0	0	141.69	235.91	326.56		
				-				Tota	l (kWh/yea	ar) =Sum(2	2 11) _{15,1012}	=	1760	(211)
Space	e heatin	g fuel (s	econdar	y), kWh/	month									
	<u> </u>		00 ÷ (20	<u>,</u>	·	i	i	·				1		
(215)m=	0	0	0	0	0	0	0	0	0	0	0	0		-
								Tota	I (kWh/yea	ar) =Sum(2	215) _{15,1012}	-	0	(215)

Water heating

-								
Output from water heater (calculated above)		· · ·						
167.18 147.59 155.55 140.2 137.95 1	124.06 119.9	130.52	129.97	145.35	152.73	163.42		_
Efficiency of water heater							178.12	(216)
(217)m= 178.12 178.12 178.12 178.12 178.12 1	178.12 178.12	178.12	178.12	178.12	178.12	178.12		(217)
Fuel for water heating, kWh/month								
$(219)m = (64)m \times 100 \div (217)m$ (219)m = 93.86 82.86 87.33 78.71 77.45 m	69.65 67.31	73.28	72.96	81.6	85.74	91.74		
(213)11- 33.00 02.00 01.33 10.11 11.43	03.00 07.01			19a) ₁₁₂ =	05.74	51.74	962.48	(219)
Annual totals					Nh/year		kWh/year	
Space heating fuel used, main system 1				n.	will y cai		1760]
Water heating fuel used							962.48	Ī
Electricity for pumps, fans and electric keep-hot								J
Total electricity for the above, kWh/year		sum of	f (230a).	(230g) =			0	(231)
Electricity for lighting							224.78	(232)
Total delivered energy for all uses (211)(221) +	. (231) + (232)	(237h) -	_				2947.26	(338)
5,	((2370) –	-				2947.20	(000)
12a. CO2 emissions – Individual heating system		. ,	-				2947.20](000)
	ns including m Energy	icro-CHP	-		ion fac	tor	Emissions].
	ns including m	icro-CHP	-	Emiss kg CO2		tor].
	ns including m Energy	icro-CHP	-		2/kWh	tor =	Emissions].
12a. CO2 emissions – Individual heating system	ns including m Energy kWh/year	icro-CHP	-	kg CO	2/kWh		Emissions kg CO2/yea	ur
12a. CO2 emissions – Individual heating system Space heating (main system 1)	Energy kWh/year (211) x	icro-CHP	-	kg CO2	2/kWh	=	Emissions kg CO2/yea 913.44	ır](261)
12a. CO2 emissions – Individual heating system Space heating (main system 1) Space heating (secondary)	Energy kWh/year (211) x (215) x (219) x	icro-CHP		kg CO2	2/kWh	=	Emissions kg CO2/yea 913.44 0	r](261)](263)
12a. CO2 emissions – Individual heating system Space heating (main system 1) Space heating (secondary) Water heating	Energy kWh/year (211) x (215) x (219) x	icro-CHP		kg CO2	2/kWh 19 19	=	Emissions kg CO2/yea 913.44 0 499.53	r](261)](263)](264)
12a. CO2 emissions – Individual heating system Space heating (main system 1) Space heating (secondary) Water heating Space and water heating	Energy kWh/year (211) x (215) x (219) x (261) + (262)	icro-CHP		kg CO2	2/kWh 19 19 19	= =	Emissions kg CO2/yea 913.44 0 499.53 1412.97	r](261)](263)](264)](265)
12a. CO2 emissions – Individual heating system Space heating (main system 1) Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric keep-hot	Energy kWh/year (211) x (215) x (219) x (261) + (262) (231) x	icro-CHP	64) =	kg CO2	2/kWh 19 19 19 19	= = =	Emissions kg CO2/yea 913.44 0 499.53 1412.97 0	r](261)](263)](264)](265)](265)
12a. CO2 emissions – Individual heating system Space heating (main system 1) Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric keep-hot Electricity for lighting	Energy kWh/year (211) x (215) x (219) x (261) + (262) (231) x	icro-CHP	64) =	kg CO2 0.5 0.5 0.5 0.5 (265)(2	2/kWh 19 19 19 19	= = =	Emissions kg CO2/yea 913.44 0 499.53 1412.97 0 116.66	r](261)](263)](264)](265)](265)](267)](268)
12a. CO2 emissions – Individual heating system Space heating (main system 1) Space heating (secondary) Water heating Space and water heating Electricity for pumps, fans and electric keep-hot Electricity for lighting Total CO2, kg/year	Energy kWh/year (211) x (215) x (219) x (261) + (262) (231) x	icro-CHP	64) = sum of	kg CO2 0.5 0.5 0.5 0.5 (265)(2	2/kWh 19 19 19 19	= = =	Emissions kg CO2/yea 913.44 0 499.53 1412.97 0 1116.66 1529.63	r](261)](263)](264)](265)](267)](268)](268)](272)

inted on 23 Novem			a FSAP 2012 program, Vei	SION. 1.0.5.50	
Project Information:					
ssessed By:	leil Ingham (STR	O010943)	Building Type:	Flat	
welling Details:					
EW DWELLING DE	SIGN STAGE		Total Floor Area: 5	5.35m²	
te Reference : 1	1-12 Grenville St	reet - GREEN	Plot Reference:	Unit 5	
ddress :					
Client Details:					
ame:					
dress :					
	tems included w	vithin the SAP calculations.			
is not a complete					
a TER and DER		• 			
el for main heating	system: Electrici	ty			
el factor: 1.55 (elec	•	-			
arget Carbon Dioxid		. ,	30.8 kg/m ²		
welling Carbon Dio		. ,	31.15 kg/m²		Fail
cess emissions = ()			
b TFEE and DFEE					
arget Fabric Energy	Efficiency (TFEE	-)	57.1 kWh/m²		
• • • •	• •				
welling Fabric Energy	• •		102.4 kWh/m ²		Fail
welling Fabric Energy	gy Efficiency (DF	ËE)			Fail
• • • •	gy Efficiency (DF	ËE)			Fail
welling Fabric Energy cess energy = 45.	gy Efficiency (DF	ÉE))	102.4 kWh/m²		Fail
welling Fabric Energ ccess energy = 45. Fabric U-values	gy Efficiency (DFI 29 kg/m² (79.3 %	ËE)			Fail
welling Fabric Energ ccess energy = 45. Fabric U-values Element	gy Efficiency (DFI 29 kg/m² (79.3 %	EE)) Average	102.4 kWh/m² Highest		
welling Fabric Energy ccess energy = 45. Fabric U-values Element External wal	gy Efficiency (DFI 29 kg/m² (79.3 %	EE)) Average 0.28 (max. 0.30)	102.4 kWh/m² Highest		ОК
welling Fabric Energy ccess energy = 45. Fabric U-values Element External wall Party wall Floor Roof	gy Efficiency (DFI 29 kg/m² (79.3 %	EE) Average 0.28 (max. 0.30) 0.00 (max. 0.20) (no floor) 0.11 (max. 0.20)	102.4 kWh/m² Highest 0.30 (max. 0.70) - 0.14 (max. 0.35)		ок ок ок
welling Fabric Energy ccess energy = 45. Fabric U-values Element External wal Party wall Floor Roof Openings	gy Efficiency (DFI 29 kg/m² (79.3 %	EE) Average 0.28 (max. 0.30) 0.00 (max. 0.20) (no floor)	102.4 kWh/m² Highest 0.30 (max. 0.70) -		ОК ОК
welling Fabric Energy ccess energy = 45. Fabric U-values Element External wal Party wall Floor Roof Openings	gy Efficiency (DFI 29 kg/m² (79.3 % I I	EE) Average 0.28 (max. 0.30) 0.00 (max. 0.20) (no floor) 0.11 (max. 0.20) 4.18 (max. 2.00)	102.4 kWh/m² Highest 0.30 (max. 0.70) - 0.14 (max. 0.35) 4.80 (max. 3.30)		ок ок ок
welling Fabric Energy ccess energy = 45. Fabric U-values Element External wall Floor Roof Openings a Thermal bridgin Thermal bridgin	gy Efficiency (DFI 29 kg/m² (79.3 % I I	EE) Average 0.28 (max. 0.30) 0.00 (max. 0.20) (no floor) 0.11 (max. 0.20)	102.4 kWh/m² Highest 0.30 (max. 0.70) - 0.14 (max. 0.35) 4.80 (max. 3.30)		ок ок ок
welling Fabric Energy ccess energy = 45. Fabric U-values Element External wal Party wall Floor Roof Openings a Thermal bridgin Thermal bridgin	gy Efficiency (DFI 29 kg/m² (79.3 % I I g Iging calculated u	EE) Average 0.28 (max. 0.30) 0.00 (max. 0.20) (no floor) 0.11 (max. 0.20) 4.18 (max. 2.00)	102.4 kWh/m² Highest 0.30 (max. 0.70) - 0.14 (max. 0.35) 4.80 (max. 3.30) 0.15		ок ок ок
welling Fabric Energy ccess energy = 45. Fabric U-values Element External wal Party wall Floor Roof Openings a Thermal bridgin Thermal bridgin Air permeability Air permeability	gy Efficiency (DFI 29 kg/m² (79.3 % I I	EE) Average 0.28 (max. 0.30) 0.00 (max. 0.20) (no floor) 0.11 (max. 0.20) 4.18 (max. 2.00)	102.4 kWh/m ² Highest 0.30 (max. 0.70) - 0.14 (max. 0.35) 4.80 (max. 3.30) 0.15 10.00 (design va	lue)	OK OK Fail
welling Fabric Energy ccess energy = 45. Fabric U-values Element External wal Party wall Floor Roof Openings a Thermal bridgin Thermal bridgin Air permeability Air permeabilit Maximum	gy Efficiency (DFI 29 kg/m² (79.3 % I I I I I I I I J J J J J J J J J J J	EE) Average 0.28 (max. 0.30) 0.00 (max. 0.20) (no floor) 0.11 (max. 0.20) 4.18 (max. 2.00)	102.4 kWh/m² Highest 0.30 (max. 0.70) - 0.14 (max. 0.35) 4.80 (max. 3.30) 0.15	lue)	ок ок ок
welling Fabric Energy (cess energy = 45. Fabric U-values Element External wall Party wall Floor Roof Openings a Thermal bridgin Thermal bridgin Chermeability Air permeability Maximum Heating efficienc	gy Efficiency (DFI 29 kg/m² (79.3 % I I g g g g g g g g g g g g g g g g g	EE) Average 0.28 (max. 0.30) 0.00 (max. 0.20) (no floor) 0.11 (max. 0.20) 4.18 (max. 2.00)	102.4 kWh/m ² Highest 0.30 (max. 0.70) - 0.14 (max. 0.35) 4.80 (max. 3.30) 0.15 10.00 (design va	lue)	OK OK Fail
welling Fabric Energy ccess energy = 45. Fabric U-values Element External wal Party wall Floor Roof Openings a Thermal bridgin Thermal bridgin Air permeability Air permeabilit Maximum	gy Efficiency (DFI 29 kg/m² (79.3 % I I g g g g g g g g g g g g g g g g g	EE) Average 0.28 (max. 0.30) 0.00 (max. 0.20) (no floor) 0.11 (max. 0.20) 4.18 (max. 2.00) Using user-specified y-value of	102.4 kWh/m² Highest 0.30 (max. 0.70) - 0.14 (max. 0.35) 4.80 (max. 3.30) 0.15 10.00 (design va 10.0		OK OK Fail
welling Fabric Energy (cess energy = 45. Fabric U-values Element External wall Party wall Floor Roof Openings a Thermal bridgin Thermal bridgin Chermeability Air permeability Maximum Heating efficienc	gy Efficiency (DFI 29 kg/m² (79.3 % I I g g g g g g g g g g g g g g g g g	Average 0.28 (max. 0.30) 0.00 (max. 0.20) (no floor) 0.11 (max. 0.20) 4.18 (max. 2.00) Using user-specified y-value of	102.4 kWh/m² Highest 0.30 (max. 0.70) - 0.14 (max. 0.35) 4.80 (max. 3.30) 0.15 10.00 (design va 10.0		OK OK Fail
welling Fabric Energy (cess energy = 45. Fabric U-values Element External wall Party wall Floor Roof Openings a Thermal bridgin Thermal bridgin Chermeability Air permeability Maximum Heating efficienc	gy Efficiency (DFI 29 kg/m² (79.3 % I I g g g g g g g g g g g g g g g g g	EE) Average 0.28 (max. 0.30) 0.00 (max. 0.20) (no floor) 0.11 (max. 0.20) 4.18 (max. 2.00) Using user-specified y-value of	102.4 kWh/m² Highest 0.30 (max. 0.70) - 0.14 (max. 0.35) 4.80 (max. 3.30) 0.15 10.00 (design va 10.0		OK OK Fail
welling Fabric Energy (cess energy = 45. Fabric U-values Element External wall Party wall Floor Roof Openings a Thermal bridgin Thermal bridgin Chermeability Air permeability Maximum Heating efficienc	gy Efficiency (DFI 29 kg/m² (79.3 % I I g g g g g g g g g g g g g g g g g	Average 0.28 (max. 0.30) 0.00 (max. 0.20) (no floor) 0.11 (max. 0.20) 4.18 (max. 2.00) Using user-specified y-value of	102.4 kWh/m² Highest 0.30 (max. 0.70) - 0.14 (max. 0.35) 4.80 (max. 3.30) 0.15 10.00 (design va 10.0		OK OK Fail
welling Fabric Energy (cess energy = 45. Fabric U-values Element External wall Party wall Floor Roof Openings a Thermal bridgin Thermal bridgin Chermeability Air permeability Maximum Heating efficienc	gy Efficiency (DFI 29 kg/m² (79.3 % I I g dging calculated u y at 50 pascals y system:	Average 0.28 (max. 0.30) 0.00 (max. 0.20) (no floor) 0.11 (max. 0.20) 4.18 (max. 2.00) Using user-specified y-value of	102.4 kWh/m² Highest 0.30 (max. 0.70) - 0.14 (max. 0.35) 4.80 (max. 3.30) 0.15 10.00 (design va 10.0		OK OK Fail

