Regulations Compliance Report

Approved Document L1A, 2013 Edition, England assessed by Stroma FSAP 2012 program, Version: 1.0.5.9 Printed on 28 October 2020 at 14:53:44

Project Information:

Assessed By: Zahid Ashraf (STRO001082) **Building Type:** Flat

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 70.86m² Plot Reference: Plot 44 Site Reference : Hermitage Lane

Address:

Client Details:

Name: Address:

This report covers items included within the SAP calculations.

It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating system: Mains gas (c)

Fuel factor: 1.00 (mains gas (c))

16.03 kg/m² Target Carbon Dioxide Emission Rate (TER)

Dwelling Carbon Dioxide Emission Rate (DER) 9.47 kg/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 38.2 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 32.0 kWh/m²

OK

2 Fabric U-values

Element Average Highest

External wall 0.14 (max. 0.30) 0.15 (max. 0.70) OK

Floor (no floor)

Roof (no roof)

Openings 1.40 (max. 2.00) 1.40 (max. 3.30) OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals 3.00 (design value)

OK Maximum 10.0

4 Heating efficiency

Main Heating system: Community heating schemes - mains gas

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

Space heating controls Charging system linked to use of community heating,

programmer and at least two room thermostats

Hot water controls: No cylinder thermostat

No cylinder

OK

Regulations Compliance Report

7 Low energy lights		
Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	OK
8 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.91	
Maximum	1.5	OK
MVHR efficiency:	93%	
Minimum	70%	OK
9 Summertime temperature		
Overheating risk (Thames valley):	Slight	OK
Based on:		
Overshading:	Average or unknown	
Windows facing: South East	6.1m²	
Windows facing: North West	5.11m ²	
Ventilation rate:	6.00	
10 Key features		
Air permeablility	3.0 m³/m²h	
External Walls U-value	0.13 W/m ² K	
Community heating, heat from boilers – mains gas		
Photovoltaic array		

		Hear	Details:						
Access at Name.	Zahid Ashraf	<u> </u>		- Mirror	hau.		CTDO	001000	
Assessor Name: Software Name:	Stroma FSAP 2012		Stroma Softwa	-				001082 n: 1.0.5.9	
			y Address:						
Address :									
1. Overall dwelling dime	ensions:		>						
Ground floor		Ar	ea(m²) 70.86	(1a) x		ight(m) 2.5	(2a) =	Volume(m³) (3a)
	a) (1b) (1a) (1d) (1a)	(1p)				2.5	(2a) –	177.14	(Ja)
Total floor area TFA = (1	a)+(1b)+(1c)+(1u)+(1e)+	F(111)	70.86	(4)) . (2-) . (2-	4) . (2 -) .	(2-)		_
Dwelling volume				(3a)+(3b))+(3C)+(3C	d)+(3e)+	.(3h) =	177.14	(5)
2. Ventilation rate:	main sec	condary	other		total			m³ per hou	r
Number of chimneys	heating he	ating		1 = [40 =	-	_
Number of chimneys			0]	0		20 =	0	(6a)
Number of open flues		0 +	0	」 ⁻	0			0	(6b)
Number of intermittent fa				L	0		10 =	0	(7a)
Number of passive vents				Ļ	0		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 fans = (6a)	+(6b)+(7a)+(7b)	+(7c) =	Г	0		÷ (5) =	0	(8)
If a pressurisation test has b	een carried out or is intended,	, proceed to (17)), otherwise o	ontinue fr			` ′	Ţ	 _`
Number of storeys in the	he dwelling (ns)							0	(9)
Additional infiltration	.25 for steel or timber fra	ama or 0 35 f	or masonr	v conetr	uction	[(9)	-1]x0.1 =	0	(10)
	resent, use the value correspo			•	uction			0	(11)
deducting areas of openii	• /	-l\ O 4 (مام (امما				ı		_
If suspended wooden in the sus	floor, enter 0.2 (unsealed	a) or 0.1 (sea	alea), else	enter U				0	(12)
• ,	s and doors draught strip	nned						0	(13)
Window infiltration	s and doors dradgift still	ppcu	0.25 - [0.2	x (14) ÷ 1	00] =			0	(15)
Infiltration rate			(8) + (10)	+ (11) + (1	2) + (13)	+ (15) =		0	(16)
Air permeability value,	q50, expressed in cubic	metres per l	hour per so	quare m	etre of e	envelope	area	3	(17)
If based on air permeabil	lity value, then (18) = [(17)	÷ 20]+(8), other	rwise (18) = (16)				0.15	(18)
	es if a pressurisation test has b	peen done or a c	legree air pei	meability	is being u	sed			
Number of sides sheltere	ed		(20) – 1	0 075 v /4	10)1 —			2	(19)
Shelter factor	ting chalter factor		(20) = 1 - (21) = (18)		9)] =			0.85	(20)
Infiltration rate incorporat			(21) = (10)	X (20) =				0.13	(21)
Infiltration rate modified f Jan Feb	Mar Apr May	Jun Jul	Aug	Sep	Oct	Nov	Dec		
	1 ' 1 ' 1	3011 301	Aug	Оер	l Oct	INOV	Dec		
Monthly average wind sp (22)m= 5.1 5	4.9 4.4 4.3	3.8 3.8	3.7	4	4.3	4.5	4.7		
, ,	1 1	1 3.0	1			1 -	<u> </u>		
Wind Factor (22a)m = (2					ı		<u> </u>	1	
(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		

Adjusted infiltr	ation rat	e (allowi	na for sh	nelter an	d wind s	speed) =	(21a) x	(22a)m					
0.16	0.16	0.16	0.14	0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15]	
Calculate effec		•	rate for t	he appli	cable ca	se	!	!	<u> </u>	!	!		
If mechanica				al.) (aa		(1		. (22)	\ (22.)			0.5	(23a)
If exhaust air h) = (23a)			0.5	(23b)
If balanced with		•	•	_								79.05	(23c)
a) If balance					.	- ` ` 	- 	í `	 		- ` ') ÷ 100]	
(24a)m= 0.27	0.26	0.26	0.25	0.24	0.23	0.23	0.22	0.23	0.24	0.25	0.25		(24a)
b) If balance	ed mech	anical ve	ntilation	without	heat red	covery (N	ЛV) (24b	m = (22)	2b)m + (23b)		1	
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If whole h if (22b)n				•					5 × (23b	o)			
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If natural if (22b)n				•	•				0.5]				
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24d)
Effective air	change	rate - er	iter (24a	or (24b	o) or (24	c) or (24	d) in box	x (25)				-	
(25)m= 0.27	0.26	0.26	0.25	0.24	0.23	0.23	0.22	0.23	0.24	0.25	0.25]	(25)
2 Heat lease	o ond be	ot lose r	oromot	0.51			•	•		•	1	4	
3. Heat losse	s and ne	·			Net Ar	200	U-val	110	AXU		k-value	2	ΑΧk
ELEMENT	area	-	Openin m		A,r		W/m2		(W/	K)	kJ/m².		kJ/K
Doors					2	х	1.4		2.8				(26)
Windows Type	e 1				6.097	7 x1.	/[1/(1.4)+	0.04] =	8.08	=			(27)
Windows Type	2				5.107	7 x1,	/[1/(1.4)+	0.04] =	6.77	一			(27)
Walls Type1	38.0)1	11.2		26.81	x	0.15	[4.02	≓ r			(29)
Walls Type2	9.7		2	_	7.76	=	0.14	<u>-</u>	1.1	=		\exists \vdash	(29)
Walls Type3	17.8		0	=	17.84	=	0.13	-	2.36	북 ¦		-	(29)
Total area of e						=	0.13		2.30				
* for windows and			ffective wi	ndow H-vs	65.61		r formula 1	/[/1/ ₋ val	(۱۵۱ مرامر	e aiven in	naragrani	1 2 2	(31)
** include the area						atou using	i Torridia 1	/[((C)+0.0+j c	is giveir iii	paragrapi	7 5.2	
Fabric heat los	ss, W/K :	= S (A x	U)				(26)(30)) + (32) =				25.13	(33)
Heat capacity	Cm = S	(Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	733.68	(34)
Thermal mass	parame	ter (TMF	P = Cm -	- TFA) ir	n kJ/m²K			Indica	tive Value	: Low		100	(35)
For design assess	sments wh	ere the de	tails of the	construct	ion are no	t known pr	ecisely the	e indicative	values of	TMP in T	able 1f		
can be used inste						_							
Thermal bridge	•	,			•	<						6.87	(36)
if details of therma Total fabric he		are not kn	own (36) =	= 0.05 x (3	1)			(33) +	(36) =			22	(37)
Ventilation hea		alculatos	l monthly					, ,	$= 0.33 \times ($	25)m v (5	١	32	(37)
	Feb	Mar		May	lun	Jul	۸۱۱۵	Sep		Nov	Dec	1	
(38)m= Jan (58)m= 15.63	15.44	15.25	Apr 14.32	14.14	Jun 13.2	13.2	13.02	13.58	Oct 14.14	14.51	14.88	1	(38)
` ′	<u> </u>	<u> </u>	. 1.02	L		L	1 .0.02	<u> </u>	<u> </u>	<u> </u>	1	J	(/
Heat transfer of			40.00	40.40	45.0	45.0	45.04		= (37) + (40.00	1	
(39)m= 47.62	47.44	47.25	46.32	46.13	45.2	45.2	45.01	45.57	46.13	46.5	46.88	46.07	(39)
								•	Average =	Surii(39)1	12 / IZ=	46.27	(38)

Heat loss para	ameter (I	HLP), W	′m²K					(40)m	= (39)m ÷	÷ (4)			
(40)m= 0.67	0.67	0.67	0.65	0.65	0.64	0.64	0.64	0.64	0.65	0.66	0.66		
						ı	l		Average =	Sum(40) ₁	12 /12=	0.65	(40)
Number of day	<u> </u>	nth (Tab	le 1a)	i		i	i			i			
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. Water hea	ting ene	rgy requ	irement:								kWh/ye	ear:	
Assumed occu if TFA > 13.9 if TFA £ 13.9	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (¯	TFA -13		27		(42)
Annual average Reduce the annual not more that 125	ge hot wa al average	hot water	usage by	5% if the a	lwelling is	designed i			se target c		2.67		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage i													
(44)m= 101.93	98.23	94.52	90.81	87.11	83.4	83.4	87.11	90.81	94.52	98.23	101.93		
		•				Į.	ļ.		Total = Su	ım(44) ₁₁₂ =	=	1112.02	(44)
Energy content of	f hot water	used - cal	culated m	onthly = 4.	190 x Vd,r	n x nm x E	Tm / 3600) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m= 151.17	132.21	136.43	118.94	114.13	98.48	91.26	104.72	105.97	123.5	134.81	146.4		
W.:					()		h (40		Total = Su	ım(45) ₁₁₂ =	=	1458.03	(45)
If instantaneous w		· ·	·	not water	storage),		DOXES (46)	, , , -		1			
(46)m= 22.67 Water storage	19.83	20.46	17.84	17.12	14.77	13.69	15.71	15.9	18.53	20.22	21.96		(46)
Storage volum) includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community h	` .	•				•					<u> </u>		(,
Otherwise if no	-			-			, ,	ers) ente	er '0' in ((47)			
Water storage	loss:												
a) If manufact	turer's d	eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Temperature f	actor fro	m Table	2b								0		(49)
Energy lost fro		•					(48) x (49)) =		1	10		(50)
b) If manufact			-								1		(54)
Hot water stor	•			e z (KVV	n/iitre/ua	iy)				0.	02		(51)
Volume factor	•		011 4.0							1.	03		(52)
Temperature f	actor fro	m Table	2b							-	.6		(53)
Energy lost fro	m watei	r storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =	1.	03		(54)
Enter (50) or		_								-	03		(55)
Water storage	loss cal	culated	for each	month			((56)m = ((55) × (41)	m				
(56)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinder contains	<u>I</u> s dedicate	d solar sto	<u>l</u> rage, (57)	<u>l</u> m = (56)m		<u>I</u> H11)] ÷ (5	<u>l</u> 0), else (5	<u>I</u> 7)m = (56)	m where (<u>I</u> (H11) is fro	m Appendi	ix H	
(57)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
	loos (s	ļ.	m Tabl			l	l	!	!		0		(58)
Primary circuit Primary circuit	,	,			59)m – 1	(58) ± 36	\$5 y (41)	ım			U		(50)
(modified by				,		` '	, ,		r thermo	ostat)			
(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)
		L	l	L		<u> </u>	<u> </u>	L	L	<u> </u>			

Combilees	ام مغمار بمام	fo., o.o.b		(C4)	(00) . 0	CF (44)	١						
Combi loss of (61)m= 0	alculated	or each	montn (61)m =	(60) ÷ 30	05 × (41))m 0	0	0	0	0	1	(61)
		<u> </u>					<u> </u>	Ļ	<u> </u>	ļ.		(F0)m + (61)m	(01)
(62)m= 206.4		191.71	172.44	169.41	151.98	146.54	160	159.47	178.78	188.31	201.67	(59)m + (61)m	(62)
Solar DHW inpu						<u> </u>		1		<u> </u>		l	(02)
(add addition									ii contribu	ion to wate	or ricating)		
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0	1	(63)
Output from	uwater hea	ter					<u>I</u>					ı	
(64)m= 206.4		191.71	172.44	169.41	151.98	146.54	160	159.47	178.78	188.31	201.67		
		<u> </u>				<u>!</u>	Ou	put from w	ater heate	r (annual)₁	12	2108.87	(64)
Heat gains fi	om water	heating,	kWh/mo	onth 0.2	5 ´ [0.85	× (45)m	ı + (61)ı	n] + 0.8 x	x [(46)m	+ (57)m	+ (59)m	 .]	-
(65)m= 94.48	1	89.58	82.34	82.17	75.54	74.57	79.04	78.03	85.29	87.62	92.9	ĺ	(65)
include (5	7)m in cald	culation o	of (65)m	only if c	ylinder i	s in the	dwelling	or hot w	ater is f	rom com	munity h	ı neating	
5. Internal	<u> </u>			•	•						,		
Metabolic ga													
Jan	T ,	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
(66)m= 113.3	4 113.34	113.34	113.34	113.34	113.34	113.34	113.34	113.34	113.34	113.34	113.34		(66)
Lighting gair	s (calcula	ted in Ap	pendix	L, equati	on L9 o	r L9a), a	lso see	Table 5	•	•	•	•	
(67)m= 18.58	16.5	13.42	10.16	7.59	6.41	6.93	9.01	12.09	15.35	17.91	19.1]	(67)
Appliances of	jains (calc	ulated in	Append	dix L, eq	uation L	13 or L1	3a), als	o see Ta	ble 5				
(68)m= 199.2	9 201.35	196.14	185.05	171.05	157.88	149.09	147.02	152.23	163.33	177.33	190.49		(68)
Cooking gair	ns (calcula	ted in Ap	pendix	L, equat	ion L15	or L15a), also s	ee Table	5				
(69)m= 34.33	34.33	34.33	34.33	34.33	34.33	34.33	34.33	34.33	34.33	34.33	34.33		(69)
Pumps and f	ans gains	(Table 5	ia)										
(70)m= 0	0	0	0	0	0	0	0	0	0	0	0		(70)
Losses e.g.	evaporatio	n (negat	ive valu	es) (Tab	le 5)							-	
(71)m= -90.6	7 -90.67	-90.67	-90.67	-90.67	-90.67	-90.67	-90.67	-90.67	-90.67	-90.67	-90.67		(71)
Water heatin	g gains (T	able 5)											
(72)m= 127	124.85	120.41	114.37	110.44	104.92	100.22	106.24	108.38	114.63	121.69	124.86		(72)
Total intern	al gains =	1			(66))m + (67)m	n + (68)m	+ (69)m +	(70)m + (7	'1)m + (72))m		
(73)m= 401.8	6 399.71	386.97	366.58	346.08	326.21	313.24	319.27	329.7	350.31	373.94	391.45		(73)
6. Solar gai	ns:												
Solar gains are		•				•	itions to c	onvert to th	ne applical		tion.		
Orientation:	Access F Table 6d		Area m²		Flu Tal	ıx ble 6a	-	g_ Fable 6b	т	FF able 6c		Gains (W)	
0									_			` '	1
Southeast 0.9		X	6.	==		36.79	X	0.63		0.7	=	68.56	(77)
Southeast 0.9		X	6.			62.67	X	0.63		0.7	=	116.78](77)]
Southeast 0.9	<u> </u>	X	6.			35.75	X	0.63	×	0.7	=	159.78](77)](77)
Southeast 0.9		X	6.	==		06.25	X	0.63		0.7	=	197.98	[(77)
Southeast 0.9	0.77	X	6.	1	X 1	19.01	X	0.63	X	0.7	=	221.76	(77)

