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 14:55:07

Project Information:

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

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 53.15m² Plot Reference: Site Reference : Hermitage Lane Plot 10

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))

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

Dwelling Carbon Dioxide Emission Rate (DER) 16.23 kg/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 67.0 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 54.0 kWh/m²

OK

2 Fabric U-values

Element Average Highest External wall 0.15 (max. 0.30) 0.15 (max. 0.70) OK Floor (no floor) Roof 0.16 (max. 0.20) OK 0.24 (max. 0.35) **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):	Medium	OK
Based on:		
Overshading:	Average or unknown	
Windows facing: North East	8.65m²	
Ventilation rate:	4.00	
10 Key features		
Air permeablility	3.0 m³/m²h	

Community heating, heat from boilers - mains gas

Photovoltaic array

		l Isar I	Details:						
Assessor Name:	Zahid Ashraf	03011	Stroma	Mum	bor		STDO	001082	
Software Name:	Stroma FSAP 2012		Softwa					on: 1.0.5.9	
		Property	Address:	Plot 10					
Address :									
Overall dwelling dime	ensions:	A	- (··· 2)		A 11 .	tarle ((a a)) / - l /	
Ground floor			ea(m²) 53.15	(1a) x		ight(m) 2.5	(2a) =	Volume(m³	(3a)
Total floor area TFA = (1)	a)+(1b)+(1c)+(1d)+(1e)+			(4)]`` ''	102.00	
Dwelling volume		()	33.13)+(3c)+(3c	d)+(3e)+	.(3n) =	132.86	(5)
				(5.5) (5.6)	, (, , , , , , , , , , , , , , , , , ,	., (,		132.00	
2. Ventilation rate:		ondary	other		total			m³ per hou	r
Number of chimneys	heating hea	$\frac{\mathbf{ating}}{0}$ + Γ	0] = [0	X 4	40 =	0	(6a)
Number of open flues	0 +	0 +	0]	0	x2	20 =	0	(6b)
Number of intermittent fa				, <u>F</u>	0	x ·	10 =	0	(7a)
Number of passive vents				F	0	x	10 =	0	(7b)
Number of flueless gas fi				F	0	x 4	40 =	0	(7c)
rumber of hadioco gao n				L				0	
							Air ch	anges per ho	our
Infiltration due to chimne	ys, flues and fans = (6a)+	-(6b)+(7a)+(7b)+	(7c) =	Γ	0		÷ (5) =	0	(8)
	peen carried out or is intended,	proceed to (17),	otherwise c	ontinue fr	om (9) to	(16)	ĺ		_
Number of storeys in the Additional infiltration	ne aweiling (ns)					[(9).	-1]x0.1 =	0	(9)
	.25 for steel or timber fra	me or 0.35 fo	r masonr	v constr	uction	[(0)]	1]XO.1 =	0	(11)
	resent, use the value correspon			•					` ′
deducting areas of opening	ngs); if equal user 0.35 floor, enter 0.2 (unsealed	I) or 0.1 (soal	ad) also	antar O			ı		7(42)
If no draught lobby, en	•	i) Ui U. i (Seai	eu), eise i	enter o				0	(12)
•	s and doors draught strip	ned						0	(14)
Window infiltration	o and dooro dradgm ourp	pou	0.25 - [0.2	x (14) ÷ 1	00] =			0	(15)
Infiltration rate			(8) + (10) -	+ (11) + (1	12) + (13) -	+ (15) =		0	(16)
Air permeability value,	q50, expressed in cubic	metres per h	our per so	quare m	etre of e	envelope	area	3	(17)
If based on air permeabil	lity value, then (18) = [(17)	÷ 20]+(8), otherv	vise (18) = (16)				0.15	(18)
Air permeability value applie	es if a pressurisation test has be	een done or a de	egree air per	meability	is being u	sed			