Hot water Storage:

	Measured cylinder loss Permitted by DBSCG: 2		ОК
Primary pipework insulated:	Yes	2.10 KWI/day	OK
6 Controls			
Space heating controls	TTZC by plumbing and	electrical services	ОК
Hot water controls:	Cylinderstat		OK
	Independent timer for D	OHW	OK
Boiler interlock:	Yes		OK
7 Low energy lights			
Percentage of fixed lights with l	ow-energy fittings	100.0%	
Minimum		75.0%	OK
8 Mechanical ventilation			
Not applicable			
9 Summertime temperature			
Overheating risk (Thames valle	y):	Not significant	OK
Based on:			
Overshading:		Average or unknown	
Windows facing: North East		3.5m ²	
Windows facing: South East		1.95m ²	
Windows facing: South West		5.4m ²	
Ventilation rate:		8.00	
10 Key features			
Roofs U-value		0.1 W/m²K	
Party Walls U-value		0 W/m²K	

			User D	etails:						
Assessor Name:	Neil Ingham		:	Stroma	a Num	ber:		STRO	010943	
Software Name:	Stroma FSAP 20	12	:	Softwa	are Ver	sion:		Versio	on: 1.0.5.50	
		Pr	operty A	ddress:	Unit 5					
Address :										
1. Overall dwelling dime	nsions:		•	(0)						
Ground floor			Area		(1a) x	Av. Hei	ight(m) 2.6	(2a) =	Volume(m ³) 143.91	(3a)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1	e)+(1n)) 55	5.35	(4)					
Dwelling volume					(3a)+(3b)	+(3c)+(3d)+(3e)+	.(3n) =	143.91	(5)
2. Ventilation rate:									<u> </u>	
Number of chimneys	main heating 0 +	secondary heating 0	/ · ·	0 0] = [total	x 4	40 =	m ³ per hour	(6a)
Number of open flues	0 +	0] + [0] = [0	x 2	20 =	0	(6b)
Number of intermittent far	าร		J <u> </u>			3	× ′	10 =	30	(7a)
Number of passive vents						0	x ^	10 =	0	(7b)
Number of flueless gas fir	es					0	x 4	40 =	0	(7c)
					L			Air ch	anges per ho	 r
Infiltration due to obimpo	in fluor and fana	(6a) J (6b) J (7a) . (7b) . (7	7c) -	Г			1		-
Infiltration due to chimney If a pressurisation test has be					continue fro	30 om (9) to (÷ (5) =	0.21	(8)
Number of storeys in th		.,					,		0	(9)
Additional infiltration							[(9)-	-1]x0.1 =	0	(10)
Structural infiltration: 0.					•	uction			0	(11)
if both types of wall are pro- deducting areas of openin		esponding to	the greate	er wall area	a (after					
If suspended wooden fl	• / /	aled) or 0.1	l (seale	d), else	enter 0				0	(12)
If no draught lobby, ent	er 0.05, else enter 0								0	(13)
Percentage of windows	and doors draught	stripped							0	(14)
Window infiltration			(0.25 - [0.2	x (14) ÷ 1	= [00			0	(15)
Infiltration rate					+ (11) + (1	<i>·</i> · · <i>·</i>			0	(16)
Air permeability value,			•	•	•	etre of e	nvelope	area	10	(17)
If based on air permeabili	•								0.71	(18)
Air permeability value applies Number of sides sheltered		as been done	e or a deg	ree air pei	meability i	is being us	sed			
Shelter factor	u			(20) = 1 - [0.075 x (1	9)] =			0	(19) (20)
Infiltration rate incorporati	ng shelter factor			(21) = (18)	x (20) =				0.71	(21)
Infiltration rate modified for	-	ed							0.71	
r	Mar Apr May	- I I	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind spe	eed from Table 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]	