							, ,		_				_
Southeast 0.9x	0.77	X	6.	1	X	118.15	X	0.63	X	0.7	=	220.15	(77)
Southeast _{0.9x}	0.77	X	6.	1	X	113.91	X	0.63	X	0.7	=	212.25	(77)
Southeast 0.9x	0.77	X	6.	1	X	104.39	X	0.63	X	0.7	=	194.51	(77)
Southeast 0.9x	0.77	X	6.	1	x	92.85	x	0.63	X	0.7	=	173.01	(77)
Southeast _{0.9x}	0.77	x	6.	1	x	69.27	x	0.63	x	0.7	=	129.07	(77)
Southeast _{0.9x}	0.77	X	6.	1	x	44.07	x	0.63	х	0.7	=	82.12	(77)
Southeast 0.9x	0.77	x	6.	1	x	31.49	x	0.63	x	0.7		58.67	(77)
Northwest 0.9x	0.77	x	5.1	1	х	11.28	x	0.63	x	0.7	=	17.61	(81)
Northwest _{0.9x}	0.77	x	5.1	1	х	22.97	x	0.63	x	0.7	=	35.85	(81)
Northwest 0.9x	0.77	x	5.1	1	х	41.38	x	0.63	x	0.7	=	64.58	(81)
Northwest 0.9x	0.77	x	5.1	1	x	67.96	x	0.63	x	0.7	=	106.06	(81)
Northwest 0.9x	0.77	x	5.1	1	x	91.35	X	0.63	x	0.7	_	142.57	(81)
Northwest _{0.9x}	0.77	×	5.1	1	x	97.38	X	0.63	×	0.7	╡ -	151.99	(81)
Northwest 0.9x	0.77	×	5.1	1	x	91.1	X	0.63	×	0.7	=	142.19	(81)
Northwest _{0.9x}	0.77	x	5.1	1	x	72.63	X	0.63	×	0.7	=	113.35	(81)
Northwest _{0.9x}	0.77	×	5.1	1	x	50.42	X	0.63	×	0.7	= =	78.69	(81)
Northwest 0.9x	0.77	×	5.1	1	x	28.07	X	0.63	×	0.7	= =	43.81	(81)
Northwest 0.9x	0.77	×	5.1	1	x	14.2	X	0.63	×	0.7	= =	22.16	(81)
Northwest _{0.9x}	0.77	×	5.1	1	x	9.21	X	0.63	×	0.7	= =	14.38	(81)
_					<u> </u>								
Solar gains in	watts calc	culated	for eacl	n month			(83)m	n = Sum(74)m	(82)m				
(83)m= 86.17		224.37	304.04	364.32	372.15	354.44	307		172.8	7 104.28	73.05]	(83)
Total gains – i	nternal and	d solar	(84)m =	(73)m	+ (83)n	n , watts	<u> </u>	I	!		ļ	J	
(84)m= 488.03	552.34 6	611.34	670.62	710.41	698.36	667.68	627	.13 581.41	523.18	3 478.21	464.51]	(84)
7. Mean inter	nal temper	rature ((heating	season	1)	•				•			
Temperature			`		<i></i>	from Tal	ble 9.	. Th1 (°C)				21	(85)
Utilisation fac	•	٠.			•		/	, (-)					`
Jan	Feb	Mar	Apr	May	Jun	Jul	ΙΑ	ug Sep	Oct	Nov	Dec]	
(86)m= 0.93	\vdash	0.83	0.72	0.57	0.41	0.3	0.3		0.76	0.89	0.94		(86)
Mean interna	l tomporati	uro in l	ivina or	no T1 /f	ollow et	one 2 to	 7 in T	able (le)		.!	ļ.	ı	
(87)m= 19.97		20.47	20.76	20.92	20.98	21	20.5		20.75	20.33	19.94]	(87)
` ′	<u> </u>				ļ		<u> </u>	I	20.70	20.00	10.04	J	(=-)
Temperature			-			-	1	` 	I	1 00 00	00.07	1	(00)
(88)m= 20.37	20.37	20.37	20.38	20.38	20.4	20.4	20.	.4 20.39	20.38	20.38	20.37		(88)
Utilisation fac	tor for gair	ns for r	est of d	welling,	h2,m (s	ee Table	9a)		1			1	
(89)m= 0.92	0.89	0.82	0.69	0.53	0.37	0.26	0.2	0.48	0.73	0.88	0.93		(89)
Mean interna	l temperat	ure in t	he rest	of dwell	ing T2	follow ste	eps 3	to 7 in Tab	le 9c)				
(90)m= 18.98	19.28	19.68	20.08	20.29	20.38	20.39	20.	39 20.35	20.08	19.5	18.93		(90)
	-								fLA = Liv	ving area ÷ (4) =	0.41	(91)
Mean interna	l temperati	ure (fດເ	r the wh	ole dwe	llina) =	fLA x T1	+ (1	– fLA) × T2					
(92)m= 19.39	 	20.01	20.36		1	1	1 `		1	10.05	40.05	1	(00)
	10.00 1	20.01 	20.30	20.55	20.63	20.64	20.	64 20.6	20.35	19.85	19.35		(92)
Apply adjustr	LL				<u> </u>	1	<u> </u>		L		19.35		(92)

												1	
(93)m= 19.39	19.66	20.01	20.36	20.55	20.63	20.64	20.64	20.6	20.35	19.85	19.35		(93)
8. Space hea													
Set Ti to the i the utilisation			•		ed at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(76)m an	d re-calc	ulate	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fac		l	<u> </u>	ividy	Ouri	Oui	/ rug	ОСР	001	1101	DCO		
(94)m= 0.91	0.87	0.81	0.69	0.54	0.38	0.27	0.3	0.49	0.73	0.87	0.92		(94)
Useful gains, hmGm , W = (94)m x (84)m													
(95)m= 444.49	481.81	493.53	464.15	386.18	268.29	181.91	189.73	285.22	381.92	415.15	427.67		(95)
Monthly avera	age exte	rnal tem	perature	from Ta	able 8								
(96)m= 4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat loss rate	for me	an intern	al tempe	erature,	Lm , W =	=[(39)m	x [(93)m	– (96)m]	•		ı	
(97)m= 718.54	700.09	638.17	530.91	408.36	272.56	182.76	190.99	296.25	450	592.8	710.09		(97)
Space heatin		1	ı							r -	ı	ı	
(98)m= 203.89	146.68	107.61	48.07	16.5	0	0	0	0	50.65	127.91	210.12		-
							Tota	l per year	(kWh/yeaı	r) = Sum(9	8) _{15,912} =	911.45	(98)
Space heatin	g require	ement in	kWh/m²	² /year								12.86	(99)
9b. Energy red	quiremer	nts – Coi	mmunity	heating	scheme								
This part is us										unity sch	neme.		_
Fraction of spa	ace heat	from se	condary,	/supplen	nentary l	neating ((Table 1	1) '0' if n	one			0	(301)
Fraction of spa	ace heat	from co	mmunity	system	1 – (301	I) =						1	(302)
The community so	cheme ma	y obtain he	eat from se	everal soul	rces. The p	orocedure	allows for	CHP and เ	up to four	other heat	sources; ti	he latter	_
includes boilers, h		-			rom powei	stations.	See Appei	ndix C.			ı		¬(222-)
Fraction of hea			-									1	(303a)
Fraction of tota	al space	heat fro	m Comn	nunity bo	oilers				(3	02) x (303	a) =	1	(304a)
Factor for cont	rol and	charging	method	(Table	4c(3)) fo	r comm	unity hea	iting sys	tem			1	(305)
Distribution los	s factor	(Table 1	12c) for d	commun	ity heatir	ng syste	m					1.05	(306)
Space heating	a											kWh/yea	 r
Annual space	-	requiren	nent									911.45	
Space heat fro	m Comi	munitv b	oilers					(98) x (30)4a) x (30	5) x (306) :	=	957.02	(307a)
Efficiency of se		•		heating	svstem	in % (fro	m Tahle					0	(308
•	,		•		•	,				,			Ⅎ`
Space heating	require	ment fro	m secon	dary/su	oplemen	tary syst	tem	(98) x (30	01) x 100 -	÷ (308) =		0	(309)
Water heating	J												
Annual water h	neating i	equirem	ent									2108.87	
If DHW from c								(0.1)		=) (000)	ı		¬(040)
Water heat fro		•						(64) x (30)3a) x (30	5) x (306) :	=	2214.31	(310a)
Electricity used	d for hea	at distrib	ution				0.01	× [(307a).	(307e) +	(310a)([310e)] =	31.71	(313)
Cooling System	m Energ	y Efficie	ncy Rati	0								0	(314)
Space cooling	(if there	is a fixe	d coolin	g systen	n, if not e	enter 0)		= (107) ÷	(314) =			0	(315)
Electricity for p	oumps a	nd fans v	within dv	vellina (1	Γable 4f)	:							
mechanical ve							outside					245.83	(330a)
											'		

						_
warm air heating system fans					0	(330b)
pump for solar water heating					0	(330g)
Total electricity for the above, kWh/year		=(330a) + (330	b) + (330g) =		245.83	(331)
Energy for lighting (calculated in Appen	dix L)				328.11	(332)
Electricity generated by PVs (Appendix	M) (negative quantity)				-716.31	(333)
Electricity generated by wind turbine (A	opendix M) (negative o	quantity)			0	(334)
12b. CO2 Emissions – Community heat	ing scheme					
		Energy kWh/year	Emission factor kg CO2/kWh		missions g CO2/year	
CO2 from other sources of space and w Efficiency of heat source 1 (%)) ing two fuels repeat (363) to	(366) for the second	fuel	94	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x	0.22	=	728.73	(367)
Electrical energy for heat distribution		[(313) x	0.52	=	16.46	(372)
Total CO2 associated with community s	ystems	(363)(366) + (368)(372	2)	=	745.19	(373)
CO2 associated with space heating (see	condary)	(309) x	0	=	0	(374)
CO2 associated with water from immers	sion heater or instantar	neous heater (312) x	0.22	=	0	(375)
Total CO2 associated with space and w	ater heating	(373) + (374) + (375) =			745.19	(376)
CO2 associated with electricity for pump	os and fans within dwe	elling (331)) x	0.52	=	127.58	(378)
CO2 associated with electricity for lighti	ng	(332))) x	0.52	=	170.29	(379)
Energy saving/generation technologies Item 1	(333) to (334) as appli	cable	0.52 x 0.01	= [-371.77	(380)
Total CO2, kg/year	sum of (376)(382) =			Ī	671.3	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =				9.47	(384)

El rating (section 14)

(385)

92.24

SAP 2012 Overheating Assessment

Calculated by Stroma FSAP 2012 program, produced and printed on 28 October 2020

Property Details: Plot 44

Dwelling type:FlatLocated in:EnglandRegion:Thames valley

Cross ventilation possible: Yes
Number of storeys: 1

Front of dwelling faces: South West

Overshading: Average or unknown

Overhangs: None

Thermal mass parameter: Indicative Value Low

Night ventilation: False

Blinds, curtains, shutters:

Ventilation rate during hot weather (ach):6 (Windows fully open)

Overheating Details:

Summer ventilation heat loss coefficient: 350.74 (P1)

Transmission heat loss coefficient: 32

Summer heat loss coefficient: 382.73 (P2)

Overhangs:

Orientation:	Ratio:	Z_overhangs:
--------------	--------	--------------

South East (SE) 0 1 North West (NW) 0 1

Solar shading:

Orientation:	Z blinds:	Solar access:	Overhangs:	Z summer:	
South East (SE)	1	0.9	1	0.9	(P8)
North West (NW)	1	0.9	1	0.9	(P8)

Solar gains:

Orientation		Area	Flux	\mathbf{g}_{-}	FF	Shading	Gains
South East (SE)	0.9 x	6.1	119.92	0.63	0.7	0.9	261.18
North West (NW)	0.9 x	5.11	98.85	0.63	0.7	0.9	180.32
						Total	441.5 (P3/P4)

Internal gains.

	June	July	August
Internal gains	452.8	436.27	444.39
Total summer gains	921.64	877.77	835.56 (P5)
Summer gain/loss ratio	2.41	2.29	2.18 (P6)
Mean summer external temperature (Thames valley)	16	17.9	17.8
Thermal mass temperature increment	1.3	1.3	1.3
Threshold temperature	19.71	21.49	21.28 (P7)
Likelihood of high internal temperature	Not significant	Slight	Slight

Assessment of likelihood of high internal temperature: Slight

		User F	Details:						
Assessor Name: Software Name:	Zahid Ashraf Stroma FSAP 2012		Strom Softwa	are Ve	rsion:			001082 on: 1.0.5.9	
Address :	· ·	Property	Address	Plot 44					
1. Overall dwelling dime	nsions:								
		Are	a(m²)		Av. He	ight(m)		Volume(m ³	3)
Ground floor		7	70.86	(1a) x	2	2.5	(2a) =	177.14	(3a)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e)+(1	n)	70.86	(4)					
Dwelling volume				(3a)+(3b)+(3c)+(3c	d)+(3e)+	.(3n) =	177.14	(5)
2. Ventilation rate:									
	main seconda heating heating	ry	other		total			m³ per hou	ır
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 fa	ns			Ī	3	x '	10 =	30	(7a)
Number of passive vents				Ī	0	x -	10 =	0	(7b)
Number of flueless gas fi	res			Ē	0	X 4	40 =	0	(7c)
				L					
				_			Air ch	anges per ho	our —
•	ys, flues and fans = (6a)+(6b)+(een carried out or is intended, procee			ontinuo fr	30		÷ (5) =	0.17	(8)
Number of storeys in the		tu to (17),	ourerwise (onunue n	om (9) to	(10)		0	(9)
Additional infiltration	3 ([(9)	-1]x0.1 =	0	(10)
Structural infiltration: 0	.25 for steel or timber frame o	r 0.35 fo	r masoni	y constr	ruction			0	(11)
if both types of wall are pu deducting areas of openir	resent, use the value corresponding t pas): if equal user 0.35	o the grea	ter wall are	a (after					
,	floor, enter 0.2 (unsealed) or 0	.1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, en	ter 0.05, else enter 0							0	(13)
<u>-</u>	s and doors draught stripped							0	(14)
Window infiltration			0.25 - [0.2	. ,	-	()		0	(15)
Infiltration rate	250 averaged in a his mate		(8) + (10)					0	(16)
•	q50, expressed in cubic metro ity value, then $(18) = [(17) \div 20] +$	-		•	etre or e	envelope	area	3	(17)
•	s if a pressurisation test has been do				is being u	sed		0.32	(10)
Number of sides sheltere	ed							2	(19)
Shelter factor			(20) = 1 -		19)] =			0.85	(20)
Infiltration rate incorporat	•		(21) = (18) x (20) =				0.27	(21)
Infiltration rate modified for	- 1 	1	1 .			<u> </u>		1	
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp (22)m= 5.1 5	eed from Table 7 4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7	1	
(22)m= 5.1 5	4.3 4.4 4.3 3.8] 3.8	3.1	4	4.3	J 4.0	4.7		
Wind Factor $(22a)m = (22a)m $	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		

Adjusted infiltrati	on rate	e (allowi	ng for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m					
0.35	0.34	0.33	0.3	0.29	0.26	0.26	0.25	0.27	0.29	0.31	0.32]	
Calculate effection If mechanical		-	rate for t	he appli	cable ca	se							
If exhaust air heat			endix N (2	3h) = (23a	ı) × Fmv (e	equation (N	N5)) other	wise (23h) = (23a)			0	(23a
If balanced with he									, (200)			0	(23b
a) If balanced		•	•	Ū		,		'	2h)m + (23h) x [1 – (23c)		(230
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(24a
b) If balanced	mecha	anical ve	ntilation	without	heat rec	coverv (N	и ЛV) (24b)m = (22	2b)m + (1 23b)		J	
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(241
c) If whole hou				•	•				5 × (23b))		•	
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(240
d) If natural ve if (22b)m =				•	•				0.5]	!	!		
(24d)m= 0.56	0.56	0.56	0.54	0.54	0.53	0.53	0.53	0.54	0.54	0.55	0.55		(240
Effective air ch	nange	rate - en	iter (24a	or (24b	o) or (24	c) or (24	d) in box	(25)				_	
(25)m= 0.56	0.56	0.56	0.54	0.54	0.53	0.53	0.53	0.54	0.54	0.55	0.55		(25)
3. Heat losses a	and he	at loss r	paramete	er:									
ELEMENT	Gros	•	Openin		Net Ar	ea	U-valı	re	AXU		k-value	9	ΑΧk
	area	(m²)	'nm		A ,r	n²	W/m2	K	(W/	K)	kJ/m²-	K	kJ/K
Doors					2	X	1.4	= [2.8				(26)
Windows Type 1					6.097	x1/	/[1/(1.4)+	0.04] =	8.08				(27)
Windows Type 2					5.107	x1/	/[1/(1.4)+	0.04] =	6.77				(27)
Walls Type1 [38.0	1	11.2		26.81	X	0.15	=	4.02				(29)
Walls Type2 [9.76	3	2		7.76	X	0.14	=	1.1				(29)
Walls Type3 [17.8	4	0		17.84	X	0.13	= [2.36	\Box [(29)
Total area of ele	ments,	m²			65.61								(31)
* for windows and ro ** include the areas						ated using	formula 1	/[(1/U-valu	ie)+0.04] á	as given in	paragrapl	n 3.2	
Fabric heat loss,	W/K =	= S (A x	U)				(26)(30)	+ (32) =				25.13	3 (33)
Heat capacity Cr	m = S(Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	733.6	(34)
Thermal mass pa	arame	ter (TMF	P = Cm ÷	- TFA) ir	kJ/m²K			Indica	tive Value	: Low		100	(35)
For design assessme can be used instead				constructi	ion are not	t known pr	ecisely the	indicative	values of	TMP in Ta	able 1f		
Thermal bridges	: S (L	x Y) cal	culated i	using Ap	pendix ł	<						6.87	(36
if details of thermal b	oridging a	are not kn	own (36) =	= 0.05 x (3	1)								
Total fabric heat	loss							(33) +	(36) =			32	(37)
Ventilation heat I							1			(25)m x (5)	1	1	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(n=)
(38)m= 32.73	32.59	32.46	31.83	31.72	31.17	31.17	31.07	31.38	31.72	31.95	32.2	J	(38)
Heat transfer coe		it, W/K					1	(39)m	= (37) + (38)m		1	
(39)m= 64.73	64.59	64.46	63.83	63.71	63.17	63.17	63.07	63.38	63.71	63.95	64.2		 1.
								,	Average =	Sum(39) ₁	12 /12=	63.83	(39)