Number of sides sheltere	ed		(20) 4 [0 07E v (4	10)1			2	(19)
Shelter factor	ilaa ahaltaa faataa		(20) = 1 - [19)] =			0.85	(20)
Infiltration rate incorporat			(21) = (18)	X (20) =				0.13	(21)
Infiltration rate modified f	 	lum lul	1 4	Con	04	Nov	Daa]	
Jan Feb	Mar Apr May	Jun Jul	Aug	Sep	Oct	Nov	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		
(22)111- 3.1 3	7.7 4.0	3.0	3.7		1 4.5	1 4.0	4./	I	
Wind Factor $(22a)m = (22a)m $	2)m ÷ 4	r	, , , , , , , , , , , , , , , , , , , 				<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 infiltra	ation rat	e (allowi	ng 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 effect		_	rate for t	he appli	cable ca	se	•	•	•	•	•	, 	
If exhaust air he			andiv N (2	3h) - (23a	a) × Fmv (e	acuation (N	JS)) other	rwisa (23h) <i>- (</i> 23a)			0.5	(23a
If balanced with) = (23a)			0.5	(23b
a) If balance		•	•	Ū		`		,	2h\m . /	22h) v [1 (220)	79.05	(230
(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						<u> </u>	<u> </u>	<u> </u>	<u> </u>		0.20	J	•
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0	1	(24)
c) If whole h	ouse ex	tract ven	tilation o	r positiv	e input v	L ventilatio	n from c	L outside	<u> </u>	<u>!</u>	ļ	J	
if (22b)m				•	•				.5 × (23b	o)			
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(240
d) If natural	ventilatio	on or wh	ole hous	e positiv	e input	ventilatio	on from I	oft	•	•			
if (22b)m	n = 1, the	en (24d)	m = (221)	o)m othe	rwise (2	4d)m = 0	0.5 + [(2	2b)m² x	0.5]			1	
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(240
Effective air			<u> </u>	` `	ŕ	ŕ		`			1	1	
(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)
3. Heat losses	s and he	eat loss p	paramet	er:									
ELEMENT	Gros	-	Openin		Net Ar		U-valu		AXU		k-value		AXk
_	area	(m²)	m	l ²	A ,r	m² ——	W/m2	K .	(W/I	K)	kJ/m²•	K	kJ/K
Doors					2	X	1.4] = [2.8	_			(26)
Windows					8.651	x1,	/[1/(1.4)+ 	0.04] =	11.47	ᆗ .			(27)
Walls Type1	47.2	21	8.65		38.56	x	0.15	=	5.78			ᆜ	(29)
Walls Type2	10.5	51	2		8.51	X	0.14	=	1.2				(29)
Roof Type1	44.3	36	0		44.36	X	0.15	= [6.65				(30)
Roof Type2	8.78	8	0		8.78	Х	0.24	=	2.11				(30)
Total area of e	lements	, m²			110.8	6							(31)
* for windows and						ated using	formula 1	/[(1/U-valu	ie)+0.04] a	as given in	paragrapl	1 3.2	
** include the area Fabric heat los				is and pan	titions		(26)(30)	+ (32) =				00.00	(33)
Heat capacity		•	0)				(20)(00)		(30) + (32	2) + (32a)	(32e) =	30.02	===
Thermal mass		,	2 – Cm =	- TFΔ) in	n k I/m²K				tive Value	, , ,	(320) =	1137.22	==
For design assess	•	•		,			ecisely the				able 1f	100	(35)
can be used instea													
Thermal bridge	es : S (L	x Y) cal	culated (using Ap	pendix ł	<						15.57	(36)
if details of therma		are not kn	own (36) =	= 0.05 x (3	1)			(0.0)	(2.5)				
Total fabric hea									(36) =	,		45.59	(37)
Ventilation hea								· · · ·	= 0.33 × (-	1	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(20)
(38)m= 11.72	11.58	11.44	10.74	10.6	9.9	9.9	9.76	10.18	10.6	10.88	11.16	J	(38)
Heat transfer of									= (37) + (1	
(39)m= 57.31	57.17	57.03	56.33	56.19	55.49	55.49	55.35	55.77	56.19	56.47	56.75	F0.05	
								•	Average =	Sum(39) ₁	₁₂ /12=	56.29	(39)