Adjust	ed infiltra	ation rat	e (allowi	ng for sh	nelter an	d wind s	speed) =	= (21a) x	(22a)m					
	0.9	0.89	0.87	0.78	0.76	0.67	0.67	0.66	0.71	0.76	0.8	0.83		
			change i	rate for t	he appli	cable ca	se		-	•	-			
	echanica		using Appe	andix NL (2	2h) _ (22a) v Emv (c	austion (nuico (22h	(22a)		l	0	(23a)
			overy: effici)) = (23a)		l	0	(23b)
			•		Ũ		,		,			(00 v)	0	(23c)
	i		1	ntilation		at recove	ery (IVI V	$\frac{\text{HR}}{1}$ (24a	a m = (2)	1	23b) × [1 – (23c)	÷ 100]	(24a)
(24a)m=		-	0	÷	0	-				0	-	0		(24a)
,			anical ve			· · · · ·	<u> </u>	1	ŕ	т <u>́</u> т	<u>, </u>			(24b)
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0		(240)
,			tract ven < (23b), t		•	•				5 x (23h)			
(24c)m=		0	0	0	0			$\frac{1}{0}$,, 0	0		(24c)
		-	on or wh		Ţ			-	-		, î			
,			en (24d)		•	•				0.5]				
(24d)m=	0.91	0.89	0.88	0.8	0.79	0.73	0.73	0.71	0.75	0.79	0.82	0.85		(24d)
Effe	ctive air	change	rate - er	nter (24a) or (24b	o) or (24	c) or (24	1d) in bo	x (25)	•				
(25)m=	0.91	0.89	0.88	0.8	0.79	0.73	0.73	0.71	0.75	0.79	0.82	0.85		(25)
3 Ho	at losso	s and he	eat loss p	aramete	ar.					-		-		
ELEN		Gros		Openin		Net Ar	ea	U-val	ue	AXU		k-value		AXk
		area		m		A ,r		W/m2		(W/I	K)	kJ/m²·ł		kJ/K
Doors						2.59	x	1.6	=	4.144				(26)
Windo	ws Type	1				3.5	x1	/[1/(4.8)+	0.04] =	14.09				(27)
Windo	ws Type	2				1.95	x1	/[1/(4.8)+	0.04] =	7.85				(27)
Windo	ws Type	3				5.4		/[1/(4.8)+	0.04] =	21.74				(27)
Walls	Гуре1	53.8	36	8.9		44.96	3 X	0.3	=	13.49				(29)
Walls -	Гуре2	16.0)6	2.59		13.47	7 X	0.22		3.01	i F		$\overline{}$	(29)
Walls	ГуреЗ	3.9	4	1.95		1.99	x	0.28	=	0.56	i F		\neg	(29)
Roof -	Гуре1	37.	6	0		37.6	x	0.1	=	3.76			i –	(30)
Roof -	Гуре2	5.3	3	0		5.33	×	0.14		0.75			\dashv	(30)
Roof -		13.0		0		13.05		0.14		1.83			\exists	(30)
	irea of e					129.8					I			(31)
Party v			,			51.22		0		0				(32)
Party f						55.35		0		0	I [(32a)
* for win	dows and		ows, use e sides of in			alue calcula		g formula 1	/[(1/U-valu	ue)+0.04] a	l as given in	n paragraph	3.2	(024)
			= S (A x					(26)(30) + (32) =				71.23	(33)
	apacity			· /						(30) + (32	2) + (32a).	(32e) =	5699.97	
			eter (TMF	P = Cm -	- TFA) ir	n kJ/m²K				ative Value		` '	250	(35)
For desi	gn assess	ments wh	nere the de tailed calcu	tails of the				recisely the				able 1f	200	(00)
			x Y) cal		using Ap	pendix ł	<					[19.48	(36)

	s of therma abric he		are not kn	own (36) =	= 0.05 x (3	1)			(33) +	(36) =			90.7	(37)
			alculated	d monthly	v					= 0.33 × (25)m x (5)		50.7	(0.)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m=	43.12	42.37	41.63	38.17	37.52	34.5	34.5	33.94	35.66	37.52	38.83	40.2		(38)
Heat t	ransfer o	coefficie	nt. W/K						(39)m	= (37) + (3	38)m		1	
(39)m=	133.82	133.07	132.33	128.87	128.22	125.2	125.2	124.64	126.37	128.22	129.53	130.9		
	L	I	ļ	!	I	!	ļ	1	!	Average =	Sum(39)1.	12 /12=	128.87	(39)
Heat lo	oss para	meter (H	HLP), W	/m²K				-	(40)m	= (39)m ÷	(4)			
(40)m=	2.42	2.4	2.39	2.33	2.32	2.26	2.26	2.25	2.28	2.32	2.34	2.36		_
Numb	er of day	/s in mo	nth (Tab	le 1a)	-					Average =	Sum(40)1.	12 /12=	2.33	(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 hea	ting ene	rgy requ	irement:								kWh/ye	ear:	
		Ŭ											1	
		וµpancy, א ח – 1		[1 - exp	(-0 000?	849 x (TI	- ΞΔ -13 9))2)] + 0.0	0013 x (TFA -13		85		(42)
	A £ 13.				(0.0000	/	71 10.0	//_/] · o.			0)			
								(25 x N)				.08		(43)
		-	hot water person pel			-	-	to achieve	a water u	se target o	t			
			1	- · ·			·	A	Can	Ort	Nev	Dee	1	
Hot wat	Jan er usage i	Feb n litres per	Mar Mar day for ea	Apr ach month	May Vd.m = fa	Jun	Jul Table 1c x	Aug (43)	Sep	Oct	Nov	Dec		
(44)m=	85.89	82.77	79.64	76.52	73.4	70.27	70.27	73.4	76.52	79.64	82.77	85.89	1	
(44)11=	05.09	02.11	79.04	70.52	73.4	10.21	10.21	73.4		Total = Su			936.97	(44)
Energy	content of	hot water	used - cal	culated m	onthly $= 4$.	190 x Vd,ı	m x nm x L	DTm / 3600			· · ·		330.37	()
(45)m=	127.37	111.4	114.95	100.22	96.16	82.98	76.89	88.24	89.29	104.06	113.59	123.35		_
lf instan	tanoous w	ator hooti	na ot point	f uso (n	hot wata	r storago)	ontor 0 in	boxes (46		Total = Su	m(45) ₁₁₂ =	-	1228.51	(45)
			- ·					1	1				1	(40)
(46)m= Water	19.11 storage	16.71 IOSS:	17.24	15.03	14.42	12.45	11.53	13.24	13.39	15.61	17.04	18.5		(46)
Storag	je volum	e (litres)) includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		180		(47)
If com	munity h	eating a	and no ta	nk in dw	velling, e	nter 110) litres in	n (47)						
Otherv	vise if no	o stored	hot wate	er (this ir	ncludes i	nstantar	neous co	ombi boil	ers) ente	ər '0' in (47)			
	storage												1	
			eclared I		or is kno	wn (kWł	n/day):				1.	47		(48)
			m Table								0.	54		(49)
-			storage					(48) x (49) =		0.	79		(50)
			eclared of factor fr	•								0		(51)
		-	ee secti			.,	~J /					0	l	(31)
	-	from Ta		-								0		(52)
Tempe	erature f	actor fro	m Table	2b								0		(53)
Energ	y lost fro	m water	[.] storage	, kWh/ye	ear			(47) x (51) x (52) x (53) =		0		(54)
Enter	(50) or	(54) in (5	55)								0.	79		(55)