Heat loss para	meter (H	HLP), W/	m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 0.91	0.91	0.91	0.9	0.9	0.89	0.89	0.89	0.89	0.9	0.9	0.91		
Number of day	a in ma	oth /Tobl	0 10)					,	Average =	Sum(40) ₁	12 /12=	0.9	(40)
Number of day Jan	Feb	Mar	e ra) Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
		ļ				<u> </u>	<u></u>		<u> </u>	!	<u> </u>		
4. Water heat	ing ene	rgy requi	rement:								kWh/ye	ear:	
Assumed occu	nancy	N								2	27		(42)
if TFA > 13.9	N = 1		[1 - exp	(-0.0003	49 x (TF	FA -13.9)2)] + 0.0	0013 x (¯	ΓFA -13.		21		(12)
Annual averag											.67		(43)
Reduce the annua not more that 125	•				•	-	o acnieve	a water us	se target o)T			
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage in	litres per	day for ea		Vd,m = fa	ctor from T	Table 1c x							
(44)m= 101.93	98.23	94.52	90.81	87.11	83.4	83.4	87.11	90.81	94.52	98.23	101.93		
Energy content of	hot water	used - cal	culated ma	onthly – 1	100 v Vd r	n v nm v F	Tm / 3600			im(44) ₁₁₂ =		1112.02	(44)
	132.21	136.43	118.94	114.13	98.48	91.26	104.72	105.97	123.5	134.81	146.4		
(45)m= 151.17	132.21	130.43	110.94	114.13	90.40	91.20	104.72			Im(45) ₁₁₂ =	l l	1458.03	(45)
If instantaneous w	ater heati	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46)		rotar – ou	(10)112 =	l	1 100.00	(-/
(46)m= 0	0	0	0	0	0	0	0	0	0	0	0		(46)
Water storage		مادرطانه	a 001/0	olor or M	WHDC	otorogo	within or		001				(47)
Storage volum If community h	, ,		•			•		airie ves	9 C I		0		(47)
Otherwise if no	•			•			` '	ers) ente	er '0' in ((47)			
Water storage	loss:		`					,	·				
a) If manufact				or is kno	wn (kWh	n/day):					0		(48)
Temperature fa											0		(49)
Energy lost fro		_	-		or io not		(48) x (49)) =			0		(50)
b) If manufaction Hot water stora			-								0		(51)
If community h	_			,		• /							, ,
Volume factor											0		(52)
Temperature fa											0		(53)
Energy lost fro		•	, kWh/ye	ear			(47) x (51)	x (52) x (53) =	-	0		(54)
Enter (50) or (, ,	,	or oach	month			((56)m - (55) × (41):	m		0		(55)
Water storage							((56)m = (T .			(EC)
(56)m= 0 If cylinder contains	0 dedicate	0 d solar sto	0 rage, (57)ı	0 m = (56)m	0 x [(50) – (0 H11)] ÷ (5	0 0), else (57	0 7)m = (56)	0 m where (0 (H11) is fro	0 m Append	ix H	(56)
(57)m= 0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primary circuit	loss (ar	nual) fro	m Table	e 3					•		0		(58)
Primary circuit	•	•			59)m = ((58) ÷ 36	65 × (41)	m					• •
(modified by				•	•	. ,	, ,		r thermo	stat)			
(59)m= 0	0	0	0	0	0	0	0	0	0	0	0		(59)

Combis loss calculated for each month (61)m = (60) + 365 x (41)m (61)m (61)m 0
Total heat required for water heating calculated for each month (62)m = 0.85 x (45)m + (46)m + (57)m + (59)m + (61)m (62)m (62
Column 128.49 112.38 115.97 101.1 97.01 83.71 77.57 89.01 90.08 104.98 114.59 124.44 (62)
Colar DHW linput calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating) (add additional lines if FGHRS and/or WWHRS applies, see Appendix G)
(add additional lines if FGHRS and/or WHRS applies, see Appendix G) (63)ms 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
Cotyput from water heater (64)me 128.49 112.38 115.97 101.1 97.01 83.71 77.57 89.01 90.08 104.98 114.59 124.44 128.49 112.38 115.97 101.1 97.01 83.71 77.57 89.01 90.08 104.98 114.59 124.44 128.49 112.38 115.97 101.1 97.01 83.71 77.57 89.01 90.08 104.98 114.59 124.44 128.49 112.38 115.97 101.1 97.01 83.71 77.57 89.01 90.08 104.98 114.59 124.44 128.49 112.38 115.97 101.1 97.01 83.71 77.57 89.01 90.08 104.98 114.59 124.44 128.49 128.49 128.49 128.49 128.33 (64) 128.59 128.49 128.49 128.49 128.33 (64) 128.50 128.50 128.50 128.50 128.33 (64) 128.50 128.50 128.50 128.50 128.50 128.33 (64) 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.50 128.
Output from water heater (64)m= 128.49 112.38 115.97 101.1 97.01 83.71 77.57 89.01 90.08 104.98 114.59 124.44 Heat gains from water heating, kWh/month 0.25 '[0.85 x (45)m + (61)m] + 0.8 x [(46)m + (57)m + (59)m] (65)m= 32.12 28.09 28.99 25.28 24.25 20.93 19.39 22.25 22.52 26.24 28.65 31.11 (65)miclude (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating 5. Internal gains (Table 5), Watts Metabolic gains (Table 5), Watts 48
Column 128.49 112.38 115.97 101.1 97.01 83.71 77.57 89.01 90.08 104.98 114.59 124.44
Couput from water heater (annual)
Heat gains from water heating, kWh/month 0.25 ' [0.85 × (45)m + (61)m] + 0.8 × [(46)m + (57)m + (59)m] (65)m = 32.12 28.09 28.99 25.28 24.25 20.93 19.39 22.25 22.52 26.24 28.65 31.11 (65) include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating 5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)m = 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.3
(65)m= 32.12
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating 5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)m= 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34 113.34
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
(66)m=
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5 (67)m= 18.58
(67)m=
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5 (68)m= 199.29 201.35 196.14 185.05 171.05 157.88 149.09 147.02 152.23 163.33 177.33 190.49 Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 (69)m= 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 (69) Pumps and fans gains (Table 5a) (70)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
(68)m= 199.29 201.35 196.14 185.05 171.05 157.88 149.09 147.02 152.23 163.33 177.33 190.49 (68) Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 (69)m= 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 (69) Pumps and fans gains (Table 5a) (70)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5 (69)m= 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 3
(69)m= 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33 34.33
Pumps and fans gains (Table 5a) (70)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
(70)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
(70)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
(71)m=
(71)m=
(72)m= 43.18 41.81 38.97 35.1 32.6 29.07 26.07 29.91 31.28 35.27 39.79 41.81 Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m (73)m= 318.04 316.67 305.53 287.31 268.24 250.36 239.08 242.94 252.6 270.95 292.03 308.4 (73) 6. Solar gains: Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.
(72)m= 43.18 41.81 38.97 35.1 32.6 29.07 26.07 29.91 31.28 35.27 39.79 41.81 Total internal gains = (66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m (73)m= 318.04 316.67 305.53 287.31 268.24 250.36 239.08 242.94 252.6 270.95 292.03 308.4 (73) 6. Solar gains: Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.
(73)m= 318.04 316.67 305.53 287.31 268.24 250.36 239.08 242.94 252.6 270.95 292.03 308.4 (73) 6. Solar gains: Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.
(73)m= 318.04 316.67 305.53 287.31 268.24 250.36 239.08 242.94 252.6 270.95 292.03 308.4 (73) 6. Solar gains: Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.
6. Solar gains: Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.
Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.
Orientation: Access Factor Area Flux a FF Gains
<u> </u>
Table 6d m² Table 6a Table 6b Table 6c (W)
Southeast $0.9x$ 0.77 x 6.1 x 36.79 x 0.63 x 0.7 = 68.56 (77)
Southeast 0.9x 0.77 x 6.1 x 62.67 x 0.63 x 0.7 = 116.78 (77)
Southeast 0.9x 0.77 x 6.1 x 85.75 x 0.63 x 0.7 = 159.78 (77)
Southeast 0.9x 0.77 x 6.1 x 106.25 x 0.63 x 0.7 = 197.98 (77)

0 4 · F					_		-						_
Southeast 0.9x	0.77	×	6.	1	x	118.15	X	0.63	×	0.7	=	220.15	(77)
Southeast 0.9x	0.77	X	6.	1	x	113.91	X	0.63	X	0.7	=	212.25	(77)
Southeast 0.9x	0.77	X	6.	1	x	104.39	X	0.63	X	0.7	=	194.51	(77)
Southeast _{0.9x}	0.77	X	6.	1	x	92.85	X	0.63	X	0.7	=	173.01	(77)
Southeast _{0.9x}	0.77	X	6.	1	x	69.27	X	0.63	X	0.7	=	129.07	(77)
Southeast 0.9x	0.77	X	6.	1	x	44.07	X	0.63	X	0.7	=	82.12	(77)
Southeast 0.9x	0.77	x	6.	1	X	31.49	X	0.63	X	0.7	=	58.67	(77)
Northwest 0.9x	0.77	X	5.1	11	x	11.28	X	0.63	X	0.7	=	17.61	(81)
Northwest 0.9x	0.77	X	5.1	11	X	22.97	X	0.63	X	0.7	=	35.85	(81)
Northwest 0.9x	0.77	X	5.1	11	x	41.38	X	0.63	X	0.7	=	64.58	(81)
Northwest 0.9x	0.77	X	5.1	11	x	67.96	X	0.63	X	0.7	=	106.06	(81)
Northwest 0.9x	0.77	X	5.1	11	x	91.35	x	0.63	X	0.7	=	142.57	(81)
Northwest _{0.9x}	0.77	X	5.1	11	x	97.38	x	0.63	X	0.7	=	151.99	(81)
Northwest _{0.9x}	0.77	X	5.1	11	x	91.1	x	0.63	X	0.7	=	142.19	(81)
Northwest _{0.9x}	0.77	Х	5.1	11	x	72.63	X	0.63	X	0.7	=	113.35	(81)
Northwest _{0.9x}	0.77	х	5.1	11	x	50.42	X	0.63	X	0.7	=	78.69	(81)
Northwest _{0.9x}	0.77	Х	5.1	11	x	28.07	X	0.63	X	0.7	=	43.81	(81)
Northwest _{0.9x}	0.77	Х	5.1	11	x	14.2	X	0.63	X	0.7	=	22.16	(81)
Northwest _{0.9x}	0.77	х	5.1	11	x	9.21	X	0.63	X	0.7	=	14.38	(81)
Solar gains in (83)m= 86.17	watts, ca	alculated 224.37	for eac 304.04	h month 364.32	372.15	354.44	(83)m 307	n = Sum(74 .87 251.			73.05]	(83)
Total gains – ii	nternal a	nd solar	(84)m =	= (73)m	+ (83)n	າ , watts	!		!			ı	
(84)m= 404.21	469.29	529.9	591.36	632.56	622.51	593.52	550	.81 504.	31 443	82 396.31	381.46]	(84)
7. Mean inter	nal temp	erature	(heating	seasor)							4	
Temperature			,		<i>'</i>	a from Ta	ble 9	Th1 (°C	;)			21	(85)
Utilisation fac	_	•			_			, (-	,				` ′
Jan	Feb	Mar	Apr	May	Jun		A	ug Se	ep O	ct Nov	Dec]	
(86)m= 0.97	0.95	0.91	0.84	0.73	0.58	0.44	0.4			8 0.95	0.97		(86)
Mean interna	l temper	ature in	living an	ea T1 (f	ollow st	ens 3 to	7 in T	able 9c)	!		-		
(87)m= 19.11	19.37	19.76	20.24	20.64	20.87	-i	20.		76 20.2	25 19.59	19.05]	(87)
Temperature				<u> </u>	<u> </u>			!	!		1	J	
(88)m= 20.16	20.16	20.16	20.17	20.17	20.17	-	20.			17 20.17	20.16	1	(88)
` ′				<u> </u>	<u> </u>		<u> </u>	- 1 - 3.		1 -5/	1 -3	J	` '
Utilisation fac	tor for ga	0.9	0.82	welling, 0.69	n2,m (s	0.37	9a) 0.4	11 0.6	4 0.8	6 0.94	0.97	1	(89)
` ′				<u> </u>	<u> </u>			!	!	!	0.97		(00)
Mean interna			1	ı		`	ı i	i			40	1	(00)
(90)m= 18.41	18.66	19.05	19.52	19.89	20.09	20.15	20.	15 20.0			18.36		(90)
									tLA = l	_iving area ÷	(4) =	0.41	(91)
Mean interna	temper	ature (fo	r the wh	ole dwe	lling) =	fLA × T1	+ (1	– fLA) ×	T2			-	
(92)m= 18.7	18.95	19.35	19.82	20.2	20.42		20.				18.65		(92)
Apply adjustn	nent to th	he mean	interna	l temper	ature f	om Table	e 4e,	where ap	opropria	te			

(93)m=	18.7	18.95	19.35	19.82	20.2	20.42	20.49	20.48	20.32	19.83	19.18	18.65		(93)
` '			uirement		20.2	20.12	20.10	20.10	20.02	10.00	10.10	10.00		(==)
					re ohtair	ned at ste	en 11 of	Tahla Oh	so tha	t Ti m-(76)m an	d re-calc	ulate	
				using Ta		ieu at st	ер 11 ог	Table 31), 30 tria	t 11,111—(r O)III air	u re-caic	ulate	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	ation fac		ains, hm	•	,		Į.		•					
(94)m=	0.95	0.93	0.89	0.81	0.69	0.54	0.4	0.44	0.66	0.85	0.93	0.96		(94)
Usefu	l gains.	hmGm	W = (94	1)m x (84	4)m	<u>!</u>	Į	ļ						
(95)m=	385.29	436.31	470.96	479.93	437.88	333.81	235.8	243.39	330.44	376.26	369.34	366		(95)
Month	nlv avera	age exte	rnal tem	perature	from T	umable 8	ļ	ļ						
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat	loss rate	for mea	an intern	al tempe	erature.	Lm , W =	=[(39)m :	x [(93)m-	 – (96)m	1				
(97)m=	931.81	907.8	828.04	697.18	541.35	367.47	245.59	257.12	394.3	588.16	772.56	927.34		(97)
Space	e heatin	g require	ement fo	r each n	nonth, k	Wh/mont	th = 0.02	24 x [(97)	m – (95)m] x (4	L 1)m			
(98)m=	406.61	316.84	265.67	156.42	76.98	0	0	0	0	157.66	290.32	417.64		
						!	ļ	Tota	l per year	(kWh/year) = Sum(9	8) _{15.912} =	2088.14	(98)
Cnaa	, hootin	a roauir	amont in	IdA/b/m2	V				, , , , , ,	(.,	, (-	[[╡``
Space	eneaun	g require	ement in	kWh/m²	year							l	29.47	(99)
8c. Sp	pace co	oling rec	uiremen	nt										
Calcu	lated fo		luly and	August.		ble 10b						1		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
1		<u> </u>					i e	and exte				Ó		
(100)m=	0	0	0	0	0	593.78	467.45	479.31	0	0	0	0		(100)
Utilisa	ation fac	tor for lo	ss hm			,						- I		
(101)m=	0	0	0	0	0	0.86	0.9	0.88	0	0	0	0		(101)
	l loss, h	mLm (V	/atts) = ((100)m x	(101)m	<u> </u>	T	1				1		
(102)m=	0	0	0	0	0	509.28	422.76	424.08	0	0	0	0		(102)
		gains ca	culated	for appli	cable w			e Table	10)					
(103)m=		0	0	0	0	811.92	776.39	727.91	0	0	0	0		(103)
						dwelling,	continue	ous (kW	h = 0.02	24 x [(10	03)m – (102)m] x	((41)m	
,		Ì		3 × (98)		047.0	000.4	000.04	0	0	-			
(104)m=	0	0	0	0	0	217.9	263.1	226.04	0	0	0	0		7
Cooloo	I fraction									= Sum(104) area ÷ (4	=	707.04	(104)
			able 10b	`					10=	coolea	area - (2	+) = [1	(105)
(106)m=		0	0	0	0	0.25	0.25	0.25	0	0	0	0		
(100)111=	U	Ū	U	U		0.25	0.25	0.23		' = Sum((106)
Snace	cooling	requirer	nent for	month -	(104)m	× (105)	√ (106)r	m	TOtal	= Sum	1 <u>04</u>)	= [0	(100)
(107)m=		0	0	0	0	54.48	65.77	56.51	0	0	0	0		
(101)		Ū	Ū	Ů		1 0	1	00.01		= Sum(=	176.76	(107)
0	!!			-\						`	19091	_ [┥
·		•		:Wh/m²/y					` ′	÷ (4) =			2.49	(108)
				alculated	only un	der spec	cial cond	litions, se		· ·				
Fabrio	Energy	/ Efficier	псу						(99) -	+ (108) =	=		31.96	(109)