Heat Ic	oss parai	meter (H	HLP), W/	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m=	1.08	1.08	1.07	1.06	1.06	1.04	1.04	1.04	1.05	1.06	1.06	1.07		
										Average =	Sum(40) ₁	12 /12=	1.06	(40)
Numbe	er of day		, 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. Wa	iter heati	ing ener	gy requi	rement:								kWh/ye	ar:	
if TF	ed occu A > 13.9 A £ 13.9	N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (¯	TFA -13		78		(42)
Reduce	l average the annual e that 125 l	l average	hot water	usage by	5% if the a	lwelling is	designed t			se target o).57		(43)
!	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	er usage in				,			,	1		1			
(44)m=	88.63	85.41	82.18	78.96	75.74	72.51	72.51	75.74	78.96	82.18	85.41	88.63		
` ′										I Total = Su	m(44) ₁₁₂ =	=	966.86	(44)
Energy o	content of I	hot water	used - cal	culated mo	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=	131.43	114.95	118.62	103.42	99.23	85.63	79.35	91.05	92.14	107.38	117.21	127.29		
				. ,						Total = Su	m(45) ₁₁₂ =	=	1267.7	(45)
It instant	taneous wa	ater heatıı	ng at point	of use (no) hot water	storage),	enter 0 ın	boxes (46)	to (61)			11		
(46)m=		17.24	17.79	15.51	14.88	12.84	11.9	13.66	13.82	16.11	17.58	19.09		(46)
	storage e volume		includin	na anv so	olar or W	/WHRS	storane	within sa	ame ves	ച		0		(47)
•	munity h	, ,					_		a	00.		<u> </u>		(47)
	vise if no	-			-			` '	ers) ente	er '0' in ((47)			
Water	storage	loss:		`					,	·	,			
a) If m	nanufactu	urer's de	eclared l	oss facto	or is kno	wn (kWh	n/day):					0		(48)
Tempe	erature fa	actor fro	m Table	2b								0		(49)
٠,	/ lost from		•					(48) x (49)) =		1	10		(50)
	nanufactu			-										(5.4)
	iter stora munity h	-			e Z (KVVI	n/litre/da	ıy)				0.	02		(51)
	e factor f	•		JII 4.5							1.	03		(52)
	erature fa			2b							-	.6		(53)
Energy	/ lost from	m water	storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =	1.	03		(54)
• • • • • • • • • • • • • • • • • • • •	(50) or (_	,								03		(55)
Water	storage	loss cal	culated f	or 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)
		dedicate	d solar sto	L rage, (57)ı	m = (56)m		<u>L</u> H11)] ÷ (5	0), else (5	<u>I</u> 7)m = (56)	m where (H11) is fro	m Appendi	хН	
							20.04	20.04	30.98	32.01	30.98	32.01		
(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.90	J 32.01	30.90	32.01		(57)
						30.98	32.01	32.01	30.98	32.01				, ,
Primar	y circuit	loss (an	nual) fro	m Table	3	<u> </u>	<u> </u>		Į	32.01		0		(57) (58)
Primar Primar		loss (an loss cal	nual) fro	m Table for each	e 3 month (59)m = ((58) ÷ 36	65 × (41)	ım					