Water	storage	loss cal	culated f	for each	month			((56)m = (55) × (41)	m			
(56)m=	24.61	22.23	24.61	23.81	24.61	23.81	24.61	24.61	23.81	24.61	23.81	24.61	(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=	24.61	22.23	24.61	23.81	24.61	23.81	24.61	24.61	23.81	24.61	23.81	24.61	(57)
Primar	y circuit	loss (ar	nual) fro	om Table	e 3						-	0	(58)
	•	•	,	for each		59)m = ((58) ÷ 36	5 × (41)	m				
(mo	dified by	factor f	rom Tab	le H5 if t	here is s	solar wat	er heatii	ng and a	cylinde	r thermo	stat)		
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26	(59)
Combi	loss ca	lculated	for each	month	(61)m =	(60) ÷ 36	65 × (41))m					
(61)m=	0	0	0	0	0	0	0	0	0	0	0	0	(61)
Total h	neat requ	uired for	water he	eating ca	alculated	l for eac	h month	(62)m =	0.85 × ((45)m +	(46)m +	(57)m +	(59)m + (61)m
(62)m=	175.24	154.64	162.82	146.55	144.03	129.31	124.76	136.11	135.62	151.93	159.92	171.22	(62)
			• • •	endix G o				, ,		r contributi	ion to wate	er heating)	
(add a	dditiona	l lines if	FGHRS	and/or \	NWHRS	applies	, see Ap	pendix (G)		-		
(63)m=	0	0	0	0	0	0	0	0	0	0	0	0	(63)
Output	t from w	ater hea	ter			-	-		-				
(64)m=	175.24	154.64	162.82	146.55	144.03	129.31	124.76	136.11	135.62	151.93	159.92	171.22	
								Outp	out from wa	ater heatei	r (annual)₁	12	1792.15 (64)
Heat g	ains fro	m water	heating,	, kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)m	n] + 0.8 >	(46)m	+ (57)m	+ (59)m]
(65)m=	80.65	71.63	76.52	70.38	70.27	64.65	63.86	67.64	66.75	72.9	74.83	79.31	(65)
inclu	ude (57)	m in calo	culation	of (65)m	only if c	ylinder i	s in the o	dwelling	or hot w	ater is fr	om com	munity h	eating
5. Int	ternal ga	ains (see	e Table 5	5 and 5a):								
Metab	olic gain	is (Table	5) Wat	4									
	Jan		<u>, 5), vvai</u>	ts									
(66)m=		Feb	Mar	Apr	Мау	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	92.38	Feb 92.38			May 92.38	Jun 92.38	Jul 92.38	Aug 92.38	Sep 92.38	Oct 92.38	Nov 92.38	Dec 92.38	(66)
Lightin		92.38	Mar ^{92.38} ted in Ap	Apr 92.38 opendix	92.38	92.38	92.38	92.38	92.38				(66)
-	lg gains	92.38	Mar ^{92.38} ted in Ap	Apr 92.38 opendix	92.38	92.38	92.38	92.38	92.38				(66) (67)
(67)m=	g gains 14.36	92.38 (calcula 12.76	Mar 92.38 ted in Ap 10.38	Apr 92.38 opendix	92.38 L, equat 5.87	92.38 ion L9 o 4.96	92.38 r L9a), a 5.36	92.38 Iso see 6.96	92.38 Table 5 9.35	92.38 11.87	92.38	92.38	
(67)m= Applia	g gains 14.36	92.38 (calcula 12.76	Mar 92.38 ted in Ap 10.38	Apr 92.38 opendix 7.86	92.38 L, equat 5.87	92.38 ion L9 o 4.96	92.38 r L9a), a 5.36	92.38 Iso see 6.96	92.38 Table 5 9.35	92.38 11.87	92.38	92.38	
(67)m= Appliar (68)m=	nces ga 161.09	92.38 (calcula 12.76 ins (calc 162.76	Mar 92.38 ted in Ap 10.38 ulated ir 158.55	Apr 92.38 opendix 7.86 Append	92.38 L, equat 5.87 dix L, eq 138.26	92.38 ion L9 of 4.96 uation L 127.62	92.38 r L9a), a 5.36 13 or L1 120.51	92.38 Iso see 6.96 3a), also 118.84	92.38 Table 5 9.35 9 see Ta 123.05	92.38 11.87 ble 5 132.02	92.38 13.85	92.38 14.76	(67)
(67)m= Appliar (68)m=	nces ga 161.09	92.38 (calcula 12.76 ins (calc 162.76	Mar 92.38 ted in Ap 10.38 ulated ir 158.55	Apr 92.38 opendix 7.86 Append 149.58	92.38 L, equat 5.87 dix L, eq 138.26	92.38 ion L9 of 4.96 uation L 127.62	92.38 r L9a), a 5.36 13 or L1 120.51	92.38 Iso see 6.96 3a), also 118.84	92.38 Table 5 9.35 9 see Ta 123.05	92.38 11.87 ble 5 132.02	92.38 13.85	92.38 14.76	(67)
(67)m= Applian (68)m= Cookir (69)m=	g gains 14.36 nces ga 161.09 ng gains 32.24	92.38 (calcula 12.76 ins (calc 162.76 (calcula	Mar 92.38 ted in Ap 10.38 ulated in 158.55 ted in A 32.24	Apr 92.38 opendix 7.86 Appendix 149.58 ppendix 32.24	92.38 L, equat 5.87 dix L, eq 138.26 L, equat	92.38 ion L9 o 4.96 uation L 127.62 ion L15	92.38 r L9a), a 5.36 13 or L1 120.51 or L15a)	92.38 Iso see 6.96 3a), also 118.84 , also se	92.38 Table 5 9.35 9 see Ta 123.05 ee Table	92.38 11.87 ble 5 132.02 5	92.38 13.85 143.34	92.38 14.76 153.98	(67)
(67)m= Applian (68)m= Cookir (69)m=	g gains 14.36 nces ga 161.09 ng gains 32.24	92.38 (calcula 12.76 ins (calc 162.76 (calcula 32.24	Mar 92.38 ted in Ap 10.38 ulated in 158.55 ted in A 32.24	Apr 92.38 opendix 7.86 Appendix 149.58 ppendix 32.24	92.38 L, equat 5.87 dix L, eq 138.26 L, equat	92.38 ion L9 o 4.96 uation L 127.62 ion L15	92.38 r L9a), a 5.36 13 or L1 120.51 or L15a)	92.38 Iso see 6.96 3a), also 118.84 , also se	92.38 Table 5 9.35 9 see Ta 123.05 ee Table	92.38 11.87 ble 5 132.02 5	92.38 13.85 143.34	92.38 14.76 153.98	(67)
(67)m= Applia (68)m= Cookir (69)m= Pumps (70)m=	g gains 14.36 nces ga 161.09 ng gains 32.24 s and far 0	92.38 (calcula 12.76 ins (calc 162.76 (calcula 32.24 ns gains 0	Mar 92.38 ted in Ap 10.38 ulated in 158.55 ted in A 32.24 (Table 5 0	Apr 92.38 opendix 7.86 Appendix 149.58 ppendix 32.24 5a)	92.38 L, equat 5.87 dix L, eq 138.26 L, equat 32.24	92.38 ion L9 of 4.96 uation L 127.62 ion L15 32.24	92.38 r L9a), a 5.36 13 or L1 120.51 or L15a) 32.24	92.38 Iso see 6.96 3a), also 118.84 , also se 32.24	92.38 Table 5 9.35 9 see Ta 123.05 9 Table 32.24	92.38 11.87 ble 5 132.02 5 32.24	92.38 13.85 143.34 32.24	92.38 14.76 153.98 32.24	(67) (68) (69)
(67)m= Applia (68)m= Cookir (69)m= Pumps (70)m=	g gains 14.36 nces ga 161.09 ng gains 32.24 s and far 0	92.38 (calcula 12.76 ins (calc 162.76 (calcula 32.24 ns gains 0	Mar 92.38 ted in Ap 10.38 ulated in 158.55 ted in A 32.24 (Table 5 0	Apr 92.38 opendix 7.86 Appendix 149.58 ppendix 32.24 5a) 0	92.38 L, equat 5.87 dix L, eq 138.26 L, equat 32.24	92.38 ion L9 of 4.96 uation L 127.62 ion L15 32.24	92.38 r L9a), a 5.36 13 or L1 120.51 or L15a) 32.24	92.38 Iso see 6.96 3a), also 118.84 , also se 32.24	92.38 Table 5 9.35 9 see Ta 123.05 9 Table 32.24	92.38 11.87 ble 5 132.02 5 32.24	92.38 13.85 143.34 32.24	92.38 14.76 153.98 32.24	(67) (68) (69)
(67)m= Applia (68)m= Cookir (69)m= Pumps (70)m= Losses (71)m=	g gains 14.36 nces ga 161.09 ng gains 32.24 s and far 0 s e.g. ev -73.9	92.38 (calcula 12.76 ins (calc 162.76 (calcula 32.24 ns gains 0 raporatic	Mar 92.38 ted in Ap 10.38 ulated in 158.55 ted in A 32.24 (Table 5 0 n (negation) -73.9	Apr 92.38 opendix 7.86 Appendix 149.58 ppendix 32.24 5a) 0 tive valu	92.38 L, equat 5.87 dix L, eq 138.26 L, equat 32.24 0 es) (Tab	92.38 ion L9 of 4.96 uation L 127.62 ion L15 32.24 0 le 5)	92.38 r L9a), a 5.36 13 or L1 120.51 or L15a) 32.24 0	92.38 Iso see 6.96 3a), also 118.84 , also se 32.24	92.38 Table 5 9.35 9 see Ta 123.05 9 Table 32.24 0	92.38 11.87 ble 5 132.02 5 32.24 0	92.38 13.85 143.34 32.24 0	92.38 14.76 153.98 32.24 0	(67) (68) (69) (70)
(67)m= Applia (68)m= Cookir (69)m= Pumps (70)m= Losses (71)m=	g gains 14.36 nces ga 161.09 ng gains 32.24 s and far 0 s e.g. ev -73.9	92.38 (calcula 12.76 ins (calc 162.76 (calcula 32.24 ns gains 0 raporatic -73.9	Mar 92.38 ted in Ap 10.38 ulated in 158.55 ted in A 32.24 (Table 5 0 n (negation) -73.9	Apr 92.38 opendix 7.86 Appendix 149.58 ppendix 32.24 5a) 0 tive valu	92.38 L, equat 5.87 dix L, eq 138.26 L, equat 32.24 0 es) (Tab	92.38 ion L9 of 4.96 uation L 127.62 ion L15 32.24 0 le 5)	92.38 r L9a), a 5.36 13 or L1 120.51 or L15a) 32.24 0	92.38 Iso see 6.96 3a), also 118.84 , also se 32.24	92.38 Table 5 9.35 9 see Ta 123.05 9 Table 32.24 0	92.38 11.87 ble 5 132.02 5 32.24 0	92.38 13.85 143.34 32.24 0	92.38 14.76 153.98 32.24 0	(67) (68) (69) (70)
(67)m= Applia (68)m= Cookir (69)m= Pumps (70)m= Losses (71)m= Water (72)m=	g gains 14.36 nces ga 161.09 ng gains 32.24 s and fai 0 s e.g. ev -73.9 heating 108.4	92.38 (calcula 12.76 ins (calc 162.76 (calcula 32.24 ns gains 0 raporatic -73.9 gains (T	Mar 92.38 ted in Ap 10.38 ulated in 158.55 ted in A 32.24 (Table 5 0 n (nega -73.9 fable 5) 102.85	Apr 92.38 opendix 7.86 Appendix 149.58 ppendix 32.24 5a) 0 tive valu -73.9	92.38 L, equat 5.87 dix L, eq 138.26 L, equat 32.24 0 es) (Tab -73.9	92.38 ion L9 of 4.96 uation L 127.62 ion L15 32.24 0 le 5) -73.9 89.79	92.38 r L9a), a 5.36 13 or L1 120.51 or L15a) 32.24 0 -73.9 85.84	92.38 Iso see 6.96 3a), also 118.84 , also se 32.24 0 -73.9 90.91	92.38 Table 5 9.35 9 see Ta 123.05 9 Table 32.24 0 -73.9 92.71	92.38 11.87 ble 5 132.02 5 32.24 0 -73.9 97.98	92.38 13.85 143.34 32.24 0 -73.9	92.38 14.76 153.98 32.24 0 -73.9 106.6	(67) (68) (69) (70) (71)
(67)m= Applia (68)m= Cookir (69)m= Pumps (70)m= Losses (71)m= Water (72)m=	g gains 14.36 nces ga 161.09 ng gains 32.24 s and fai 0 s e.g. ev -73.9 heating 108.4	92.38 (calcula 12.76 ins (calc 162.76 (calcula 32.24 ns gains 0 raporatic -73.9 gains (T 106.59	Mar 92.38 ted in Ap 10.38 ulated in 158.55 ted in A 32.24 (Table 5 0 n (nega -73.9 fable 5) 102.85	Apr 92.38 opendix 7.86 Appendix 149.58 ppendix 32.24 5a) 0 tive valu -73.9	92.38 L, equat 5.87 dix L, eq 138.26 L, equat 32.24 0 es) (Tab -73.9	92.38 ion L9 of 4.96 uation L 127.62 ion L15 32.24 0 le 5) -73.9 89.79	92.38 r L9a), a 5.36 13 or L1 120.51 or L15a) 32.24 0 -73.9 85.84	92.38 Iso see 6.96 3a), also 118.84 , also se 32.24 0 -73.9 90.91	92.38 Table 5 9.35 9 see Ta 123.05 9 Table 32.24 0 -73.9 92.71	92.38 11.87 ble 5 132.02 5 32.24 0 -73.9 97.98	92.38 13.85 143.34 32.24 0 -73.9 103.93	92.38 14.76 153.98 32.24 0 -73.9 106.6	(67) (68) (69) (70) (71)