SAP Input

Property Details: Plot 44

Address:

Located in: England Region: Thames valley

UPRN:

Date of assessment: 08 July 2020
Date of certificate: 28 October 2020

Assessment type: New dwelling design stage

Transaction type:

Tenure type:

Related party disclosure:

Thermal Mass Parameter:

New dwelling
Unknown

No related party
Indicative Value Low

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

PCDF Version: 466

Property description:

Dwelling type: Flat

Detachment:

Year Completed: 2020

Floor Location: Floor area:

Storey height:

Floor 0 70.856 m² 2.5 m

Living area: 29.384 m² (fraction 0.415)

Front of dwelling faces: South West

Opening types:

Name: Source: Type: Glazing: Argon: Frame:

SW Manufacturer Solid

SE Manufacturer Windows double-glazed Yes NW Manufacturer Windows double-glazed Yes

U-value: No. of Openings: Name: Gap: Frame Factor: g-value: Area: SW 0 1.4 mm SF 0.7 0.63 1.4 6.097 1 16mm or more 0.63 5.107 NW 16mm or more 0.7 1.4 1

Name: Type-Name: Location: Orient: Width: Height: SW Corridor Wall South West 0 0

SE External Wall South East 0 0 0 NW External Wall North West 0 0

Overshading: Average or unknown

Opaque Elements:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Elements	<u>s</u>						
External Wall	38.01	11.2	26.81	0.15	0	False	N/A
Corridor Wall	9.759	2	7.76	0.15	0.4	False	N/A
Stairwell Wall	17.841	0	17.84	0.15	0.9	False	N/A
Internal Flomente							

Internal Elements

Party Elements

Thermal bridges:

Thermal bridges: User-defined (individual PSI-values) Y-Value = 0.1047

Length Psi-value

5.93 0.291 E2 Other lintels (including other steel lintels)

SAP Input

17.7	0.048	E4	Jamb
47.108	0.064	E7	Party floor between dwellings (in blocks of flats)
2.9	0.074	E16	Corner (normal)
5.8	-0.072	E17	Corner (inverted internal area greater than external area)
8.7	0.057	E18	Party wall between dwellings
8.7	0.113	E25	Staggered party wall between dwellings
43.978	0	P3	Intermediate floor between dwellings (in blocks of flats)

Ventilation:

Pressure test: Yes (As designed)

Ventilation: Balanced with heat recovery

Number of wet rooms: Kitchen + 1

Ductwork: Insulation, rigid

Approved Installation Scheme: True

Number of chimneys: 0
Number of open flues: 0
Number of fans: 0
Number of passive stacks: 0
Number of sides sheltered: 2
Pressure test: 3

Main heating system

Main heating system: Community heating schemes

Heat source: Community boilers

heat from boilers – mains gas, heat fraction 1, efficiency 94 Piping>=1991, pre-insulated, low temp, variable flow

Central heating pump: 2013 or later Design flow temperature: Unknown

Boiler interlock: Yes

Main heating Control:

Main heating Control: Charging system linked to use of community heating, programmer and at least two room

thermostats Control code: 2312

Secondary heating system:

Secondary heating system: None

Water heating

Water heating: From main heating system

Water code: 901 Fuel :mains gas No hot water cylinder Solar panel: False

Others:

Electricity tariff: Standard Tariff
In Smoke Control Area: Unknown
Conservatory: No conservatory

Low energy lights: 100%

Terrain type: Low rise urban / suburban

EPC language: English Wind turbine: No

Photovoltaics: Photovoltaic 1

Installed Peak power: 0.87 Tilt of collector: 30°

Overshading: None or very little Collector Orientation: South West

Assess Zero Carbon Home: No

		Us <u>er</u> l	Details:						
Assessor Name: Software Name:	Zahid Ashraf Stroma FSAP 2012		Strom Softwa					0001082 on: 1.0.5.9	
		Property	Address	: Plot 44					
Address :									
1. Overall dwelling dime	ensions:								
Ground floor			ea(m²)	14-2		ight(m)	_	Volume(m ³	<u>`</u>
		<u> </u>	70.86	(1a) x	2	2.5	(2a) =	177.14	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(In)	70.86	(4)					
Dwelling volume				(3a)+(3b)+(3c)+(3c	d)+(3e)+	(3n) =	177.14	(5)
2. Ventilation rate:									
	main seconda heating heating		other		total			m³ per hou	ır
Number of chimneys	0 + 0	+	0] = [0	×	40 =	0	(6a)
Number of open flues	0 + 0	_ + [0	Ī = [0	×	20 =	0	(6b)
Number of intermittent fa	ins				3	×	10 =	30	(7a)
Number of passive vents	;			F	0	x	10 =	0	(7b)
Number of flueless gas fi					0	x	40 =	0	(7c)
				L					(, o)
							Air ch	nanges per ho	our
Infiltration due to chimne	ys, flues and fans = $(6a)+(6b)+$	(7a)+(7b)+	(7c) =	Γ	30		÷ (5) =	0.17	(8)
	peen carried out or is intended, proce	ed to (17),	otherwise (continue fi	rom (9) to	(16)			
Number of storeys in the Additional infiltration	he dwelling (ns)							0	(9)
	.25 for steel or timber frame of	or 0 35 fc	or macon	ry coneti	ruction	9)]	9)-1]x0.1 =	0	(10)
	resent, use the value corresponding			•	uction			0	(11)
deducting areas of opening									_
·	floor, enter 0.2 (unsealed) or	0.1 (seal	ed), else	enter 0				0	(12)
If no draught lobby, en	ter 0.05, else enter 0 s and doors draught stripped							0	(13)
Window infiltration	s and doors draught stripped		0.25 - [0.2	2 x (14) ÷ 1	100] =			0	(14)
Infiltration rate					- 12) + (13) ·	+ (15) =		0	(16)
Air permeability value,	q50, expressed in cubic met	es per h	our per s	quare m	etre of e	envelop	e area	5	(17)
If based on air permeabil	lity value, then $(18) = [(17) \div 20]$ -	-(8), otherv	vise (18) =	(16)				0.42	(18)
	es if a pressurisation test has been d	one or a de	egree air pe	rmeability	is being u	sed			_
Number of sides sheltere Shelter factor	ed		(20) = 1 -	[0.075 x (19)] =			2	(19) (20)
Infiltration rate incorporate	ting shelter factor		(21) = (18	`	/,1			0.85	(21)
Infiltration rate modified f	•		() (-	, (-,				0.36	(21)
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
Monthly average wind sp	1 ' 1 ' 1	1	<u>, </u>			1		J	
(22)m= 5.1 5	4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7]	
	2)	1	1	1	•	•	1	ı	
Wind Factor (22a)m = (2.32)m $= (2.32)$ m		1 0 05	0.00		1 4 00	1 4 40	140	1	
(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	J	

0.45	0.45	0.44	0.39	0.38	d wind s	0.34	0.33	0.36	0.38	0.4	0.42	1	
Calculate effec		l					0.00	0.00	0.00	0.4	0.42	J	
If mechanica	al ventila	ition:										0	(2
If exhaust air he	eat pump i	using Appe	endix N, (2	3b) = (23a	a) × Fmv (e	quation (N	N5)) , othe	wise (23b) = (23a)			0	(2
If balanced with	heat reco	overy: effic	iency in %	allowing f	or in-use fa	actor (from	Table 4h) =				0	(2
a) If balance	d mecha	anical ve	ntilation	with hea	at recove	ery (MVI	HR) (24a	<u> </u>	2b)m + (2	23b) × [1 – (23c)) ÷ 100]	
24a)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
b) If balance			ntilation		1	overy (N	/IV) (24b	<u> </u>	ŕ			1	
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
c) If whole h				•	•				F (00)				
<u>``</u>		<u> </u>	· ·	, ,	o); otherv	,	ŕ				Ι ο	1	(2
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0	J	(2
d) If natural if (22b)n					ve input v erwise (2				0.51				
24d)m= 0.6	0.6	0.6	0.58	0.57	0.56	0.56	0.55	0.56	0.57	0.58	0.59	1	(2
Effective air	change	rate - er	ter (24a	or (24h	o) or (24	c) or (24	d) in box	(25)				J	
25)m= 0.6	0.6	0.6	0.58	0.57	0.56	0.56	0.55	0.56	0.57	0.58	0.59	1	(2
											l	J	
3. Heat losse		·							A 37.11				
LEMENT	Gros area	-	Openin m		Net Ard A ,n		U-valı W/m2		A X U (W/ł	<)	k-value kJ/m²-l		A X k kJ/K
oors		(***)			2	x	1		2	<u>,</u>			(2
√indows Type	e 1				6.097	x ₁ ,	 /[1/(1.4)+	0.04] =	8.08	=			(2
Vindows Type					5.107	= .	/[1/(1.4)+	L	6.77	=			(2
Valls Type1	38.0	11	11.2	\neg	26.81	=	0.18		4.83	=			(2
Valls Type2	9.76		2	=	7.76	= ^	0.18		1.4	-		3	(2
Valls Type3		_		=		=		- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -		号 片		- -	(2
otal area of e	17.8		0		17.84	=	0.18	[3.21				
for windows and			effective wi	ndow H-vs	65.61		ı formula 1	/[/1/ L.v.alı	ω).μ() (M] a	s aivon in	naragrani	h 2 2	(3
include the area						aled using	TOTTIUIA 1	/[(1/ O -vaid	о)+0.0 4 ја	s giveri iii	paragrapi	13.2	
abric heat los	s, W/K =	= S (A x	U)				(26)(30)	+ (32) =				26.29) (3
leat capacity	Cm = S((Axk)						((28)	.(30) + (32	?) + (32a).	(32e) =	733.6	8 (3
hermal mass	parame	ter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value:	Medium		250	(3
or design assess	ments wh	ere the de	tails of the	constructi	ion are not	known pr	ecisely the	indicative	values of	TMP in Ta	able 1f		
an be used inste						,							
hermal bridge	,	,		• .	•	(5.26	(3
details of therma otal fabric he		are not kn	own (36) =	= 0.05 x (3	11)			(33) +	(36) =			31.55	5 (3
entilation hea		alculated	l monthly	,					$= 0.33 \times (3)$	25)m x (5))	31.30	<u>, </u>
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	1	
Jan	35.03	34.8	33.72	33.52	32.58	32.58	32.41	32.94	33.52	33.93	34.36	1	(3
88)m= 35.27		ı				50				20.00		J	(-
35.27	00#!s!s	o+ \\///						(00)	(07) : (0	20)			
88)m= 35.27 leat transfer of 66.81	coefficier 66.58	nt, W/K 66.35	65.27	65.07	64.13	64.13	63.95	(39)m 64.49	= (37) + (3 65.07	88)m 65.48	65.9	1	

Heat loss para	ameter (I	HLP), W	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 0.94	0.94	0.94	0.92	0.92	0.91	0.91	0.9	0.91	0.92	0.92	0.93		
									Average =	Sum(40) ₁	12 /12=	0.92	(40)
Number of day	<u> </u>	1 `	· ·										
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. Water hea	ting ene	rgy requi	irement:								kWh/ye	ear:	
Assumed occu	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (TFA -13.		27		(42)
if TFA £ 13.5 Annual average	•	ator usac	no in litre	se nor da	w Vd av	orago –	(25 v NI)	± 36					(42)
Reduce the annua									se target o		3.03		(43)
not more that 125	litres per	person pei	day (all w	ater use, l	not and co	ld)							
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage i	n litres pe	r day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)	-	-	-			
(44)m= 96.84	93.32	89.8	86.27	82.75	79.23	79.23	82.75	86.27	89.8	93.32	96.84		
_						_	- /			m(44) ₁₁₂ =		1056.42	(44)
Energy content of	hot water	used - cal	culated m	onthly = 4.	190 x Vd,r	n x nm x E	07m / 3600) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m= 143.61	125.6	129.61	113	108.42	93.56	86.7	99.49	100.67	117.33	128.07	139.08		_
If instantaneous v	vator hoati	ina at noint	of use (no	n hot water	· storaga)	enter () in	hoves (46		Total = Su	m(45) ₁₁₂ =	=	1385.13	(45)
		· · ·											(46)
(46)m= 0 Water storage	0	0	0	0	0	0	0	0	0	0	0		(46)
Storage volum) includir	ng any s	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(47)
If community h	neating a	and no ta	ınk in dv	vellina. e	nter 110) litres in	(47)						` ,
Otherwise if no	•			•			` '	ers) ente	er '0' in ((47)			
Water storage	loss:												
a) If manufact	turer's d	eclared I	oss fact	or is kno	wn (kWł	n/day):					0		(48)
Temperature f	actor fro	m Table	2b								0		(49)
Energy lost fro		_	-				(48) x (49)) =			0		(50)
b) If manufact			-										(54)
Hot water stor If community h	•			ie z (KVV	n/iitre/ua	iy)					0		(51)
Volume factor	_		011 4.0								0		(52)
Temperature f	actor fro	m Table	2b								0		(53)
Energy lost fro	m wate	r storage	, kWh/y	ear			(47) x (51)) x (52) x (53) =		0		(54)
Enter (50) or		_									0		(55)
Water storage	loss cal	culated f	for each	month			((56)m = (55) × (41)	m				
(56)m= 0	0	0	0	0	0	0	0	0	0	0	0		(56)
If cylinder contain	I s dedicate	d solar sto	<u>L</u> rage, (57)	<u>I</u> m = (56)m	x [(50) – (<u>I</u> H11)] ÷ (5	<u>l</u> 0), else (5	<u>I</u> 7)m = (56)	m where (H11) is fro	m Append	ix H	
(57)m= 0	0	0	0	0	0	0	0	0	0	0	0		(57)
	loca (c	anual\ fra	m Toble	. 2		ı	ı	ı	ı		0		(58)
Primary circuit Primary circuit	•	•			59)m – 1	(58) ± 36	\$5 x (41)	m			·		(50)
(modified by				,	•	. ,	, ,		r thermo	stat)			
(59)m = 0	0	0	0	0	0	0	0	0	0	0	0		(59)
· ·													

Oambilaaa a		.		(04)	(00) - 0	OF (44)	\						
Combi loss ci	alculated 0	or each	montn (61)m = 0	(60) ÷ 3	05 × (41))m l o	T 0	0	0	0		(61)
(*)							<u> </u>	_!	<u> </u>	<u> </u>	<u> </u>	(F0)m + (G1)m	(01)
(62)m= 122.07	<u> </u>	110.17	96.05	92.16	79.53	73.69	84.56	85.57	99.73	108.86	118.22	(59)m + (61)m	(62)
Solar DHW input													(02)
(add addition									ii continbu	lion to wate	er neating)		
(63)m= 0	0	0	0	0	0	0	0	T 0	0	0	0]	(63)
Output from v	vater hea	L ter					ļ	1		ļ			
(64)m= 122.07	1	110.17	96.05	92.16	79.53	73.69	84.56	85.57	99.73	108.86	118.22		
	1						Οι	tput from w	ater heate	er (annual)	l12	1177.36	(64)
Heat gains fro	om water	heating,	kWh/mo	onth 0.2	5 ′ [0.85	× (45)m	+ (61)	m] + 0.8 x	x [(46)m	+ (57)m	+ (59)m	1	•
(65)m= 30.52	26.69	27.54	24.01	23.04	19.88	18.42	21.14	21.39	24.93	27.22	29.55]	(65)
include (57	m in calc	culation o	of (65)m	only if c	vlinder i	s in the	dwellin	or hot w	ater is f	rom com	munity h	ı neating	
5. Internal of	•			•	,						,	<u> </u>	
Metabolic gai	Ì												
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 113.34	113.34	113.34	113.34	113.34	113.34	113.34	113.34	113.34	113.34	113.34	113.34		(66)
Lighting gains	s (calcula	ted in Ap	pendix	L, equati	on L9 o	r L9a), a	lso see	Table 5	•		•	l	
(67)m= 18.58	16.5	13.42	10.16	7.59	6.41	6.93	9.01	12.09	15.35	17.91	19.1		(67)
Appliances g	ains (calc	ulated in	Append	dix L, eq	uation L	13 or L1	3a), als	o see Ta	ble 5		•	•	
(68)m= 199.29	201.35	196.14	185.05	171.05	157.88	149.09	147.02	152.23	163.33	177.33	190.49		(68)
Cooking gain	s (calcula	ted in Ap	pendix	L, equat	ion L15	or L15a), also	see Table	5	•	•	•	
(69)m= 34.33	34.33	34.33	34.33	34.33	34.33	34.33	34.33	34.33	34.33	34.33	34.33		(69)
Pumps and fa	ans gains	(Table 5	ia)			•						•	
(70)m= 0	0	0	0	0	0	0	0	0	0	0	0		(70)
Losses e.g. e	vaporatio	n (negat	ive valu	es) (Tab	le 5)	-		-	-	-	-		
(71)m= -90.67	-90.67	-90.67	-90.67	-90.67	-90.67	-90.67	-90.67	-90.67	-90.67	-90.67	-90.67		(71)
Water heating	g gains (T	able 5)				-	-	-	-	-	-		
(72)m= 41.02	39.72	37.02	33.35	30.97	27.61	24.76	28.42	29.71	33.51	37.8	39.72		(72)
Total interna	ıl gains =	:			(66)m + (67)m	n + (68)m	+ (69)m +	(70)m + (7	71)m + (72))m		
(73)m= 315.88	314.57	303.58	285.56	266.61	248.91	237.78	241.44	251.03	269.19	290.04	306.31		(73)
6. Solar gair	ns:												
Solar gains are		Ü	flux from	Table 6a		•	tions to	convert to th	ne applica		tion.		
Orientation:	Access F Table 6d	actor	Area m²		Flu	ıx ble 6a		g_ Table 6b	т	FF		Gains	
					Га	Die ba	. –	Table 6b	_ '	able 6c		(W)	,
Southeast 0.9x		X	6.	1	x ;	36.79	×	0.63	X	0.7	=	68.56	(77)
Southeast 0.9x	• • • • • • • • • • • • • • • • • • • •	X	6.	1	X (62.67	x	0.63	X	0.7	=	116.78	(77)
Southeast 0.9x		X	6.	1	X 8	35.75	×	0.63	x	0.7	=	159.78	(77)
Southeast 0.9x		X	6.	1	x 1	06.25	x	0.63	x	0.7	=	197.98	(77)
Southeast 0.9x	0.77	X	6.	1	x 1	19.01	X	0.63	X	0.7	=	221.76	(77)