Combi loss calculated for each month $(61)m = (60) \div 365 \times (41)m$													
													(61)
											<u> </u>	J · (59)m + (61)m	(-)
(62)m= 186.71	164.88	173.9	156.91	154.51	139.12		146.3		162.66	` 	182.56	1	(62)
Solar DHW input												1	(/
(add additiona									ar contino	mon to wat	or ricating)		
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(63)
Output from w	ater hea	ter					<u> </u>	ļ.			<u> </u>	ı	
(64)m= 186.71	164.88	173.9	156.91	154.51	139.12	134.62	146.3	33 145.63	162.66	170.71	182.56]	
	<u> </u>			ļ		1		Utput from w	ater heat	_ I er (annual)₁	112	1918.54	(64)
Heat gains fro	m water	heating,	kWh/me	onth 0.2	8.0] ` 5	5 × (45)m	ı + (61)m] + 0.8	x [(46)m	n + (57)m	+ (59)m	 .]	-
(65)m= 87.92	78.16	83.66	77.18	77.22	71.27	70.6	74.5		79.93	81.77	86.54]	(65)
include (57)	m in calc	culation of	of (65)m	only if c	vlinder	is in the	dwelliı	ng or hot w	vater is	from com	munity h	ı neating	
5. Internal ga					•						,	J. Company	
Metabolic gain	,												
Jan	Feb	Mar	Apr	May	Jun	Jul	Au	g Sep	Oct	Nov	Dec]	
(66)m= 89.14	89.14	89.14	89.14	89.14	89.14	89.14	89.1	4 89.14	89.14	89.14	89.14		(66)
Lighting gains	(calcula	ted in Ap	pendix	L, equat	ion L9	or L9a), a	lso se	e Table 5		-	-	•	
(67)m= 14.4	12.79	10.4	7.88	5.89	4.97	5.37	6.98	9.37	11.9	13.89	14.81]	(67)
Appliances ga	ins (calc	ulated in	Append	dix L, eq	uation	L13 or L1	3a), a	lso see Ta	ıble 5	•	•	•	
(68)m= 155.4	157.01	152.94	144.29	133.37	123.11	116.25	114.6	34 118.71	127.36	138.28	148.54		(68)
Cooking gains	(calcula	ted in A	ppendix	L, equat	ion L1	or L15a), also	see Table	5	•	-	•	
(69)m= 31.91	31.91	31.91	31.91	31.91	31.91	31.91	31.9	1 31.91	31.91	31.91	31.91		(69)
Pumps and far	ns gains	(Table 5	ōa)			•		•				•	
(70)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(70)
Losses e.g. ev	aporatio	n (negat	tive valu	es) (Tab	le 5)	•		•		•	•	•	
(71)m= -71.31	-71.31	-71.31	-71.31	-71.31	-71.31	-71.31	-71.3	-71.31	-71.31	-71.31	-71.31		(71)
Water heating	gains (T	able 5)				-	-	-		•		•	
(72)m= 118.18	116.32	112.45	107.2	103.78	98.98	94.9	100.1	13 101.99	107.43	113.57	116.32		(72)
Total internal	gains =				(6	6)m + (67)m	n + (68)	m + (69)m +	(70)m + (71)m + (72))m	•	
(73)m= 337.72	335.86	325.54	309.11	292.79	276.81	266.27	271.	5 279.81	296.42	315.47	329.41		(73)
6. Solar gains	S:					•	•		•				
Solar gains are	calculated	using sola	r flux from	Table 6a	and asso	ciated equa	itions to	convert to the	ne applica	able orienta	tion.		
Orientation: A		actor	Area			ux		g_ T-1-1-01	_	FF		Gains	
_	Table 6d		m²			able 6a		Table 6b		Table 6c		(W)	_
Northeast _{0.9x}	0.77	X	8.6	35	X	11.28	X	0.63	X	0.7	=	29.83	(75)
Northeast _{0.9x}	0.77	X	8.6	S5	X	22.97	X	0.63	x	0.7	=	60.72	(75)
Northeast _{0.9x}	0.77	X	8.6	S5	x	41.38	X	0.63	x	0.7	=	109.4	(75)
Northeast _{0.9x}	0.77	х	8.6	S5	x	67.96	x	0.63	x	0.7	=	179.67	(75)
Northeast _{0.9x}	0.77	X	8.6	65	X	91.35	X	0.63	X	0.7	=	241.51	(75)