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

Orientation:	Access Factor Table 6d	r	Area m²		Flux Table 6a		g_ Table 6b		FF Table 6c		Gains (W)	
Northeast 0.9	0.77	x	3.5	×	11.28	×	0.85	x	0.7	=	16.28	(75)
Northeast 0.9	0.77	x	3.5	x	22.97	×	0.85	x	0.7	=	33.14	(75)
Northeast 0.9	0.77	x	3.5	x	41.38	×	0.85	x	0.7	=	59.72	(75)
Northeast 0.9	0.77	x	3.5	x	67.96	×	0.85	x	0.7	=	98.07	(75)
Northeast 0.9	0.77	x	3.5	x	91.35	×	0.85	x	0.7	=	131.83	(75)
Northeast 0.9	0.77	x	3.5	x	97.38	×	0.85	x	0.7	=	140.54	(75)
Northeast 0.9	0.77	x	3.5	x	91.1	x	0.85	x	0.7	=	131.47	(75)
Northeast 0.9	0.77	x	3.5	x	72.63	x	0.85	x	0.7	=	104.81	(75)
Northeast 0.9	0.77	x	3.5	x	50.42	×	0.85	x	0.7	=	72.77	(75)
Northeast 0.9	0.77	x	3.5	x	28.07	x	0.85	x	0.7	=	40.51	(75)
Northeast 0.9	0.77	x	3.5	x	14.2	x	0.85	x	0.7	=	20.49	(75)
Northeast 0.9	0.77	x	3.5	x	9.21	×	0.85	x	0.7	=	13.3	(75)
Southeast 0.9	0.77	x	1.95	x	36.79	x	0.85	x	0.7	=	29.58	(77)
Southeast 0.9	0.77	x	1.95	x	62.67	x	0.85	x	0.7	=	50.39	(77)
Southeast 0.9	0.77	x	1.95	x	85.75	×	0.85	x	0.7	=	68.95	(77)
Southeast 0.9	0.77	x	1.95	x	106.25	×	0.85	x	0.7	=	85.43	(77)
Southeast 0.9	0.77	x	1.95	x	119.01	x	0.85	x	0.7	=	95.69	(77)
Southeast 0.9	0.77	x	1.95	x	118.15	×	0.85	x	0.7	=	95	(77)
Southeast 0.9	0.77	x	1.95	x	113.91	x	0.85	x	0.7	=	91.59	(77)
Southeast 0.9	0.77	x	1.95	x	104.39	x	0.85	x	0.7	=	83.94	(77)
Southeast 0.9	0.77	x	1.95	x	92.85	x	0.85	x	0.7	=	74.66	(77)
Southeast 0.9	0.77	x	1.95	x	69.27	×	0.85	x	0.7	=	55.69	(77)
Southeast 0.9	0.77	x	1.95	x	44.07	x	0.85	x	0.7	=	35.44	(77)
Southeast 0.9	0.77	x	1.95	x	31.49	×	0.85	x	0.7	=	25.32	(77)
Southwest0.9	0.77	x	5.4	×	36.79		0.85	x	0.7	=	81.93	(79)
Southwest0.9	0.77	x	5.4	×	62.67		0.85	x	0.7	=	139.55	(79)
Southwest0.9	0.77	x	5.4	x	85.75		0.85	x	0.7	=	190.94	(79)
Southwest0.9	0.77	x	5.4	x	106.25		0.85	x	0.7	=	236.58	(79)
Southwest0.9	0.77	x	5.4	x	119.01		0.85	x	0.7	=	264.99	(79)
Southwest0.9	0.77	x	5.4	×	118.15		0.85	x	0.7	=	263.07	(79)
Southwest0.9	0.77	x	5.4	x	113.91		0.85	x	0.7	=	253.63	(79)
Southwest0.9	0.77	x	5.4	x	104.39		0.85	x	0.7	=	232.44	(79)
Southwest0.9	0.77	x	5.4	x	92.85		0.85	x	0.7	=	206.74	(79)
Southwest0.9	0.77	x	5.4	×	69.27]	0.85	x	0.7	=	154.23	(79)
Southwest0.9		x	5.4	×	44.07]	0.85	x	0.7	=	98.13	(79)
Southwest0.9	0.77	x	5.4	x	31.49		0.85	x	0.7	=	70.11	(79)

Solar g	ains in	watts, ca	alculated	for eac	n month			(83)m = S	um(74)m .	(82)m			_	
(83)m=	127.79	223.09	319.6	420.08	492.51	498.62	476.7	421.19	354.17	250.43	154.05	108.73	(8	3)
Total g	ains – ir	nternal a	nd solar	(84)m =	- (73)m -	+ (83)m	, watts						1	
(84)m=	462.36	555.91	642.09	725.99	781.8	771.7	739.12	688.61	629.99	543.01	465.89	434.78	(8	34)

7. <u>Me</u>	an <u>inter</u>	rnal temp	per <u>ature</u>	(heating	se <u>ason</u>)								
				, J		, 	from Tal	ole 9, Th	1 (°C)				21	(85)
Utilisa	ation fac	ctor for g	ains for	living are	ea, h1,m	i (see Ta	ble 9a)					I		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(86)m=	0.99	0.99	0.97	0.94	0.88	0.77	0.63	0.68	0.86	0.96	0.99	0.99		(86)
Mean	interna	l temper	ature in	living ar	ea T1 (fo	ollow ste	ps 3 to 7	7 in Tabl	e 9c)					
(87)m=	21	21	21	21	21	21	21	21	21	21	21	21		(87)
Temp	erature	during h	neating p	eriods ir	n rest of	dwelling	from Ta	able 9, T	h2 (°C)	-		-		
(88)m=	19.07	19.08	19.09	19.12	19.13	19.16	19.16	19.17	19.15	19.13	19.12	19.1		(88)
Utilisa	ation fac	ctor for g	ains for	rest of d	welling,	h2,m (se	e Table	9a)		-				
(89)m=	0.99	0.98	0.96	0.92	0.82	0.63	0.41	0.47	0.76	0.93	0.98	0.99		(89)
Mean	interna	l temper	ature in	the rest	of dwelli	ina T2 (f	ullow ste	eps 3 to 3	7 in Tabl	e 9c)				
(90)m=	19.07	19.08	19.09	19.12	19.13	19.16	19.16	19.17	19.15	19.13	19.12	19.1		(90)
									1	LA = Livin	g area ÷ (4	4) =	0.55	(91)
Mean	interna	l temper	ature (fo	or the wh	ole dwe	llina) = f	LA x T1	+ (1 – fL	A) x T2			I		
(92)m=	20.13	20.14	20.14	20.16	20.16	20.18	20.18	20.18	20.17	20.16	20.16	20.15		(92)
Apply	v adjustr	nent to t	ı he mear	interna	l temper	i ature fro	n I Table	e 4e, whe	ere appro	opriate				
(93)m=	20.13	20.14	20.14	20.16	20.16	20.18	20.18	20.18	20.17	20.16	20.16	20.15		(93)
8. Sp	ace hea	ating req	uirement						•		•			
				•		ned at st	ep 11 of	Table 9	b, so tha	t Ti,m=(76)m an	d re-calc	ulate	
the ut		factor fo	or gains Mar	<u> </u>	i	1 1		A	Con	Ort	Nev	Dee		
l Itilis:	Jan ation fac	tor for g	1	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(94)m=	0.99	0.98	0.97	0.93	0.86	0.71	0.55	0.6	0.82	0.95	0.98	0.99		(94)
Usefu	L gains,	hmGm	, W = (94	1 4)m x (8-	ـــــــــــــــــــــــــــــــــــــ			I						
(95)m=	458.07	546.7	621.86	677.09	669.83	551.03	403.67	411.73	516.72	515.64	458.58	431.45		(95)
Montl	hly 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)
		1	1	· · · ·	· · ·	· · ·	<u>, , , , , , , , , , , , , , , , , , , </u>	x [(93)m	r ` ´ ´ ´					
	2118.97		1805.21		1084.97	698.24	447.84	471.12	767.17	1226.01		2087.69		(97)
	e heatin 1235.71	ř	ement fo 880.41	i	i	r	r	24 x [(97]	í t	<u> </u>	ŕ	1000.04		
(98)m=	1235.71	995.23	000.41	557.12	308.87	0	0		0	528.51	887.38	1232.24	CC2E 49	(98)
0								TOLA	ll per year	(KVVII/yeai) = Sum(9	O)15,912 =	6625.48	
		ig require			,								119.7	(99)
			nts – Indi	ividual h	eating s	ystems i	ncluding	j micro-C	CHP)					
•	e heati ion of sp	ng: bace hea	at from s	econdar	y/supple	mentarv	v system					[0	(201)
		bace hea				,	-	(202) = 1 ·	– (201) =				1	(202)
		tal heati			. ,			(204) = (2	02) × [1 –	(203)] =			1	(204)
		main spa	-	-									321.29	(206)
		seconda		• •		a systen	า. %						0	(208)
	.,) P.P.		,	0 -) - 1011	,					l	Ť	`