_								_		_				_
Southeast 0.9x	0.77	X	6.	1	X	1	18.15	X	0.63	X	0.7	=	220.15	(77)
Southeast _{0.9x}	0.77	X	6.	1	X	1	13.91	X	0.63	X	0.7	=	212.25	(77)
Southeast _{0.9x}	0.77	X	6.	1	X	1	04.39	X	0.63	X	0.7	=	194.51	(77)
Southeast 0.9x	0.77	X	6.	1	X	9	2.85	X	0.63	X	0.7	=	173.01	(77)
Southeast 0.9x	0.77	X	6.	1	X	6	9.27	X	0.63	X	0.7	=	129.07	(77)
Southeast 0.9x	0.77	X	6.	1	X	4	4.07	X	0.63	X	0.7	=	82.12	(77)
Southeast 0.9x	0.77	X	6.	1	X	3	31.49	x	0.63	X	0.7	=	58.67	(77)
Northwest _{0.9x}	0.77	X	5.1	1	X	1	1.28	x	0.63	x	0.7	=	17.61	(81)
Northwest _{0.9x}	0.77	X	5.1	1	X	2	22.97	x	0.63	x	0.7	=	35.85	(81)
Northwest 0.9x	0.77	X	5.1	1	X	4	1.38	X	0.63	x	0.7	=	64.58	(81)
Northwest _{0.9x}	0.77	X	5.1	1	x	6	67.96	x	0.63	x	0.7	=	106.06	(81)
Northwest _{0.9x}	0.77	X	5.1	1	x	9	1.35	x	0.63	x	0.7	=	142.57	(81)
Northwest _{0.9x}	0.77	X	5.1	1	X	9	7.38	x	0.63	x	0.7	=	151.99	(81)
Northwest _{0.9x}	0.77	X	5.1	1	X	,	91.1	x	0.63	x	0.7		142.19	(81)
Northwest _{0.9x}	0.77	X	5.1	1	X	7	72.63	x	0.63	x	0.7		113.35	(81)
Northwest _{0.9x}	0.77	x	5.1	1	X	5	0.42	x	0.63	x	0.7		78.69	(81)
Northwest _{0.9x}	0.77	X	5.1	1	X	2	28.07	x	0.63	x	0.7		43.81	(81)
Northwest _{0.9x}	0.77	X	5.1	1	X		14.2	x	0.63	x	0.7		22.16	(81)
Northwest _{0.9x}	0.77	x	5.1	1	X	,	9.21	x	0.63	x	0.7		14.38	(81)
Solar gains in (83)m= 86.17		lculated 224.37	for eac	n month 364.32	$\overline{}$	72.15	354.44	(83)m 307	n = Sum(74)m .87 251.71	(<mark>82)m</mark>		73.05]	(83)
Total gains – i	nternal ar	nd solar	(84)m =	(73)m	+ (83)m	, watts		•		•	-	•	
(84)m= 402.05	467.2	527.95	589.6	630.93	6	21.05	592.22	549	.31 502.74	442.0	6 394.32	379.37		(84)
7. Mean inter	nal tempe	erature	(heating	seasor	า)									
Temperature	during he	eating p	eriods ir	the liv	ng	area	from Tal	ble 9	, Th1 (°C)				21	(85)
Utilisation fac	tor for ga	ins for I	iving are	ea, h1,n	า (ร	ee Ta	ıble 9a)							
Jan	Feb	Mar	Apr	May		Jun	Jul	Α	ug Sep	Oc	Nov	Dec		
(86)m= 1	1	0.99	0.95	0.84		0.64	0.47	0.5	0.8	0.97	1	1		(86)
Mean interna	l tempera	iture in I	iving are	ea T1 (f	ollo	w ste	ps 3 to 7	7 in T	able 9c)				_	
(87)m= 20.02	20.16	20.39	20.68	20.9	т —	20.98	21	2		20.66	20.28	19.99]	(87)
Temperature	durina he	eating p	eriods ir	rest of	dw	elling	from Ta	able 9	9. Th2 (°C)	•	•		•	
(88)m= 20.13	20.13	20.14	20.15	20.15	1	20.16	20.16	20.	` 	20.15	5 20.15	20.14]	(88)
Utilisation fac	tor for as	ins for r	est of d	welling	h2	m (se	a Tahla	(Oa)		!			J	
(89)m= 1	0.99	0.98	0.93	0.79	1	0.57	0.39	0.4	14 0.73	0.96	0.99	1]	(89)
							<u> </u>		I			<u> </u>]	
Mean interna (90)m= 19.23	19.38	19.6	19.89	20.08	Ť	12 (f 20.16	20.16	20.	1	19.88	19.51	19.21	1	(90)
19.23	19.50	19.0	13.03	20.00		.0.10	20.10				ving area ÷ (<u> </u>	0.41	(91)
												,	0.41	(51)
Mean interna		T T			$\overline{}$			_		_	1	1 :	1	(00)
(92)m= 19.55	19.7	19.93	20.22	20.42		20.5	20.51	20.		20.2		19.54]	(92)
Apply adjustr	nent to th	e mean	internal	tempe	ratu	ire tro	m Table	4e,	wnere appr	opriate	•			

(93)m= 19.55	19.7	19.93	20.22	20.42	20.5	20.51	20.51	20.47	20.2	19.83	19.54		(93)
8. Space hea	ting regi	uirement											
Set Ti to the r	•			re obtair	ed at ste	ep 11 of	Table 9	o. so tha	t Ti.m=(76)m an	d re-calc	ulate	
the utilisation			•										
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fac	tor for g	ains, hm	:	_									
(94)m= 1	0.99	0.98	0.93	0.81	0.6	0.42	0.48	0.76	0.96	0.99	1		(94)
Useful gains,	hmGm	, W = (9 ²	4)m x (8	4)m									
(95)m= 401.05	464.24	518.11	551.17	510.24	370.96	249.92	261.29	381.73	424.54	392	378.69		(95)
Monthly avera	age exte	rnal tem	perature	from Ta	able 8					•			
(96)m= 4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat loss rate	for mea	an intern	al tempe	erature,	Lm , W =	=[(39)m :	x [(93)m	– (96)m]				
(97)m= 1019.19	985.58	891.14	738.96	567.4	378.31	250.68	262.79	410.5	624.79	833.55	1010.83		(97)
Space heatin	g require	ement fo	r each n	nonth, k\	/Vh/mont	th = 0.02	24 x [(97))m – (95)m] x (4 ⁻	1)m			
(98)m= 459.9	350.34	277.53	135.21	42.53	0	0	0	0	148.99	317.92	470.31		
							Tota	l per year	(kWh/year	r) = Sum(9	8) _{15,912} =	2202.74	(98)
Space heatin	g require	ement in	kWh/m²	² /year							'	31.09	(99)
8c. Space co	•			,									
				Coo Tol	ala 10h								
Calculated fo	Feb	Mar	August. Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Heat loss rate				<u> </u>				<u> </u>					
(100)m= 0	0	0	0	0	602.81	474.55	486.05	0	0	0	0		(100)
Utilisation fac					002.01		.00.00						(/
(101)m= 0	0	0	0	0	0.95	0.98	0.97	0	0	0	0		(101)
Useful loss, h	ml m (W												, ,
(102)m= 0	0	0	0	0	574.04	465.1	471.52	0	0	0	0		(102)
Gains (solar				<u> </u>									` ,
(103)m = 0	0	0	0	0	810.47	775.08	726.41	0	0	0	0		(103)
Space cooling												(41)m	` ,
set (104)m to					iwoming,	oomma	546 (NV	11) – 0.0	247/[(10	(102)111] 2	(41)111	
(104)m= 0	0	0	0	0	170.23	230.62	189.64	0	0	0	0		
								Total	= Sum(104)	=	590.49	(104)
Cooled fraction	า							f C =	cooled	area ÷ (4	4) =	1	(105)
Intermittency f	actor (Ta	able 10b)	•	•		•	•					_
(106)m= 0	0	0	0	0	0.25	0.25	0.25	0	0	0	0		
								Total	l = Sum((104)	=	0	(106)
Space cooling				`	``						· ·		_
(107)m= 0	0	0	0	0	42.56	57.66	47.41	0	0	0	0		_
								Total	= Sum(107)	=	147.62	(107)
Space cooling	requirer	ment in k	:Wh/m²/y	year				(107)	÷ (4) =			2.08	(108)
8f. Fabric Ene	rgy Effic	iency (ca	alculated	l only un	der spec	cial cond	litions, s	ee sectic	on 11)				
Fabric Energy	y Efficier	ncy						(99)	+ (108) =	=		33.17	(109)
Target Fabri		-	encv (TF	EE)								38.15	(109)
g a.ə.ı	g	,	- , (- ,								23.10	`′

		Hear	Details:						
Access at Name.	Zahid Ashraf	<u> </u>		- Muses	hau.		CTDO	001000	
Assessor Name: Software Name:	Stroma FSAP 2012		Stroma Softwa	-				001082 n: 1.0.5.9	
			y Address:						
Address :									
1. Overall dwelling dime	ensions:		>						
Ground floor		Ar	ea(m²) 70.86	(1a) x		ight(m) 2.5	(2a) =	Volume(m³) (3a)
	a) (1b) (1a) (1d) (1a)	(1p)				2.5	(2a) –	177.14	(Ja)
Total floor area TFA = (1	a)+(1b)+(1c)+(1u)+(1e)+	F(111)	70.86	(4)) . (2-) . (2-	4) . (2 -) .	(2-)		_
Dwelling volume				(3a)+(3b))+(3C)+(3C	d)+(3e)+	.(3h) =	177.14	(5)
2. Ventilation rate:	main sec	condary	other		total			m³ per hou	r
Number of chimneys	heating he	ating		1 = [40 =	-	_
Number of chimneys			0]	0		20 =	0	(6a)
Number of open flues		0 +	0	」 ⁻	0			0	(6b)
Number of intermittent fa				L	0		10 =	0	(7a)
Number of passive vents				Ļ	0		10 =	0	(7b)
Number of flueless gas fi	res				0	X 4	40 =	0	(7c)
							Air ch	anges per ho	ur
Infiltration due to chimne	ys, flues and fans = (6a)	+(6b)+(7a)+(7b)	+(7c) =	Г	0		÷ (5) =	0	(8)
If a pressurisation test has b	een carried out or is intended,	, proceed to (17)), otherwise o	ontinue fr			` ′	Ţ.	 _`
Number of storeys in the	he dwelling (ns)							0	(9)
Additional infiltration	.25 for steel or timber fra	ama or 0 35 f	or masonr	v conetr	uction	[(9)	-1]x0.1 =	0	(10)
	resent, use the value correspo			•	uction			0	(11)
deducting areas of openii	• /	-l\ O 4 (مام (امما				ı		_
If suspended wooden in the sus	floor, enter 0.2 (unsealed	a) or 0.1 (sea	alea), else	enter U				0	(12)
• ,	s and doors draught strip	nned						0	(13)
Window infiltration	s and doors dradgift still	ppcu	0.25 - [0.2	x (14) ÷ 1	00] =			0	(15)
Infiltration rate			(8) + (10)	+ (11) + (1	2) + (13)	+ (15) =		0	(16)
Air permeability value,	q50, expressed in cubic	metres per l	hour per so	quare m	etre of e	envelope	area	3	(17)
If based on air permeabil	lity value, then (18) = [(17)	÷ 20]+(8), other	rwise (18) = (16)				0.15	(18)
	es if a pressurisation test has b	peen done or a c	legree air pei	meability	is being u	sed			
Number of sides sheltere	ed		(20) – 1	0 075 v /4	10)1 —			2	(19)
Shelter factor	ting chalter factor		(20) = 1 - (21) = (18)		9)] =			0.85	(20)
Infiltration rate incorporat			(21) = (10)	X (20) =				0.13	(21)
Infiltration rate modified f Jan Feb	Mar Apr May	Jun Jul	Aug	Sep	Oct	Nov	Dec		
	1 ' 1 ' 1	3011 301	Aug	Оер	l Oct	1407	Dec		
Monthly average wind sp (22)m= 5.1 5	4.9 4.4 4.3	3.8 3.8	3.7	4	4.3	4.5	4.7		
, ,	1 1	1 3.0	1			1 -	<u> </u>		
Wind Factor (22a)m = (2					ı		<u> </u>	1	
(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		

Adjusted infiltration rate (allow	ing for shelter a	nd wind s	speed) =	(21a) x	(22a)m					
0.16 0.16 0.16	0.14 0.14	0.12	0.12	0.12	0.13	0.14	0.14	0.15		
Calculate effective air change If mechanical ventilation:	rate for the app	licable ca	ise	-	-	-	-			(00-)
If exhaust air heat pump using App	nendix N (23h) = (2	3a) x Fmv (4	equation (I	NS)) othe	rwise (23h) = (23a)			0.5	(23a)
If balanced with heat recovery: effi) = (20u)			0.5	(23b)
a) If balanced mechanical v						2h\m . /	23h) v [:	1 (22a)	79.05	(23c)
(24a)m= 0.27 0.26 0.26	0.25 0.24	0.23	0.23	0.22	0.23	0.24	0.25	0.25	- 100] 	(24a)
b) If balanced mechanical v			L	l .		l		0.20	J	(-)
(24b)m = 0 0 0		0	0	0	0	0	0	0	1	(24b)
c) If whole house extract ve										, ,
if $(22b)m < 0.5 \times (23b)$,	•	•				5 × (23b)			
(24c)m = 0 0 0	0 0	0	0	0	0	0	0	0		(24c)
d) If natural ventilation or wlif (22b)m = 1, then (24d						0.51				
(24d)m= 0 0 0	0 0	0	0	0	0	0	0	0]	(24d)
Effective air change rate - e	nter (24a) or (2	4b) or (24	c) or (24	d) in box	· (25)				ı	
(25)m= 0.27 0.26 0.26	0.25 0.24	0.23	0.23	0.22	0.23	0.24	0.25	0.25]	(25)
2. Heat leases and heat leas	parameter	1								
3. Heat losses and heat loss FI FMFNT Gross	Openings	Net Ar	.03	U-valı	10	AXU		k-value	Δ Δ	X k
ELEMENT Gross area (m²)	m ²	A,r		W/m2		(W/I	K)	kJ/m²-l		/K
Doors		2	х	1.4	=	2.8				(26)
Windows Type 1		6.097	7 x1	/[1/(1.4)+	0.04] =	8.08				(27)
Windows Type 2		5.107	7 x1	/[1/(1.4)+	0.04] =	6.77	Ħ			(27)
Walls Type1 38.01	11.2	26.8	1 X	0.15	i - 	4.02	= [(29)
Walls Type2 9.76	2	7.76	x	0.14	<u> </u>	1.1	F i			(29)
Walls Type3 17.84	0	17.84	4 X	0.13	<u> </u>	2.36	=		-	(29)
Total area of elements, m ²		65.6								(31)
* for windows and roof windows, use	effective window U-			formula 1	/[(1/U-valu	ıe)+0.04] a	as given in	paragraph	1 3.2	, ,
** include the areas on both sides of	•	artitions								
Fabric heat loss, W/K = S (A x	(U)			(26)(30)) + (32) =				25.13	(33)
Heat capacity Cm = S(A x k)						(30) + (32	, , ,	(32e) =	733.68	(34)
Thermal mass parameter (TM	•					tive Value			100	(35)
For design assessments where the decan be used instead of a detailed calc		ction are no	t known pr	ecisely the	indicative	values of	TMP in Ta	able 1f		
Thermal bridges : S (L x Y) ca		ppendix l	K						6.87	(36)
if details of thermal bridging are not k	nown (36) = 0.05 x	(31)								`
Total fabric heat loss					(33) +	(36) =			32	(37)
Ventilation heat loss calculate	d monthly				(38)m	= 0.33 × (25)m x (5))	1	
Jan Feb Mar	Apr May	/ Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m= 15.63 15.44 15.25	14.32 14.14	13.2	13.2	13.02	13.58	14.14	14.51	14.88		(38)
Heat transfer coefficient, W/K					(39)m	= (37) + (38)m			
(39)m= 47.62 47.44 47.25	46.32 46.13	45.2	45.2	45.01	45.57	46.13	46.5	46.88		_
					,	Average =	Sum(39) ₁	12 /12=	46.27	(39)

Heat loss para	ameter (I	HLP), W	′m²K					(40)m	= (39)m ÷	÷ (4)			
(40)m= 0.67	0.67	0.67	0.65	0.65	0.64	0.64	0.64	0.64	0.65	0.66	0.66		
						ı	l		Average =	Sum(40) ₁	12 /12=	0.65	(40)
Number of day	<u> </u>	nth (Tab	le 1a)	i		i	i			i			
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. Water hea	ting ene	rgy requ	irement:								kWh/ye	ear:	
Assumed occu if TFA > 13.9 if TFA £ 13.9	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (¯	TFA -13		27		(42)
Annual average Reduce the annual not more that 125	ge hot wa al average	hot water	usage by	5% if the a	lwelling is	designed i			se target c		2.67		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage i													
(44)m= 101.93	98.23	94.52	90.81	87.11	83.4	83.4	87.11	90.81	94.52	98.23	101.93		
						Į.	ļ.		Total = Su	ım(44) ₁₁₂ =	=	1112.02	(44)
Energy content of	f hot water	used - cal	culated m	onthly = 4.	190 x Vd,r	n x nm x E	Tm / 3600) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m= 151.17	132.21	136.43	118.94	114.13	98.48	91.26	104.72	105.97	123.5	134.81	146.4		
W.:					()		h (40		Total = Su	ım(45) ₁₁₂ =	=	1458.03	(45)
If instantaneous w		· ·	·	not water	storage),		DOXES (46)	, , , -		1			
(46)m= 22.67 Water storage	19.83	20.46	17.84	17.12	14.77	13.69	15.71	15.9	18.53	20.22	21.96		(46)
Storage volum) includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community h	` .	•				•					<u> </u>		(,
Otherwise if no	-			-			, ,	ers) ente	er '0' in ((47)			
Water storage	loss:												
a) If manufact	turer's d	eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Temperature f	actor fro	m Table	2b								0		(49)
Energy lost fro		•					(48) x (49)) =		1	10		(50)
b) If manufact			-								1		(54)
Hot water stor	•			e z (KVV	n/iitre/ua	iy)				0.	02		(51)
Volume factor	•		011 4.0							1.	03		(52)
Temperature f	actor fro	m Table	2b							-	.6		(53)
Energy lost fro	m watei	r storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =	1.	03		(54)
Enter (50) or		_								-	03		(55)
Water storage	loss cal	culated	for each	month			((56)m = ((55) × (41)	m				
(56)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinder contains	<u>I</u> s dedicate	d solar sto	<u>l</u> rage, (57)	<u>l</u> m = (56)m		<u>I</u> H11)] ÷ (5	<u>l</u> 0), else (5	<u>I</u> 7)m = (56)	m where (<u>I</u> (H11) is fro	m Appendi	ix H	
(57)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
	loos (s	ļ.	m Tabl			l	l	!	!		0		(58)
Primary circuit Primary circuit	,	,			59)m – 1	(58) ± 36	\$5 y (41)	ım			U		(50)
(modified by				,		` '	, ,		r thermo	ostat)			
(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)
		L	l	L		L	L	L	L	<u> </u>			

Combi loss os	laulatad	for oach	month	(61)m –	(60) · 2(SE (41	\m						
Combi loss ca	0 0	0	0	0	00) + 3	05 × (41)	0	T 0	0	0	0]	(61)
											<u> </u>	J · (59)m + (61)m	` ,
(62)m= 206.44	182.14	191.71	172.44	169.41	151.98	146.54	160	159.47	178.78	188.31	201.67]	(62)
Solar DHW input		l		<u> </u>		<u> </u>							` ,
(add additiona											ooag)		
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0	1	(63)
Output from w	ater hea	ter		Į.		ļ.					•		
(64)m= 206.44	182.14	191.71	172.44	169.41	151.98	146.54	160	159.47	178.78	188.31	201.67	1	
				ı			Ot	utput from w	ater heate	r (annual)	112	2108.87	(64)
Heat gains fro	m water	heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	ı + (61)	m] + 0.8 x	k [(46)m	+ (57)m	+ (59)m	 n]	
(65)m= 94.48	83.9	89.58	82.34	82.17	75.54	74.57	79.04		85.29	87.62	92.9]	(65)
include (57)	m in cald	culation (of (65)m	only if c	ylinder i	s in the	dwellin	g or hot w	ater is f	rom com	munity h	neating	
5. Internal g	ains (see	Table 5	and 5a):	-								
Metabolic gair	ns (Table	5), Wat	ts										
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
(66)m= 136	136	136	136	136	136	136	136	136	136	136	136		(66)
Lighting gains	(calcula	ted in Ap	pendix	L, equat	ion L9 o	r L9a), a	lso see	e Table 5				_	
(67)m= 46.45	41.25	33.55	25.4	18.99	16.03	17.32	22.51	30.22	38.37	44.78	47.74]	(67)
Appliances ga	ins (calc	ulated ir	Append	dix L, eq	uation L	13 or L1	3a), als	so see Ta	ble 5	-	_	_	
(68)m= 297.44	300.53	292.75	276.19	255.29	235.65	222.52	219.44	227.21	243.77	264.67	284.32		(68)
Cooking gains	(calcula	ted in A	ppendix	L, equat	ion L15	or L15a), also	see Table	5		-	-	
(69)m= 50.87	50.87	50.87	50.87	50.87	50.87	50.87	50.87	50.87	50.87	50.87	50.87]	(69)
Pumps and fa	ns gains	(Table 5									-	_	
(70)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(70)
Losses e.g. ev	vaporatio	n (nega	tive valu	es) (Tab	le 5)	-			-			_	
(71)m= -90.67	-90.67	-90.67	-90.67	-90.67	-90.67	-90.67	-90.67	-90.67	-90.67	-90.67	-90.67]	(71)
Water heating	gains (T	able 5)	-	-		-		-	-	-	-	_	
(72)m= 127	124.85	120.41	114.37	110.44	104.92	100.22	106.24	1 108.38	114.63	121.69	124.86]	(72)
Total internal	gains =			•	(66))m + (67)m	n + (68)n	n + (69)m +	(70)m + (7	71)m + (72))m	-	
(73)m= 567.09	562.84	542.91	512.16	480.92	452.8	436.27	444.39	462.01	492.97	527.35	553.12]	(73)
6. Solar gain	s:												
Solar gains are	calculated	using sola	r flux from	Table 6a	and assoc	iated equa	ations to	convert to th	ne applical	ole orienta	tion.		
Orientation:			Area		Flu			g_ Table 6b	_	FF		Gains	
-	Table 6d		m²		Ta	ble 6a	. –	Table 6b	_ '	able 6c		(W)	,
Southeast 0.9x	0.77	X	6.	1	x 3	36.79	X	0.63	x	0.7	=	68.56	(77)
Southeast 0.9x	0.77	X	6.	1	x 6	52.67	X	0.63	x	0.7	=	116.78	(77)
Southeast 0.9x	0.77	х	6.	1	X 8	35.75	x	0.63	x	0.7	=	159.78	(77)
Southeast 0.9x	0.77	X	6.	1	x 1	06.25	X	0.63	x	0.7	=	197.98	(77)
Southeast 0.9x	0.77	X	6.	1	x 1	19.01	x	0.63	x	0.7	=	221.76	(77)

Southeast 0.9x	0.77	X	6.	1	x	118	.15	X	0.63	X	0.7	=	220.15	(77)
Southeast 0.9x	0.77	X	6.	1	x [113	.91	x	0.63	X	0.7	=	212.25	(77)
Southeast 0.9x	0.77	X	6.	1	x	104	.39	x	0.63	X	0.7	=	194.51	(77)
Southeast 0.9x	0.77	X	6.	1	x	92.	85	x	0.63	X	0.7	=	173.01	(77)
Southeast 0.9x	0.77	x	6.	1	x	69.	27	x	0.63	x	0.7	=	129.07	(77)
Southeast _{0.9x}	0.77	X	6.	1	x	44.	07	х	0.63	x	0.7	=	82.12	(77)
Southeast 0.9x	0.77	X	6.	1	x	31.	49	х	0.63	x	0.7	=	58.67	(77)
Northwest _{0.9x}	0.77	X	5.1	1	x	11.	28	x	0.63	x	0.7	=	17.61	(81)
Northwest _{0.9x}	0.77	X	5.1	1	x	22.	97	x	0.63	x	0.7	=	35.85	(81)
Northwest 0.9x	0.77	X	5.1	1	x	41.	38	x	0.63	x	0.7	=	64.58	(81)
Northwest _{0.9x}	0.77	X	5.1	1	x	67.	96	x	0.63	x	0.7	=	106.06	(81)
Northwest _{0.9x}	0.77	X	5.1	1	x	91.	35	x	0.63	x	0.7	=	142.57	(81)
Northwest _{0.9x}	0.77	x	5.1	1	x	97.	38	x	0.63	x	0.7	=	151.99	(81)
Northwest _{0.9x}	0.77	X	5.1	1	x	91	.1	x	0.63	x	0.7	=	142.19	(81)
Northwest _{0.9x}	0.77	X	5.1	1	x	72.	63	x	0.63	x	0.7	=	113.35	(81)
Northwest _{0.9x}	0.77	X	5.1	1	x	50.	42	x	0.63	x	0.7	=	78.69	(81)
Northwest _{0.9x}	0.77	X	5.1	1	x	28.	07	x	0.63	X	0.7	=	43.81	(81)
Northwest _{0.9x}	0.77	X	5.1	1	x	14	.2	x	0.63	x	0.7	=	22.16	(81)
Northwest _{0.9x}	0.77	X	5.1	1	x	9.2	21	x	0.63	x	0.7	=	14.38	(81)
Solar gains in	watts, calc	ulated	for eac	h month	١			(83)m	= Sum(74)m .	(82)m			_	
(83)m= 86.17	152.63 2	224.37	304.04	364.32	37	'2.15 i	354.44	307	.87 251.71	172.8	7 104.28	73.05		(83)
Total gains – i	nternal and	d solar	(84)m =	= (73)m	+ (8	33)m , \	watts				_		•	
(84)m= 653.26	715.47 7	767.28	816.2	845.25	82	24.94	790.7	752	.26 713.72	665.8	5 631.63	626.18		
7. Mean inter	nal temper									l		0200		(84)
Temperature		rature (heating	season)							020.10		(84)
remperature	during hea					area fro	om Tab	ole 9,	Th1 (°C)			020.10	21	(84)
Utilisation fac	•	ating pe	eriods ir	n the livi	ng a			ole 9,	Th1 (°C)			923.73	21	
•	•	ating pe	eriods ir	n the livi	ng a n (se				Th1 (°C)	Oct	Nov	Dec	21	
Utilisation fac	tor for gair	ating pe	eriods ir ving are	the livi a, h1,m	ng a	ee Tabl	le 9a)		ug Sep	Oct 0.65	Nov 0.8		21	
Utilisation fac	Feb 0.82	ating pons for li	eriods ir ving are Apr 0.63	n the livi ea, h1,m May 0.49	ng a	ee Tabl Jun 0.35	le 9a) Jul ^{0.25}	Aı 0.2	ug Sep 27 0.43		+	Dec	21	(85)
Utilisation factors Jan (86)m= 0.86	Feb 0.82 I temperati	ating pons for li	eriods ir ving are Apr 0.63	n the livi ea, h1,m May 0.49	ng a	ee Tabl Jun 0.35	le 9a) Jul ^{0.25}	Aı 0.2	ug Sep 27 0.43 Table 9c)		0.8	Dec	21	(85)
Utilisation factors Jan (86)m= 0.86 Mean internal (87)m= 20.29	Feb 0.82 I temperate 20.45	ns for li Mar 0.74 ure in l	eriods ir ving are Apr 0.63 iving are	n the livi ea, h1,m May 0.49 ea T1 (fo 20.95	ng and (see	Jun 0.35 w steps 0.99	Jul 0.25 s 3 to 7	0.2 ' in T	ug Sep 27 0.43 Table 9c) 1 20.98	0.65	0.8	Dec 0.87	21	(85)
Utilisation factors Jan (86)m= 0.86 Mean internal	Feb 0.82 I temperatu 20.45 2 during hea	ns for li Mar 0.74 ure in l	eriods ir ving are Apr 0.63 iving are	n the livi ea, h1,m May 0.49 ea T1 (fo 20.95	ng an (se	Jun 0.35 w steps 0.99	Jul 0.25 s 3 to 7	0.2 ' in T	ug Sep 7 0.43 Table 9c) 1 20.98 9, Th2 (°C)	0.65	0.8	Dec 0.87	21	(85)
Utilisation factors Jan (86)m= 0.86 Mean interna (87)m= 20.29 Temperature (88)m= 20.37	retor for gair Feb 0.82 I temperatu 20.45 during hea 20.37	ns for li Mar 0.74 ure in l 20.65 ating pe	eriods ir ving are Apr 0.63 iving are 20.85 eriods ir 20.38	n the livi ea, h1,m May 0.49 ea T1 (fo 20.95 n rest of 20.38	ng a ling (see	ee Tabl Jun 0.35 w steps 0.99 elling fi	Jul 0.25 s 3 to 7 21 rom Ta	0.2 ' in T 2' ble 9	ug Sep 7 0.43 Table 9c) 1 20.98 9, Th2 (°C)	20.85	0.8	Dec 0.87	21	(85)
Utilisation factors Jan (86)m= 0.86 Mean internal (87)m= 20.29 Temperature (88)m= 20.37 Utilisation factors	retor for gair Feb 0.82 I temperate 20.45 during hea 20.37 ctor for gair	ns for ling por no for ling por no for response to the latest term of	eriods ir ving are Apr 0.63 iving are 20.85 eriods ir 20.38	n the livies, h1,m May 0.49 ea T1 (for 20.95 n rest of 20.38 welling,	ng a ling (see	us steps 0.35 w steps 0.99 elling fi	le 9a) Jul 0.25 s 3 to 7 21 rom Ta 20.4 Table	Au 0.2 in T 2 ble 9 20.	ug Sep 27 0.43 Table 9c) 1 20.98 20.39	20.85	0.8	Dec 0.87 20.27	21	(85)
Utilisation factors Jan (86)m= 0.86 Mean internal (87)m= 20.29 Temperature (88)m= 20.37 Utilisation factors (89)m= 0.85	tor for gair Feb 0.82 I temperatu 20.45 2 during hea 20.37 2 tor for gair 0.8	ns for ling portion of the line of the lin	eriods ir ving are Apr 0.63 iving are 20.85 eriods ir 20.38 est of do	n the livies, h1,m May 0.49 ea T1 (for 20.95 n rest of 20.38 welling, 0.46	ng a long	w steps 0.99 elling fr 0.0.4 m (see	le 9a) Jul 0.25 s 3 to 7 21 rom Ta 20.4 Table 0.22	Au 0.2 in T 2 in 5 in	ug Sep 17 0.43 Table 9c) 1 20.98 2, Th2 (°C) 4 20.39	0.65 20.85 20.38	0.8	Dec 0.87	21	(85) (86) (87) (88)
Utilisation factors Jan	tor for gair Feb 0.82 I temperatu 20.45 20.37 20.37 ctor for gair 0.8 I temperatu	ns for li Mar 0.74 ure in l 20.65 ating per 20.37 ns for r 0.72 ure in t	eriods ir ving are Apr 0.63 iving are 20.85 eriods ir 20.38 est of do 0.6 he rest	n the livies, h1,m May 0.49 ea T1 (for 20.95 n rest of 20.38 welling, 0.46 of dwell	ng a (see of other order of other order or	ee Tabl Jun 0.35 w steps 0.99 elling fi 0.4 m (see 0.32 T2 (foll	Jul 0.25 s 3 to 7 21 rom Ta 20.4 Table 0.22	Ai 0.22 in T 22 ble \$ 20.2 9a) 0.22 ps 3	ug Sep 7 0.43 Table 9c) 1 20.98 9, Th2 (°C) 4 20.39 to 7 in Table	0.65 20.85 20.38 0.62 e 9c)	0.8 20.57 20.38 0.78	Dec 0.87 20.27 20.37	21	(85) (86) (87) (88) (89)
Utilisation factors Jan (86)m= 0.86 Mean internal (87)m= 20.29 Temperature (88)m= 20.37 Utilisation factors (89)m= 0.85	tor for gair Feb 0.82 I temperate 20.45 20.37 20.37 20.37 Itemperate 0.8	ns for ling portion of the line of the lin	eriods ir ving are Apr 0.63 iving are 20.85 eriods ir 20.38 est of do	n the livies, h1,m May 0.49 ea T1 (for 20.95 n rest of 20.38 welling, 0.46	ng a (see of other order of other order or	ee Tabl Jun 0.35 w steps 0.99 elling fi 0.4 m (see 0.32 T2 (foll	le 9a) Jul 0.25 s 3 to 7 21 rom Ta 20.4 Table 0.22	Au 0.2 in T 2 in 5 in	ug Sep 27 0.43 Table 9c) 1 20.98 20.7 h2 (°C) 20.39 to 7 in Table 4 20.37	0.65 20.85 20.38 0.62 e 9c) 20.21	0.8 20.57 20.38 0.78	Dec 0.87 20.27 20.37 0.86		(85) (86) (87) (88) (89)
Utilisation factors Jan	tor for gair Feb 0.82 I temperatu 20.45 20.37 20.37 20.37 tor for gair 0.8 I temperatu 19.65	ns for li Mar 0.74 ure in l 20.65 ating pe 20.37 ns for r 0.72 ure in t 19.93	eriods ir ving are Apr 0.63 iving are 20.85 eriods ir 20.38 est of do 0.6 he rest 20.2	n the livies, h1,m May 0.49 ea T1 (for 20.95 n rest of 20.38 welling, 0.46 of dwell 20.33	ng a (see of other see of other	w steps 0.99 elling fr 0.4 m (see 0.32 T2 (foll 0.39	Jul 0.25 s 3 to 7 21 rom Ta 20.4 Table 0.22 low stee	All 0.2 in T 2 i	ug Sep 17 0.43 18 20.98 19 20.98 20 39 10 7 in Table 20.37	0.65 20.85 20.38 0.62 e 9c) 20.21	0.8 20.57 20.38 0.78	Dec 0.87 20.27 20.37 0.86	21	(85) (86) (87) (88) (89)
Utilisation factors Jan	tor for gair Feb 0.82 I temperate 20.45 20.37 20.37 20.37 I temperate 19.65	ns for li Mar 0.74 ure in l 20.65 ating pe 20.37 ns for r 0.72 ure in t 19.93 ure (for	eriods in ving are 0.63 iving are 20.85 eriods in 20.38 est of do 0.6 he rest 20.2	n the livies, h1,m May 0.49 ea T1 (for 20.95 n rest of 20.38 welling, 0.46 of dwell 20.33	ng a (see of open see of open	ee Tabl Jun 0.35 w steps 0.99 elling fr 0.4 m (see 0.32 T2 (foll 0.39	Jul 0.25 s 3 to 7 21 rom Ta 20.4 Table 0.22 low ste 20.39	Ai 0.2 ' in T 2' ble § 20. 9a) 0.2 ps 3 20.	ug Sep 77 0.43 Table 9c) 1 20.98 9, Th2 (°C) 4 20.39 to 7 in Table 4 20.37	0.65 20.85 20.38 0.62 e 9c) 20.21	0.8 20.57 20.38 0.78 19.83 ving area ÷ (-	Dec 0.87 20.27 20.37 0.86 19.4 4) =		(85) (86) (87) (88) (89) (90) (91)
Utilisation factors Jan	tor for gair Feb 0.82 I temperatu 20.45 20.37 20.37 20.37 Itemperatu 19.65 I temperatu 19.99 2	ns for li Mar 0.74 ure in l 20.65 ating pe 20.37 ns for r 0.72 ure in t 19.93 ure (for	eriods ir ving are Apr 0.63 iving are 20.85 eriods ir 20.38 est of do 0.6 he rest 20.2 r the wh 20.47	the livies, h1,m May 0.49 ea T1 (for 20.95) for rest of 20.38 welling, 0.46 of dwell 20.33 ole dwell 20.59	ng a (see of see	ee Tabl Jun 0.35 w steps 0.99 elling fr 0.4 m (see 0.32 T2 (foll 0.39) = fLA	le 9a) Jul 0.25 s 3 to 7 21 rom Ta 20.4 Table 0.22 low ste 20.39	All 0.2 in T 2 i	ug Sep 17 0.43 1able 9c) 1 20.98 20, Th2 (°C) 1 20.39 14 0.39 15 7 in Table 16 20.37 17 ft 18 ft 19 ft 10	0.65 20.85 20.38 0.62 e 9c) 20.21 LA = Liv	0.8 20.57 20.38 0.78 19.83 ving area ÷ (Dec 0.87 20.27 20.37 0.86		(85) (86) (87) (88) (89)