$ \begin{array}{ c c c c c c c c } \hline Jan & Feb & Mar & Apr & May & Jun & Jul & Aug & Sep & Oct & Nov & Dec & kWh \\ \hline Space heating requirement (calculated above) & & & & \\ \hline 1235.71 & 995.23 & 880.41 & 557.12 & 308.87 & 0 & 0 & 0 & 0 & 528.51 & 887.38 & 1232.24 \\ \hline (211)m = \{ [(98)m x (204)] \} x 100 \div (206) & & & & \\ \hline 384.61 & 309.76 & 274.02 & 173.4 & 96.13 & 0 & 0 & 0 & 0 & 164.5 & 276.19 & 383.53 \\ \hline & & & & & & \\ \hline & & & & & & \\ \hline & & & &$	/year (211) (211)
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	
Space heating fuel (secondary), kWh/month = {[(98)m x (201)] } x 100 ÷ (208)	(211)
$= \{[(98)m \times (201)]\} \times 100 \div (208)$	
(215)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	
Total (kWh/year) =Sum(215) _{15,1012} = 0	
	(215)
Water heating Output from water heater (calculated above)	
175.24 154.64 162.82 146.55 144.03 129.31 124.76 136.11 135.62 151.93 159.92 171.22	
Efficiency of water heater 178.12	(216)
(217)m= 178.12 178.12 178.12 178.12 178.12 178.12 178.12 178.12 178.12 178.12 178.12 178.12 178.12 178.12 178.12 178.12	(217)
Fuel for water heating, kWh/month	
$ (219)m = (64)m \times 100 \div (217)m \\ (219)m = 98.38 86.81 91.41 82.27 80.86 72.59 70.04 76.41 76.14 85.29 89.78 96.12 \\ \hline$	
Total = $Sum(219a)_{112}$ = 1006.12	(219)
Annual totals kWh/year kWh/y	ear
Space heating fuel used, main system 1 2062.14	
Water heating fuel used 1006.12	
Electricity for pumps, fans and electric keep-hot	
Total electricity for the above, kWh/year sum of (230a)(230g) = 0	(231)
Electricity for lighting	(232)
Total delivered energy for all uses (211)(221) + (231) + (232)(237b) = 3321.9	94 (338)
12a. CO2 emissions – Individual heating systems including micro-CHP	
EnergyEmission factorEmissionkWh/yearkg CO2/kWhkg CO2/	
Space heating (main system 1) $(211) \times 0.519 = 1070.25$	
Space heating (secondary) (215) x $0.519 = 0$	(263)
Water heating (219) x 0.519 = 522.17	(264)
	(264)
Water heating (219) x 0.519 = 522.17	(264)
Water heating $(219) \times$ 0.519 = 522.17 Space and water heating $(261) + (262) + (263) + (264) =$ 1592.42	(264)
Water heating $(219) \times$ 0.519 = 522.17 Space and water heating $(261) + (262) + (263) + (264) =$ 1592.42Electricity for pumps, fans and electric keep-hot $(231) \times$ 0.519 =	(264) (265) (267) (268)
Water heating $(219) \times$ 0.519 = 522.17 Space and water heating $(261) + (262) + (263) + (264) =$ 1592.42 Electricity for pumps, fans and electric keep-hot $(231) \times$ 0.519 = 0 Electricity for lighting $(232) \times$ 0.519 = 0	(264) (265) (267) (268)

• •	ent L1A, 2013 Editio /ember 2021 at 13:2	n, England assessed by Strom 6:11	a FSAP 2012 program, Versio	on: 1.0.5.50
Project Informati	on:			
Assessed By:	Neil Ingham (STF	20010943)	Building Type:	Flat
Dwelling Details:				
NEW DWELLING	DESIGN STAGE		Total Floor Area: 37.	37m²
Site Reference :	11-12 Grenville S	treet - GREEN	Plot Reference:	Unit 6
Address :				
Client Details:				
Name:				
Address :				
•	rs items included v ete report of regula	vithin the SAP calculations.		
1a TER and DEI		tions compliance.		
	ting system: Electric	itv		
Fuel factor: 1.55 (• •	·· ,		
,	oxide Emission Rate	(TER)	35.13 kg/m ²	
-	Dioxide Emission Ra	. ,	36.42 kg/m ²	Fail
	s = 1.29 kg/m² (3.7 %	b)		
1b TFEE and DF				
-	ergy Efficiency (TFE		56.2 kWh/m ²	
Dwelling Fabric E	nergy Efficiency (DF	EE)	95.3 kWh/m²	E-il
Excess energy =	39.11 kg/m² (69.6 %)		Fail
2 Fabric U-value		,, ,		
Element		Average	Highest	
External		0.27 (max. 0.30)	0.30 (max. 0.70)	ОК
Party wa		0.00 (max. 0.20)	-	OK
Floor		(no floor)		
Roof		0.10 (max. 0.20)	0.10 (max. 0.35)	OK
Opening		3.73 (max. 2.00)	4.80 (max. 3.30)	Fail
2a Thermal brid	ging			
Thermal 3 Air permeabil		using user-specified y-value of	0.15	
•			10.00 (dosign valu	0)
Maximum	bility at 50 pascals		10.00 (design valu 10.0	OK
4 Heating efficie	ency			
Main Heati	ng system:			
		Heat pumps with radiators of Mitsubishi ECODAN 5kW	or underfloor heating - electric	
Secondary	heating system:	None		
5 Cylinder insul	ation			
	-			

Hot water Storage:

	Measured cylinder loss: Permitted by DBSCG: 2	•	ОК
Primary pipework insulated:	Yes	TO KVII/day	OK
6 Controls	165		UK
0 00111013			
Space heating controls	TTZC by plumbing and	electrical services	ОК
Hot water controls:	Cylinderstat		OK
	Independent timer for D	HW	OK
Boiler interlock:	Yes		OK
7 Low energy lights			
Percentage of fixed lights with	ow-energy fittings	100.0%	
Minimum		75.0%	OK
8 Mechanical ventilation			
Not applicable			
9 Summertime temperature			
Overheating risk (Thames valle	ey):	Not significant	ОК
Based on:			
Overshading:		Average or unknown	
Windows facing: North East		5.19m²	
Ventilation rate:		8.00	
10 Key features			
Roofs U-value		0.1 W/m²K	
Party Walls U-value		0 W/m²K	

User Details:													
Assessor Name:	Neil Ingham			Strom	a Num	ber:		STRO	010943				
Software Name:	Stroma FSA	P 2012		Softwa	are Ver	sion:		Versio	on: 1.0.5.50				
		Р	roperty <i>i</i>	Address:	Unit 6								
Address :													
1. Overall dwelling dime	nsions:												
Ground floor			-	a(m²) 7.37	(1a) x	Av. Hei	i ght(m) .65	(2a) =	Volume(m ³) 99.03	(3a)			
Total floor area TFA = (1a	a)+(1b)+(1c)+(1c	d)+(1e)+(1r	I) 3	7.37	(4)			-		_			
Dwelling volume			L		(3a)+(3b)	+(3c)+(3d)+(3e)+	.(3n) =	99.03	(5)			
2. Ventilation rate:	-												
Number of chimneys	main heating	+ 0	у] + [_	0 0] = [total 0	X 4	40 =	m ³ per hour	(6a)			
Number of open flues	0	+ 0	+	0	=	0	x 2	20 =	0	(6b)			
Number of intermittent fa	ns					2	x ′	10 =	20	(7a)			
Number of passive vents						0	x ^	10 =	0	(7b)			
Number of flueless gas fi	res					0	x 4	40 =	0	(7c)			
Air changes per hour													
Infiltration due to chimne	ys, flues and fan	s = (6a) + (6b) + (7)	a)+(7b)+(1	7c) =	Г	20	<u> </u>	÷ (5) =	0.2	(8)			
If a pressurisation test has b					ontinue fro	-							
Number of storeys in the	ne dwelling (ns)								0	(9)			
Additional infiltration							[(9)-	-1]x0.1 =	0	(10)			
Structural infiltration: 0. if both types of wall are pr deducting areas of openir	resent, use the value	e corresponding to			•	uction			0	(11)			
If suspended wooden f	loor, enter 0.2 (u	insealed) or 0.	1 (seale	d), else	enter 0				0	(12)			
If no draught lobby, en	ter 0.05, else ent	ter 0							0	(13)			
Percentage of windows	s and doors drau	ight stripped							0	(14)			
Window infiltration				0.25 - [0.2		- 1			0	(15)			
Infiltration rate				(8) + (10) ·		<i>·</i> · · <i>·</i>			0	(16)			
Air permeability value,			•	•	•	etre of e	nvelope	area	10	(17)			
If based on air permeabil Air permeability value applie	•					is boing us	od		0.7	(18)			
Number of sides sheltere		lest has been don	e or a deg	liee all pei	meaning	is being us	eu		0	(19)			
Shelter factor	~			(20) = 1 - [0.075 x (1	9)] =			1	(20)			
Infiltration rate incorporat	ing shelter factor	r		(21) = (18)	x (20) =				0.7	(21)			
Infiltration rate modified for	or monthly wind	speed											
Jan Feb	Mar Apr	May Jun	Jul	Aug	Sep	Oct	Nov	Dec					
Monthly average wind sp	eed from Table	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												
(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	-			_	
	0.89	0.88	0.86	0.77	0.75	0.67	0.67	0.65	0.7	0.75	0.79	0.82		
		al ventila	-	rate for t	ne appli	cable ca	se						0	(23a)
				endix N, (2	3b) = (23a	a) × Fmv (e	equation (N5)) , other	wise (23b) = (23a)			0	(23b)
lf bala	anced with	heat reco	overy: effici	iency in %	allowing f	or in-use f	actor (fror	n Table 4h)) =				0	(23c)
a) If	balance	d mecha	anical ve	ntilation	with he	at recove	ery (MV	HR) (24a	ı)m = (22	2b)m + (1	23b) × [*	1 – (23c)		` `
, (24a)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24a)
b) If	balance	d mecha	anical ve	ntilation	without	heat rec	covery (l	MV) (24b)m = (22	2b)m + (2	23b)			
(24b)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If	whole h	ouse ex	tract ven	tilation o	or positiv	ve input v	ventilatio	on from c	outside	-	-	-	•	
i	f (22b)m	า < 0.5 ×	: (23b), t	hen (240	c) = (23b	o); otherv	wise (24	c) = (22b	o) m + 0.	.5 × (23b)		1	
(24c)m=	0	0	0	0	0	0	0	0	0	0	0	0		(24c)
,					•	•		on from l 0.5 + [(2		0.51				
(24d)m=	<u> </u>	0.88	0.87	0.8	0.78	0.72	0.72	0.0 1 [(2.	0.75	0.78	0.81	0.84	1	(24d)
								ld) in box					1	
(25)m=	0.9	0.88	0.87	0.8	0.78	0.72	0.72	0.71	0.75	0.78	0.81	0.84	1	(25)
										I		1	1	
		s and ne Gros	eat loss p			Net Ar	~~	U-valı	10	AXU		k-value		AXk
ELEN		area	-	Openin m		A,r		W/m2		(W/I	<)	kJ/m ² ·l		kJ/K
Doors						2.59	x	1.6	=	4.144				(26)
Window	WS					5.19	x1	/[1/(4.8)+	0.04] =	20.9				(27)
Walls 7	Гуре1	19.6	51	5.19		14.42	<u>x</u>	0.3	=	4.33			\neg	(29)
Walls 7	Гуре2	10.1	3	2.59	· · · · ·	7.54	x	0.22	=	1.69	ן ר		$\neg \square$	(29)
Roof		37.3	3	0		37.33	3 X	0.1	= =	3.73	ז ר		-	(30)
Total a	rea of e	lements	, m²			67.07	,							(31)
Party v	vall					22.79) x	0	=	0				(32)
Party fl	loor					37.33	3				i		\exists	(32a)
* for wine	dows and	roof winde	ows, use e	ffective wi	ndow U-va	alue calcul	ated using	g formula 1,	/[(1/U-valu	ıe)+0.04] a	s given in	paragraph	1 3.2	
			sides of in		ls and par	titions		(26) (20)	(22)					
			= S (A x	U)				(26)(30)		(00) . (0)		(00.)	34.79	(33)
		Cm = S(,) (m.		1/m21/				(30) + (32 itive Value:		(32e) =	3063.6	
		•				n kJ/m²K		recisely the				ahla 1f	250	(35)
	0		tailed calcu		construct		. Known pi		maicative	, values of				
Therma	al bridge	es : S (L	x Y) cal	culated u	using Ap	pendix ł	<						10.06	(36)
			are not kn	own (36) =	= 0.05 x (3	1)			()	()				
	abric hea									(36) =			44.85	(37)
ventila	i					1		Δ		$= 0.33 \times ($	1	i –	1	
(38)-	Jan 29.43	Feb 28.92	Mar 28.42	Apr 26.08	May 25.64	Jun 23.61	Jul	Aug	Sep 24.39	Oct 25.64	Nov 26.53	Dec 27.46	4	(38)
(38)m=	29.43			20.00	20.04	23.61	23.61	23.23				27.46	I	(50)
	74.28	oefficier 73.77	nt, VV/K 73.27	70.93	70.49	68.46	68.46	68.08	(39)m 69.24	= (37) + (3 70.49	38)m 71.38	72.31	1	
(39)m=	14.20	13.11	13.21	10.83	10.49	00.40	00.40	00.00		Average =			70.93	(39)