												1	
(93)m= 19.79	19.99	20.23	20.47	20.59	20.64	20.64	20.65	20.62	20.48	20.14	19.76		(93)
8. Space hea													
Set Ti to the i the utilisation					ed at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(76)m an	d re-calc	ulate	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fac	l			iviay	Ouri	- Oui	/ rug	ОСР	000	1101	DCO		
(94)m= 0.83	0.79	0.72	0.6	0.47	0.33	0.23	0.25	0.41	0.62	0.78	0.85		(94)
Useful gains,	hmGm	, W = (9	4)m x (8	4)m									
(95)m= 545.31	565.4	552.29	493.63	396.49	270.43	182.36	190.43	291.31	415.9	490.25	530.56		(95)
Monthly avera	age exte	rnal tem	perature	from Ta	able 8								
(96)m= 4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat loss rate		i			i	-``	· · ·	– (96)m				ı	
(97)m= 737.55	715.59	648.7	535.83	409.98	272.88	182.82	191.1	297.18	455.72	606.44	729.31		(97)
Space heatin		1	1	1		I			i	r e			
(98)m= 143.03	100.93	71.73	30.38	10.03	0	0	0	0	29.63	83.66	147.87		¬(00)
							Tota	l per year	(kWh/yeai	r) = Sum(9	8) _{15,912} =	617.25	(98)
Space heatin	g require	ement in	kWh/m²	² /year								8.71	(99)
9b. Energy red	quiremer	nts – Coi	mmunity	heating	scheme								
This part is us										unity sch	neme.		¬
Fraction of spa			•		•	_	(Table 1	1) 'U' if n	one			0	(301)
Fraction of spa	ace heat	from co	mmunity	system	1 – (301	1) =						1	(302)
The community so									up to four	other heat	sources; ti	he latter	
includes boilers, here		-			rom powei	r stations.	See Appei	ndix C.				1	(303a)
			•		-:l				(2)	00) (000	_\ -\		<u></u>
Fraction of total	·			•		r oommi	unity hoo	utina ovo		02) x (303	a) =	1	(304a)
Factor for conf				,	. ,,		•	iting sys	tem			1	(305)
Distribution los	ss factor	(Table 1	12c) for (commun	ity heatir	ng syste	m					1.05	(306)
Space heating	_										ı	kWh/yea	<u>r_</u>
Annual space	heating	requiren	nent									617.25	
Space heat fro	m Com	munity b	oilers					(98) x (30	04a) x (30	5) x (306) :	=	648.11	(307a)
Efficiency of se	econdar	y/supple	mentary	heating	system	in % (fro	m Table	4a or A	ppendix	E)		0	(308
Space heating	require	ment fro	m secon	dary/su	oplemen	tary sys	tem	(98) x (30	01) x 100 ·	÷ (308) =		0	(309)
Water heating	1												
Annual water		equirem	ent									2108.87	
If DHW from c													_
Water heat fro		•								5) x (306) :		2214.31	(310a)
Electricity used							0.01	× [(307a).	(307e) +	· (310a)(310e)] =	28.62	(313)
Cooling Syster	m Energ	y Efficie	ncy Rati	0								0	(314)
Space cooling	(if there	is a fixe	ed coolin	g systen	n, if not e	enter 0)		= (107) ÷	(314) =			0	(315)
Electricity for p							اللاعديد				I		7,000
mechanical ve	ntilation	- paland	ea, extr	act or po	sitive inj	put trom	outside					245.83	(330a)

				_
warm air heating system fans			0	(330b)
pump for solar water heating			0	(330g)
Total electricity for the above, kWh/yea	ır	=(330a) + (330b) + (330g) =	245.83	(331)
Energy for lighting (calculated in Apper	ndix L)		328.11	(332)
Electricity generated by PVs (Appendix	(M) (negative quantity)		-716.31	(333)
Electricity generated by wind turbine (A	Appendix M) (negative quantity)		0	(334)
10b. Fuel costs – Community heating	scheme			
	Fuel kWh/year	Fuel Price (Table 12)	Fuel Cost £/year	
Space heating from CHP	(307a) x	4.24 × 0.0	1 = 27.48	(340a)
Water heating from CHP	(310a) x	4.24 × 0.0	1 = 93.89	(342a)
		Fuel Price		_
Pumps and fans	(331)	13.19 × 0.0	0Z.4Z	(349)
Energy for lighting	(332)	13.19 × 0.0	1 = 43.28	(350)
Additional standing charges (Table 12)			120	(351)
Energy saving/generation technologies Total energy cost	= (340a)(342e) + (345)(354) =		317.07	(355)
11b. SAP rating - Community heating	scheme			
Energy cost deflator (Table 12)			0.42	(356)
Energy cost factor (ECF)	[(355) x (356)] ÷ [(4) + 45.0] =		1.15	(357)
SAP rating (section12)			83.97	(358)
12b. CO2 Emissions – Community hea	ting scheme			
		ergy Emission fac h/year kg CO2/kWh	tor Emissions kg CO2/year	
CO2 from other sources of space and		n/year kg CO2/kwii	kg CO2/year	
Efficiency of heat source 1 (%)		repeat (363) to (366) for the second	d fuel 94	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 1	100 ÷ (367b) x 0.22	= 657.75	(367)
Electrical energy for heat distribution	[(313) x	0.52	= 14.86	(372)
Total CO2 associated with community	systems (363)(36	66) + (368)(372)	= 672.61	(373)
CO2 associated with space heating (see	econdary) (309) x		= 0	_
	(309) x	0	= 0	(374)
CO2 associated with water from immer			= 0	(374) (375)
CO2 associated with water from immer	rsion heater or instantaneous hea			
	rsion heater or instantaneous heavater heating (373) + (37	otter (312) x 0.22 74) + (375) =	= 0	(375)
Total CO2 associated with space and v	rsion heater or instantaneous heatwater heating (373) + (374) ps and fans within dwelling (331)	nter (312) x 0.22 74) + (375) =	= 0	(375)
Total CO2 associated with space and vice CO2 associated with electricity for pure CO2 associated with electricity for light Energy saving/generation technologies	rsion heater or instantaneous heatwater heating (373) + (374) aps and fans within dwelling (331) ing (332))) x	nter (312) x 0.22 74) + (375) = 0.52 0.52	= 0 672.61 = 127.58 = 170.29	(375) (376) (378) (379)
Total CO2 associated with space and vacCO2 associated with electricity for pureCO2 associated with electricity for light	rsion heater or instantaneous heatwater heating (373) + (374) aps and fans within dwelling (331) ing (332))) x	nter (312) x 0.22 74) + (375) = 0.52	= 0 672.61 = 127.58 = 170.29	(375) (376) (378)

Dwelling CO2 Emission Rate (383) ÷ (4) =			8.45	(384)
El rating (section 14)			93.08	(385)
13b. Primary Energy – Community heating scheme				
	Energy kWh/year	Primary factor	P.Energy kWh/year	
Energy from other sources of space and water heating (not Cl Efficiency of heat source 1 (%)	HP) ing two fuels repeat (363) to	(366) for the second f	fuel 94	(367a)
Energy associated with heat source 1 [(307b)+(310b)] x 100 ÷ (367b) x	1.22	= 3715.0	7 (367)
Electrical energy for heat distribution	[(313) x		= 87.88	(372)
Total Energy associated with community systems	(363)(366) + (368)(37	2)	= 3802.94	(373)
if it is negative set (373) to zero (unless specified otherwise	, see C7 in Appendix C	C)	3802.94	(373)
Energy associated with space heating (secondary)	(309) x	0	= 0	(374)
Energy associated with water from immersion heater or instar	taneous heater(312) x	1.22	= 0	(375)
Total Energy associated with space and water heating	(373) + (374) + (375) =		3802.94	(376)
Energy associated with space cooling	(315) x	3.07	= 0	(377)
Energy associated with electricity for pumps and fans within d	welling (331)) x	3.07	= 754.69	(378)
Energy associated with electricity for lighting	(332))) x	3.07	= 1007.3	(379)
Energy saving/generation technologies Item 1		3.07 × 0.01	-2199.0	8 (380)
Total Primary Energy, kWh/year sum of (376)(382) =		3365.84	(383)

		Llear	Details:						
Access Name:	Zahid Ashraf	USEI		a Mirros	b a v .		CTDO	001002	
Assessor Name: Software Name:	Zahid Ashraf Stroma FSAP 2012		Stroma Softwa					001082 on: 1.0.5.9	
			/ Address:						
Address :									
1. Overall dwelling dime	ensions:	_							
Ground floor		Ar	ea(m²) 70.86	(1a) x		ight(m) 2.5	(2a) =	Volume(m ³	(3a)
	a) (1b) (1a) (1d) (1a)	(1p)			4	2.5	(2a) -	177.14	(Ja)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)-	F(111)	70.86	(4)) . (2-) . (2-	1) . (2-) .	(2-)		_
Dwelling volume				(3a)+(3b))+(3c)+(3c	d)+(3e)+	.(3h) =	177.14	(5)
2. Ventilation rate:	main sec	condary	other		total			m³ per hou	ır
Number of chimneys	heating he	ating		1 ₌ [40 =		_
Number of chimneys			0]	0		20 =	0	(6a)
Number of open flues		0 +	0	」 ⁻	0			0	(6b)
Number of intermittent fa				Ļ	3		10 =	30	(7a)
Number of passive vents				Ļ	0		10 =	0	(7b)
Number of flueless gas f	ires				0	X 4	40 =	0	(7c)
							Air ch	anges per ho	our
Infiltration due to chimne	ys, flues and fans = (6a)	+(6b)+(7a)+(7b)	+(7c) =	Г	30		÷ (5) =	0.17	(8)
If a pressurisation test has b	peen carried out or is intended	, proceed to (17)	, otherwise o	ontinue fr			` ′		`` <i>`</i>
Number of storeys in the	he dwelling (ns)							0	(9)
Additional infiltration	05 for atool or tirebords					[(9)	-1]x0.1 =	0	(10)
	0.25 for steel or timber fra resent, use the value correspo			•	uction			0	(11)
deducting areas of opening	ngs); if equal user 0.35								
•	floor, enter 0.2 (unseale	d) or 0.1 (sea	led), else	enter 0				0	(12)
If no draught lobby, en								0	(13)
· ·	s and doors draught stri	pped	0.05 10.0	(4.4)4	001			0	(14)
Window infiltration			0.25 - [0.2			. (45)		0	(15)
Infiltration rate	.50		(8) + (10)					0	(16)
•	q50, expressed in cubic	•	•	•	etre of e	envelope	area	5	(17)
If based on air permeabil	es if a pressurisation test has b				is heina u	sad .		0.42	(18)
Number of sides sheltere		occir done or a d	egree an per	meability	is being u	Sca		2	(19)
Shelter factor	-		(20) = 1 -	0.075 x (1	19)] =			0.85	(20)
Infiltration rate incorpora	ting shelter factor		(21) = (18)	x (20) =				0.36	(21)
Infiltration rate modified f	or monthly wind speed								
Jan Feb	Mar Apr May	Jun Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	peed 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 = (2	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		
` '					L			J	

0.45	0.45	0.44	0.39	0.38	0.34	0.34	0.33	0.36	0.38	0.4	0.42]	
alculate effec		-	rate for t	he appli	cable ca	se					!	<u>.</u>	
If mechanical If exhaust air he			andiv N (2	3h) - (23s	a) v Emy (e	aguation (N	J5)) other	wice (23h) – (23a)			0	
If balanced with) = (25a)			0	
a) If balance		•	-	_					2h\m + /	23h) v [1 (226)	0 \ : 100l	
4a)m= 0	0	0	0	0	0	0	0	0	0	0	0] - 100j]	
b) If balance						overv (N				23h)		J	
4b)m= 0	0	0	0	0	0	0	0	0	0	0	0	1	
c) If whole h	ouse ex	tract ven	tilation o	r positiv	L /e input v	L ventilatio	n from c	L outside			<u>!</u>	J	
if (22b)n				•	•				5 × (23b)			
1c)m= 0	0	0	0	0	0	0	0	0	0	0	0]	
d) If natural	ventilatio	on or wh	ole hous	e positiv	ve input	ventilatio	on from I	oft			•	_	
if (22b)n		<u> </u>	<u> </u>		<u> </u>	4d)m =	0.5 + [(2		0.5]			1	
4d)m= 0.6	0.6	0.6	0.58	0.57	0.56	0.56	0.55	0.56	0.57	0.58	0.59		
Effective air			<u> </u>	<u> </u>	ŕ	_		<u> </u>				1	
5)m= 0.6	0.6	0.6	0.58	0.57	0.56	0.56	0.55	0.56	0.57	0.58	0.59]	
. Heat losse	s and he	eat loss p	oaramete	er:									
LEMENT	Gros	_	Openin	_	Net Ar		U-valu		AXU	0	k-value		AXI
	area	(m²)	m	l ²	A ,r	_	W/m2		(W/I	<) 	kJ/m²•	K	kJ/K
oors					2	×	1	= [2				
indows Type					6.097	_	/[1/(1.4)+	L	8.08				
indows Type	2				5.107	x1,	/[1/(1.4)+	0.04] = [6.77	亅 ,			
alls Type1	38.0)1	11.2		26.81	X	0.18	=	4.83	_		<u> </u>	
alls Type2	9.70	6	2		7.76	Х	0.18	= [1.4	_		<u> </u>	
alls Type3	17.8	34	0		17.84	X	0.18	=	3.21				
tal area of e					65.61								
or windows and include the area						ated using	formula 1	/[(1/U-valu	ıe)+0.04] a	s given in	paragrapi	h 3.2	
bric heat los				o ana pan	1110110		(26)(30)	+ (32) =				26.3	29
eat capacity		•	-,					((28)	.(30) + (32	2) + (32a).	(32e) =	733	
nermal mass		,	P = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value:	Medium	, ,	25	
r design assess	•	•		,			ecisely the	indicative	values of	TMP in Ta	able 1f		
n be used inste	ad of a de	tailed calc	ulation.										
ermal bridge	•	,			-	<						5.2	:6
etails of therma		are not kn	own (36) =	= 0.05 x (3	11)			(22) 1	(36) -				
tal fabric he		aloulotoo	l month!	,					(36) =	25)m v (F)		31.	55
entilation hea	Feb	Mar			Jun	Jul	Λιια		= 0.33 × (Nov	Dec	1	
35.27	35.03	34.8	Apr 33.72	May 33.52	32.58	32.58	Aug 32.41	Sep 32.94	33.52	33.93	34.36	1	
		<u> </u>	00.72	00.02	1 02.00	02.00	02.71				1 07.00	J	
eat transfer of 66.81	66.58	nt, VV/K 66.35	65.27	65.07	64.13	64.13	63.95	(39)m 64.49	= (37) + (3 65.07	65.48	65.9	1	
9)m= 66.81													

Heat loss para	meter (I	HLP), W/	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 0.94	0.94	0.94	0.92	0.92	0.91	0.91	0.9	0.91	0.92	0.92	0.93		
Number of day	e in mo	nth (Tah	le 1a)			•	•	,	Average =	Sum(40) ₁ .	12 /12=	0.92	(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)
<u></u>													
4. Water heat	ing ene	rgy requi	rement:								kWh/ye	ear:	
Assumed occu if TFA > 13.9 if TFA £ 13.9	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (¯	ΓFA -13.		27		(42)
Annual averag Reduce the annua not more that 125	e hot wa al average	hot water	usage by	5% if the α	lwelling is	designed t			se target o		3.03		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage in	n litres pe	r day for ea		Vd,m = fa	ctor from	Table 1c x							
(44)m= 96.84	93.32	89.8	86.27	82.75	79.23	79.23	82.75	86.27	89.8	93.32	96.84		
Energy content of	hot water	used - cal	culated m	onthly – 4	190 x Vd r	пуптуГ)Tm / 360(m(44) ₁₁₂ =	L	1056.42	(44)
(45)m= 143.61	125.6	129.61	113	108.42	93.56	86.7	99.49	100.67	117.33	128.07	139.08		
(10)	120.0	120.01	110	100.12	00.00	00.7	00.10			m(45) ₁₁₂ =	L	1385.13	(45)
If instantaneous w	ater heati	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46) to (61)		,	L		
(46)m= 21.54	18.84	19.44	16.95	16.26	14.03	13	14.92	15.1	17.6	19.21	20.86		(46)
Water storage Storage volum) includin	na anv so	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(47)
If community h	` '	•	•			Ū					100		(47)
Otherwise if no	•			•			` '	ers) ente	er '0' in (47)			
Water storage													
a) If manufact				or is kno	wn (kWł	n/day):				1.	39		(48)
Temperature factor from Table 2b 0.54										(49)			
Energy lost from water storage, kWh/year (48) x (49) = 0.75										(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 h	-			•		,							, ,
Volume factor											0		(52)
Temperature fa	actor fro	m Table	2b								0		(53)
Energy lost fro		_	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54)
Enter (50) or (. , .	•								0.	75		(55)
Water storage	loss cal	culated f	or each	month			((56)m = (55) × (41)ı	m 				
(56)m= 23.33 If cylinder contains	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33	iv LI	(56)
						1	· · · · ·					XII	(E7)
(57)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(57)
Primary circuit Primary circuit	•	•			50\m - 4	(50) · 26	SE ~ (11)	m			0		(58)
(modified by				,	•	. ,	, ,		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)
			ļ	L		<u> </u>	<u> </u>	L	<u> </u>	<u> </u>	<u>. </u>		

0			£	41- /	(04)	(00) - 0	OF /44	\						
г	oss ca	o 0	for eacr	month ((61)m =	(60) ÷ 3	05 × (41	<u> </u>	T 0	Ι ,	0	Ι ,	1	(61)
(61)m=					<u> </u>			(22)		0	ļ	(57)	(50) (04)	(01)
г			water h					(62)m 146.0		ì	ì ´	`	(59)m + (61)m 1	(62)
(62)m=	190.2	167.69		158.09	155.02	138.65	133.29			163.92	173.16	185.67	J	(62)
									'0' if no sola	r contribut	ion to wate	er heating)		
(63)m=	0	0	0	and/or \	0	applies 0	o, see Ap	pendi 0		0	0	0	1	(63)
L						0							J	(00)
(64)m=	190.2	ater hea	176.2	158.09	155.02	138.65	133.29	146.0	8 145.77	163.92	173.16	185.67	1	
(01)=	100.2	107.00	170.2	100.00	100.02	100.00	1 100:20	<u> </u>	utput from w		<u> </u>	L	1933.75	(64)
Heat as	aine fro	m water	heating	k\/\/h/m	onth () 2	5 ′ [0 85	× (45)m)m] + 0.8					J` ′
(65)m=	85.03	75.43	80.37	73.64	73.33	67.18	66.1	70.36		76.29	78.66	83.52]	(65)
L							<u> </u>		g or hot w	<u> </u>	<u> </u>	<u> </u>] posting	()
	` '					yiiiiuei i	3 111 1116 1	uweiiii	g of flot w	alei is ii	OIII COIII	iiiiuiiity i	leating	
		Ì		5 and 5a).									
Metabo	Jan	s (Table Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
(66)m=	113.34	113.34	113.34	113.34	113.34	113.34	113.34	113.3	` 	113.34	113.34	113.34	1	(66)
Lighting	g gains	(calculat	ted in A	opendix	L. eguat	ion L9 o	r L9a). a	lso se	e Table 5				J	
(67)m=	18.58	16.5	13.42	10.16	7.59	6.41	6.93	9.01	12.09	15.35	17.91	19.1]	(67)
L Applian	ces ga	ins (calc	ulated in	n Append	dix L, eq	uation L	.13 or L1	3a), al	so see Ta	ble 5	<u>!</u>	!	J	
	199.29	201.35	196.14	185.05	171.05	157.88	149.09	147.0		163.33	177.33	190.49	1	(68)
Cooking	a gains	(calcula	ted in A	ppendix	L. eguat	ion L15	or L15a). also	see Table	: 5	ļ		ı	
(69)m=	34.33	34.33	34.33	34.33	34.33	34.33	34.33	34.33		34.33	34.33	34.33	1	(69)
Pumps	and fai	ns gains	(Table	 5а)			1			1	1		J	
(70)m=	3	3	3	3	3	3	3	3	3	3	3	3]	(70)
Losses	e.g. ev	aporatio	n (nega	tive valu	es) (Tab	le 5)			,				•	
(71)m=	-90.67	-90.67	-90.67	-90.67	-90.67	-90.67	-90.67	-90.6	7 -90.67	-90.67	-90.67	-90.67]	(71)
Water h	neating	gains (T	able 5)	!					•				•	
(72)m=	114.28	112.25	108.03	102.28	98.56	93.31	88.85	94.56	96.59	102.54	109.25	112.26]	(72)
Total internal gains = $(66)m + (67)m + (68)m + (70)m + (71)m + (72)m$														
(73)m=	392.15	390.11	377.59	357.49	337.2	317.6	304.87	310.5	9 320.92	341.21	364.49	381.85]	(73)
6. Sola	ar gains	S:					•		,		•			
Solar ga	ains are o	calculated	using sola	r flux from	Table 6a	and assoc	iated equa	ations to	convert to th	ne applicat	ole orienta	tion.		
Orienta		ccess F	actor	Area		Flu			g_ 	_	FF		Gains	
	_	Table 6d		m²		1a	ble 6a		Table 6b	_ '	able 6c		(W)	_
Southea	st 0.9x	0.77	Х	6.	1	x;	36.79	x	0.63	x	0.7	=	68.56	(77)
Southea	st 0.9x	0.77	Х	6.	1	x (62.67	_ x	0.63	x	0.7	=	116.78	(77)
Southea	ıst _{0.9x}	0.77	х	6.	1	X 8	35.75] x [0.63	x	0.7	=	159.78	(77)
Southea	ıst _{0.9x}	0.77	х	6.	1	x 1	06.25	_ x	0.63	x	0.7	=	197.98	(77)
Southea	st 0.9x	0.77	х	6.	1	x 1	19.01	x	0.63	x	0.7	=	221.76	(77)

Southeast 0.9x									
Southeast 0.9x									
Southeast 0.9x									
Southeast 0.9x									
Southeast 0.9x									
Southeast 0.9x									
Northwest 0.9x									
Northwest 0.9x									
Northwest 0.9x									
Northwest 0.9x									
Northwest 0.9x									
Northwest 0.9x									
Northwest 0.9x									
Northwest 0.9x									
Northwest $0.9x$ 0.77 x 5.11 x 50.42 x 0.63 x 0.7 $=$ 78.69 (81) Northwest $0.9x$ 0.77 x 5.11 x 28.07 x 0.63 x 0.7 $=$ 43.81 (81) Northwest $0.9x$ 0.77 x 5.11 x 14.2 x 0.63 x 0.7 $=$ 22.16 (81) Northwest $0.9x$ 0.77 x 5.11 x 14.2 x 0.63 x 0.7 $=$ 22.16 (81) Northwest $0.9x$ 0.77 x 5.11 x 9.21 x 0.63 x 0.7 $=$ 14.38 (81) Solar gains in watts, calculated for each month									
Northwest 0.9x									
Northwest 0.9x									
Northwest 0.9x									
Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m (83)m = 86.17									
(83)m= 86.17 152.63 224.37 304.04 364.32 372.15 354.44 307.87 251.71 172.87 104.28 73.05 Total gains – internal and solar (84)m = (73)m + (83)m , watts (84)m= 478.32 542.73 601.96 661.54 701.52 689.75 659.3 618.46 572.62 514.09 468.77 454.9 (84) 7. Mean internal temperature (heating season)									
remperature during heating periods in the living area from Table 3, Tiff (5)									
Utilisation factor for gains for living area, h1,m (see Table 9a)									
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec									
(86)m= 1 0.99 0.98 0.92 0.79 0.58 0.43 0.47 0.73 0.95 0.99 1 (86)									
Mean internal temperature in living area T1 (follow steps 3 to 7 in Table 9c) (87)m= 20.12 20.26 20.48 20.75 20.93 20.99 21 21 20.96 20.74 20.38 20.1 (87)									
Temperature during heating periods in rest of dwelling from Table 9, Th2 (°C) (88)m= 20.13 20.14 20.15 20.15 20.16 20.16 20.17 20.16 20.15 20.15 20.14 (88)									
(88)m= 20.13 20.14 20.15 20.15 20.16 20.16 20.17 20.16 20.15 20.15 20.14 (88)									
Utilisation factor for gains for rest of dwelling, h2,m (see Table 9a)									
(89)m= 0.99 0.99 0.97 0.9 0.74 0.51 0.35 0.39 0.66 0.93 0.99 1 (89)									
Mean internal temperature in the rest of dwelling T2 (follow steps 3 to 7 in Table 9c)									
(90)m= 18.96 19.17 19.49 19.87 20.08 20.16 20.16 20.16 20.13 19.86 19.35 18.93 (90)									
(90)m= 18.96 19.17 19.49 19.87 20.08 20.16 20.16 20.16 20.13 19.86 19.35 18.93 (90)									
(90)m= 18.96 19.17 19.49 19.87 20.08 20.16 20.16 20.16 20.13 19.86 19.35 18.93 (90) fLA = Living area ÷ (4) = 0.41 (91)									

(00) = 40.44	1 40 00	400	00.00	00.40	00.5	00.54	00.54	00.40	00.00	10.70	40.40		(93)
(93)m= 19.44	19.62	19.9	20.23	20.43	20.5	20.51	20.51	20.48	20.22	19.78	19.42		(93)
8. Space hea				ro obtoin	ad at at	nn 11 of	Table 0	o oo tha	tTim /	76\m an	d ro oolo	uloto	
Set Ti to the the utilisation			•		eu ai sii	=p 1101	rable 9i	o, so ma	t 11,111=(, o) III aii	u re-caic	uiale	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fac	ctor for g	ains, hm	:									ı	
(94)m= 0.99	0.99	0.97	0.9	0.75	0.54	0.38	0.42	0.69	0.93	0.99	1		(94)
Useful gains,	1	` ` `	, ,					ı		Г		1	(a=)
(95)m= 475.28	535.32	581.45	595.94	529.19	374.1	250.29	262.05	394.19	476.83	462.07	452.69		(95)
Monthly aver		1				40.0	104		10.0		1.0		(00)
(96)m= 4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat loss rat	î .					=[(39)m 250.71	-``	``		020.25	4000.00		(07)
(97)m= 1011.52		889.09	739.71	568.3	378.52		262.85	411.29	626.07	830.35	1002.82		(97)
Space heatin (98)m= 398.96	299.01	228.88	103.51	29.1	vn/mon	n = 0.02	24 X [(97])m – (95 0)m] x (4 111.04	265.16	409.3		
(98)111= 398.90	299.01	220.00	103.31	29.1	0	U						1844.96	(98)
							Tota	l per year	(kvvn/year	r) = Sum(9	8)15,912 =	1844.96	╡ .
Space heating	ig require	ement in	kWh/m²	² /year								26.04	(99)
9a. Energy red	quiremer	nts – Indi	vidual h	eating sy	/stems i	ncluding	micro-C	CHP)					
Space heati	ng:												_
Fraction of sp	pace hea	at from se	econdar	y/supple	mentary	system						0	(201)
Fraction of sp	pace hea	at from m	ain syst	em(s)			(202) = 1	- (201) =				1	(202)
Fraction of to	tal heati	ng from i	main sys	stem 1			(204) = (2	02) × [1 –	(203)] =			1	(204)
Efficiency of	main spa	ace heat	ing syste	em 1								93.5	(206)
Efficiency of	seconda	ry/supple	ementar	y heating	g system	ո, %						0	(208)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ar
Space heating	g require	ement (c	alculate	d above)								ı	
398.96	299.01	228.88	103.51	29.1	0	0	0	0	111.04	265.16	409.3		
(211) m = {[(98)	3)m x (20)4)] } x 1	00 ÷ (20	06)									(211)
426.69	319.79	244.79	110.7	31.13	0	0	0	0	118.76	283.6	437.75		
							Tota	I (kWh/yea	ar) =Sum(2	211) _{15,1012}	<u>=</u>	1973.21	(211)
Space heating	g fuel (s	econdar	y), kWh/	month							·		
$= \{[(98) \text{m x } (20)]\}$	01)] } x 1	00 ÷ (20	8)							ı		ı	
(215)m= 0	0	0	0	0	0	0	0	0	0	0	0		_
							Tota	l (kWh/yea	ar) =Sum(2	215) _{15,1012}	<u>_</u>	0	(215)
Water heating	-												
Output from w							T	T		l	l	l	
190.2	167.69	176.2	158.09	155.02	138.65	133.29	146.08	145.77	163.92	173.16	185.67		7,
Efficiency of w	1											79.8	(216)
(217)m= 86.74	86.34	85.51	83.72	81.32	79.8	79.8	79.8	79.8	83.8	85.95	86.87		(217)
Fuel for water	•												
(219)m = (64) (219)m = 219.27	194.22	206.06	188.84	190.63	173.75	167.03	183.06	182.66	195.61	201.48	213.75		
, ,,,,,,	1	L	J. 2					I = Sum(2'		I		2316.34	(219)
Annual totals	.							•		Wh/year		kWh/year	
Space heating		ed, main	system	1					ĸ	, y cai		1973.21	7
			-									<u> </u>	_

					_
Water heating fuel used				2316.34	
Electricity for pumps, fans and electric keep-hot					
central heating pump:			30]	(230c)
boiler with a fan-assisted flue			45]	(230e)
Total electricity for the above, kWh/year	sum of (230	0a)(230g) =		75	(231)
Electricity for lighting				328.11	(232)
12a. CO2 emissions – Individual heating systems	s including micro-CHP				
	Energy kWh/year	Emission fac kg CO2/kWh	ctor	Emissions kg CO2/yea	
Space heating (main system 1)	(211) x	0.216	=	426.21	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	500.33	(264)
Space and water heating	(261) + (262) + (263) + (264) =			926.54	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	170.29	(268)
Total CO2, kg/year	Sul	m of (265)(271) =		1135.76	(272)

TER =

(273)

16.03