Heat lo	oss para	meter (H	HLP), W	/m²K					(40)m	= (39)m ÷	- (4)			
(40)m=	1.99	1.97	1.96	1.9	1.89	1.83	1.83	1.82	1.85	1.89	1.91	1.93		
Numb			nth (Tab		1				,	Average =	Sum(40)1.	12 /12=	1.9	(40)
Numbe	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)
(41)11-	01	20		00		00			00	01	00	01		()
4. Wa	ater heat	ting ene	rgy requ	irement:								kWh/ye	ear:	
if TF				: [1 - exp	o(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (⁻	TFA -13		34		(42)
Annua <i>Reduce</i>	l averag	e hot wa al average	hot water	usage by		welling is	designed	(25 x N) to achieve		se target o		.99		(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	er usage il	n litres pei	r day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	: (43)			1		I	
(44)m=	72.58	69.94	67.3	64.67	62.03	59.39	59.39	62.03	64.67	67.3	69.94	72.58		
Energy	content of	hot water	used - cal	culated m	onthly = 4.	190 x Vd,ı	m x nm x L	OTm / 3600			m(44) ₁₁₂ = ables 1b, 1		791.82	(44)
(45)m=	107.64	94.14	97.15	84.69	81.27	70.13	64.98	74.57	75.46	87.94	95.99	104.24		
lf instan	taneous w	ater heati	ng at point	t of use (no	o hot wate	r storage),	enter 0 in	boxes (46		Total = Su	m(45) ₁₁₂ =	-	1038.2	(45)
(46)m=	16.15	14.12	14.57	12.7	12.19	10.52	9.75	11.19	11.32	13.19	14.4	15.64		(46)
· · ·	storage	loss:	ļ	ļ		Į	ļ	1	Į					
-		. ,		• •			-	within sa	ame ves	sel		180		(47)
	-	-			velling, e					or (0) in ((47)			
	storage		not wate	er (this ir	iciudes i	nstantar	ieous co	ombi boil	ers) ente	er u in (47)			
	-		eclared I	oss fact	or is kno	wn (kWł	n/day):				1.	47		(48)
			m Table								0.	54		(49)
Energy	/ lost fro	m watei	storage	e, kWh/y	ear			(48) x (49)) =		0.	79		(50)
				•	loss fact									
		•			le 2 (kW	h/litre/da	ay)					0		(51)
	•	from Ta	ee secti ble 2a	011 4.5								0		(52)
			m Table	2b								0		(52)
Enera	/ lost fro	m water	· storage	. kWh/v	ear			(47) x (51)) x (52) x (53) =		0		(54)
		(54) in (5	•	, ,								79		(55)
Water	storage	loss cal	culated	for each	month			((56)m = (55) × (41)	m				
(56)m=	24.61	22.23	24.61	23.81	24.61	23.81	24.61	24.61	23.81	24.61	23.81	24.61		(56)
If cylinde	er contains	s dedicate	d solar sto	rage, (57)	m = (56)m	x [(50) – (H11)] ÷ (5	50), else (5	7)m = (56)	m where (H11) is fro	m Append	ix H	
(57)m=	24.61	22.23	24.61	23.81	24.61	23.81	24.61	24.61	23.81	24.61	23.81	24.61		(57)
Primar	y circuit	loss (ar	nnual) fro	om Table	e 3							0		(58)
	•					,	. ,	65 × (41)						
•		1	r	r	ı —	· · · · · ·		ng and a	· ·	1	, 		I	(- -)
(59)m=	23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)

Combi	loss ca	lculated	for eac	ch r	month ((61)m =	(60)) ÷ 36	65 × (41))m								
(61)m=	0	0	0		0	0		0	0	0		0	0	()	0		(61)
Total h	eat req	uired for	water	hea	ating ca	alculated	d fo	r eacl	n month	(62)ı	n =	0.85 × ((45)m ·	+ (46)ı	m +	(57)m	+ (59)m + (61)m	
(62)m=	155.51	137.38	145.02	2	131.02	129.14	1	16.45	112.85	122.	44	121.79	135.8	1 142	.32	152.11	7	(62)
Solar DH	-IW input	calculated	using Ap	opei	ndix G or	· Appendix	(H)	(negativ	ve quantity	/) (ent	er '0'	' if no sola	r contrib	ution to	wate	er heating	g)	
(add a	dditiona	al lines if	FGHR	S a	and/or V	WWHRS	S ap	plies,	, see Ap	pend	ix G	G)						
(63)m=	0	0	0		0	0		0	0	0		0	0	()	0		(63)
Output	from w	ater hea	ter															
(64)m=	155.51	137.38	145.02	2	131.02	129.14	1	16.45	112.85	122.	44	121.79	135.8 ⁻	1 142	.32	152.11	7	
											Outp	out from wa	ater hea	ter (ann	ual)	12	1601.84	(64)
Heat g	ains fro	m water	heatin	g, ł	kWh/mo	onth 0.2	5 ′	[0.85	× (45)m	+ (6	1)m	n] + 0.8 x	((46)r	n + (5	7)m	+ (59)	m]	
(65)m=	74.09	65.89	70.6	Т	65.22	65.32	6	60.38	59.9	63.0)9	62.15	67.54	68.	98	72.96	7	(65)
inclu	de (57)	m in calo	ulatior	n of	f (65)m	only if c	ylir	nder is	s in the c	dwell	ing	or hot w	ater is	from (com	munity	 heating	
	. ,	ains (see			. ,	•					U					-	-	
		ns (Table				/-												
Melabi	Jan	Feb	Mar		Apr	May	Γ	Jun	Jul	A	n	Sep	Oct		ov	Dec	-	
(66)m=	66.92	66.92	66.92	-	66.92	66.92	-	6.92	66.92	66.9	-	66.92	66.92			66.92	-	(66)
		(calcula													-			
(67)m=	9 9an 3 10.75	9.54	7.76		5.88	4.39	<u> </u>	3.71	L9a), a 4.01	5.2		6.99	8.88	10.	36	11.04	Г	(67)
														10.	50	11.04		(0.)
		ins (calc	· · · · ·	-			1			· ·				100	24	100.04	7	(68)
(68)m=	114.98	116.17	113.17		106.77	98.69		91.09	86.02	84.8		87.83	94.23	102	.31	109.91		(68)
	<u> </u>	s (calcula	· · · · ·	<u> </u>		· · ·	-						· · · · · ·				-	(00)
(69)m=	29.69	29.69	29.69		29.69	29.69	2	9.69	29.69	29.0	59	29.69	29.69	29.	69	29.69		(69)
Pumps	and fa	ns gains	(Table	9 5a	a)												7	
(70)m=	0	0	0		0	0		0	0	0		0	0	()	0		(70)
Losses	s e.g. e	/aporatic	n (neg	ativ	ve valu	es) (Tab	le	5)									_	
(71)m=	-53.53	-53.53	-53.53	3	-53.53	-53.53	-{	53.53	-53.53	-53.	53	-53.53	-53.53	3 -53	.53	-53.53		(71)
Water	heating	gains (T	able 5)		-							-					
(72)m=	99.58	98.05	94.89		90.59	87.79	8	33.86	80.51	84.	8	86.32	90.77	95	.8	98.06		(72)
Total i	nterna	gains =	:					(66)	m + (67)m	n + (68)m +	+ (69)m + ((70)m +	(71)m +	- (72)	m		
(73)m=	268.38	266.85	258.89	9	246.3	233.95	2	21.73	213.62	217.	91	224.22	236.9	6 251	.55	262.09	,	(73)
6. Sol	lar gain	s:	•			2							-					
Solar g	ains are	calculated	using so	lar f	flux from	Table 6a	and	associ	ated equa	tions t	o co	nvert to th	e applic	able ori	entat	ion.		
Orienta		Access F			Area			Flu			_	g		F			Gains	
		Table 6d			m²			Tat	ole 6a		T	able 6b		Table	6c		(W)	
Northea	ast <mark>0.9x</mark>	0.77		x [5.1	9	x	1	1.28	x		0.85	x	().7	=	24.15	(75)
Northea	ast <mark>0.9x</mark>	0.77		× [5.1	9	x	2	2.97	x		0.85	x	().7	=	49.15	(75)
Northea	ast <mark>0.9x</mark>	0.77		× [5.1	9	x	4	1.38	x		0.85	x	().7	=	88.55	(75)
Northea	ast <mark>0.9x</mark>	0.77		× [5.1	9	x	6	7.96	x		0.85	×	().7		145.43	(75)
Northea	ast <mark>0.9x</mark>	0.77		× [5.1	9	x	9	1.35	×		0.85	×	().7	=	195.48	(75)

							_						_
Northeast 0.9x	0.77	×	5.1	9	x	97.38	x	0.85	x	0.7	=	208.4	(75)
Northeast 0.9x	0.77	x	5.1	9	x	91.1	x	0.85	x	0.7	=	194.96	(75)
Northeast 0.9x	0.77	x	5.1	9	x	72.63	x	0.85	x	0.7	=	155.42	(75)
Northeast 0.9x	0.77	x	5.1	9	x	50.42	x	0.85	x	0.7	=	107.9	(75)
Northeast 0.9x	0.77	X	5.1	9	x	28.07	x	0.85	x	0.7	=	60.06	(75)
Northeast 0.9x	0.77	x	5.1	9	x	14.2	x	0.85	x	0.7	=	30.38	(75)
Northeast 0.9x	0.77	x	5.1	9	x	9.21	x	0.85	x	0.7	=	19.72	(75)
Solar gains ir	n watts, ca	alculated	for eacl	n month			(83)m	n = Sum(74)m	n(82)m				
<mark>(83)</mark> m= 24.15		88.55	145.43	195.48		08.4 194.96	155	.42 107.9	60.06	30.38	19.72		(83)
Total gains –			. ,	. ,	<u>`</u>	· ·						1	
(84)m= 292.52	2 316	347.44	391.73	429.43	43	30.14 408.57	373	.33 332.12	297.0	2 281.93	281.8		(84)
7. Mean inte	ernal temp	erature	(heating	season)								
Temperatur	e during h	eating p	eriods ir	n the livi	ng	area from Ta	ble 9	, Th1 (°C)				21	(85)
Utilisation fa	actor for ga	ains for I	iving are	ea, h1,m	ı (s	ee Table 9a)					-		
Jan	Feb	Mar	Apr	May		Jun Jul	A	ug Sep	Oct	Nov	Dec		
(86)m= 0.99	0.99	0.98	0.96	0.91	(0.79 0.65	0.7	71 0.89	0.97	0.99	0.99		(86)
Mean intern	al tempera	ature in I	iving are	ea T1 (fo	ollo	w steps 3 to	7 in 1	able 9c)		·			
(87)m= 21	21	21	21	21		21 21	2		21	21	21		(87)
Temperatur	e durina h	eating n	eriods ir	rest of	- dw	elling from T	ahla (1	
(88)m= 19.34		19.36	19.4	19.41	—	9.45 19.45	19.		19.41	19.39	19.38		(88)
					I				-			l	
	o.99		0.94		T -	m (see Table	т <u>́</u>	52 0.82	0.96	0.99	0.00	1	(89)
		0.98		0.86	I	0.67 0.46	0.8			0.99	0.99		(00)
	<u> </u>				٣Ť	T2 (follow st	T -				1	1	
(90)m= 19.34	19.35	19.36	19.4	19.41	1	9.45 19.45	19.	45 19.43	19.41		19.38		(90)
									fLA = Liv	ving area ÷ (4	4) =	0.86	(91)
Mean intern	al temper	ature (fo	r the wh	ole dwe	llin	$g) = fLA \times T1$	+ (1	– fLA) × T	2				
<mark>(92)m=</mark> 20.77		20.77	20.78	20.78		0.78 20.78	20.		20.78		20.77		(92)
r	1 1				T	re from Tabl					1	1	
(93)m= 20.77		20.77	20.78	20.78	2	0.78 20.78	20.	78 20.78	20.78	20.77	20.77		(93)
8. Space he	· · ·						· -		·	(70)			
the utilisatio			•		ned	at step 11 o	t lab	le 9b, so th	at II,m:	=(76)m an	d re-calo	culate	
Jan	Feb	Mar	Apr	May		Jun Jul		ug Sep	Oct	Nov	Dec		
Utilisation fa				may	I						200	I	
(94)m= 0.99	0.99	0.98	0.96	0.9	(0.77 0.63	0.6	69 0.89	0.97	0.99	0.99		(94)
Useful gains	s, hmGm ,	W = (94)m x (84	4)m				<u>I</u>		!		1	
(95)m= 290.62	2 313.1	341.68	376.15	386.55	3	32.37 255.72	255	.94 294.17	288.5	3 279.07	280.21		(95)
Monthly ave	rage exte	rnal tem	perature	from T	abl	e 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)
			· · ·		-	, W =[(39)m		<u> </u>	-i		1	1	
	1170.56			639.82		23.16 286.25	298				1198.21		(97)
	- T - T				Wh	$\frac{\text{/month} = 0.0}{2}$	1	<u> </u>		-		1	
(98)m= 693.77	7 576.22	523.66	335.64	188.43		0 0	() 0	319.0	1 501.82	682.99		

								Tota	l per year	(kWh/year	⁻) = Sum(9	8)15,912 =	3821.53	(98)
Spac	e heating	g requir	ement ir	n kWh/m²	²/year								102.26	(99)
9a. En	ergy req	luiremer	nts – Ind	lividual h	eating sy	ystems i	ncluding	micro-C	CHP)					
•	e heatir	0												_
	-			econdar		mentary	-						0	(201)
	-			nain syst	. ,			(202) = 1 -					1	(202)
			0	main sys				(204) = (20	02) × [1 –	(203)] =			1	(204)
	-	-		ting syste									249.28	(206)
Efficie	ency of s	seconda	ry/suppl	ementar	y heating	g system	n, %					-	0	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
Spac		<u> </u>	ì		· · · · · ·								1	
	693.77	576.22	523.66	335.64	188.43	0	0	0	0	319.01	501.82	682.99		
(211)n			1	100 ÷ (20	i					407.00	004.04	070.00	1	(211)
	278.31	231.16	210.07	134.65	75.59	0	0	0 Tota	0	127.98 ar) =Sum(2	201.31	273.99	1533.06	(211)
Snoo	o hootin	a fuel (e	ooondor	n/) k\//h/	month			Tota	i (ittini yot				1533.00	
Space heating fuel (secondary), kWh/month = $\{[(98)m \times (201)]\} \times 100 \div (208)$														
(215)m=	í i	0	0	0	0	0	0	0	0	0	0	0		
								Tota	l (kWh/yea	ar) =Sum(2	215) _{15,1012}	=	0	(215)
Water	heating	I												
Output			I	ulated a		· · · - ·-							1	
Efficie	155.51	137.38	145.02	131.02	129.14	116.45	112.85	122.44	121.79	135.81	142.32	152.11	470.40	
	ncy of w	178.12	178.12	178.12	178.12	178.12	178.12	178.12	178.12	178.12	178.12	178.12	178.12	(216)
	or water			-	170.12	170.12	170.12	170.12	170.12	170.12	170.12	170.12		(217)
	n = (64)	-			-		_	-		_	-	-		
(219)m=	87.3	77.13	81.41	73.56	72.5	65.38	63.36	68.74	68.37	76.24	79.9	85.4		_
								Tota	I = Sum(2	19a) ₁₁₂ =			899.28	(219)
	al totals	f	مأ مم مأ م	o voto m	4					k	Wh/year	•	kWh/yea	,
•	•			system	1								1533.06	4
Water	heating	fuel use	ed										899.28	
Electri	city for p	oumps, f	ans and	electric	keep-ho	t								
Total e	electricity	/ for the	above,	kWh/yea	r			sum	of (230a).	(230g) =			0	(231)
Electri	city for li	ghting											189.76	(232)
Total c	lelivered	lenergy	for all u	ses (211)(221)	+ (231)	+ (232).	(237b)	=				2622.1	(338)
12a.	CO2 em	issions ·	– Individ	lual heati	ing syste	ems inclu	uding mi	cro-CHP)					
						En	orav			Emice	ion fac	tor	Emissions	
							e rgy /h/year			kg CO			kg CO2/ye	
Space	heating	(main s	ystem 1)			1) x			0.5		=	795.66	(261)
Space	heating	(secon	dary)			(21	5) x			0.5	19	=	0	(263)

Water heating	(219) x	0.519	=	466.72	(264)
Space and water heating	(261) + (262) + (263) + (26	4) =		1262.38	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	0	(267)
Electricity for lighting	(232) x	0.519	=	98.49	(268)
Total CO2, kg/year		sum of (265)(271) =		1360.87	(272)
Dwelling CO2 Emission Rate		(272) ÷ (4) =		36.42	(273)
El rating (section 14)				78	(274)