Northeast _{0.9x}	0.77	x	8.6	55	x	ç	7.38	X		0.63	x	0.7	=	257.47	(75)
Northeast _{0.9x}	0.77	x	8.6	55	x	,	91.1	X		0.63	х	0.7	=	240.86	(75)
Northeast _{0.9x}	0.77	X	8.6	55	x	7	72.63	X		0.63	x	0.7	=	192.02	(75)
Northeast _{0.9x}	0.77	x	8.6	55	x	5	50.42	X		0.63	x	0.7	=	133.31	(75)
Northeast _{0.9x}	0.77	x	8.6	55	x	2	28.07	x		0.63	x	0.7		74.21	(75)
Northeast 0.9x	0.77	x	8.6	55	x		14.2	X		0.63	×	0.7	= =	37.53	(75)
Northeast 0.9x	0.77	x	8.6	55	x	,	9.21	x		0.63		0.7	- -	24.36	(75)
'															
Solar gains in	watts, ca	alculated	for eacl	n month				(83)m	n = S	um(74)m .	(82)m				
(83)m= 29.83	60.72	109.4	179.67	241.51	2	57.47	240.86	192	2.02	133.31	74.21	37.53	24.36		(83)
Total gains –	internal a	and solar	(84)m =	(73)m	+ (8	33)m	, watts					_			
(84)m= 367.55	396.58	434.94	488.78	534.3	53	34.28	507.13	463	3.51	413.11	370.63	353.01	353.77		(84)
7. Mean inte	rnal temp	perature	(heating	season)										
Temperature						area	from Tal	ole 9	, Th	1 (°C)				21	(85)
Utilisation fa	_	• •			_					` ,					_
Jan	Feb	Mar	Apr	May	È	Jun	Jul	A	ug	Sep	Oct	Nov	Dec		
(86)m= 0.95	0.94	0.91	0.84	0.73	(0.57	0.45	0.	.5	0.71	0.87	0.94	0.96		(86)
Mean interna	el temper	atura in	living ar	 22 T1 (f	مالد	w sta	ns 3 to 7	7 in T	Fahl	o 0c)	ļ.		!		
(87)m= 18.91	19.11	19.51	20.06	20.53	_	0.83	20.94	20.		20.68	20.09	19.42	18.87		(87)
	ļ									<u> </u>		1	1		` '
Temperature	20.02	eating p	eriods ir	20.04	т —	elling :0.05	20.05	20.		12 (°C) 20.04	20.04	20.03	20.03	Ī	(88)
(88)m= 20.02	20.02	20.02	20.03	20.04		0.05	20.05	20.	.05	20.04	20.04	20.03	20.03		(00)
Utilisation fa	 				т —			T		1	1	_		1	>
(89)m= 0.95	0.93	0.9	0.82	0.68		0.51	0.36	0.4	41	0.65	0.85	0.92	0.95		(89)
Mean interna	al temper	ature in	the rest	of dwell	ing	T2 (f	ollow ste	eps 3	3 to 7	7 in Tabl	le 9c)	_			
(90)m= 17.23	17.52	18.09	18.88	19.51	1	9.89	20	19.	.99	19.72	18.94	17.98	17.18		(90)
										1	fLA = Livi	ng area ÷ (4) =	0.47	(91)
Mean interna	al temper	ature (fo	r the wh	ole dwe	llin	g) = f	LA × T1	+ (1	– fL	.A) × T2					
(92)m= 18.03	18.27	18.77	19.44	20	2	0.34	20.45	20.	.43	20.18	19.49	18.67	17.98		(92)
Apply adjust	ment to t	he mean	internal	temper	atu	re fro	m Table	4e,	whe	ere appro	opriate	•			
(93)m= 18.03	18.27	18.77	19.44	20	2	0.34	20.45	20.	.43	20.18	19.49	18.67	17.98		(93)
8. Space hea	ating requ	uirement													
Set Ti to the					ned	at st	ep 11 of	Tab	le 9b	o, so tha	t Ti,m=	(76)m an	d re-cald	culate	
the utilisation	1				1	la	1	Ι ,		Can	0.4	Nev	l Daa		
Jan Utilisation fa	Feb	Mar	Apr	May	<u> </u>	Jun	Jul	A	ug	Sep	Oct	Nov	Dec		
(94)m= 0.93	0.91	0.88	0.8	0.68	Ι (0.53	0.4	0.4	45	0.66	0.83	0.91	0.93		(94)
Useful gains								_ <u>.</u>		0.00	0.00	1 0.0 .	1 3.33		, ,
(95)m= 341.22	1	380.65	390.91	364.18	28	32.67	201.86	206	5.81	271.84	308.13	319.68	330.43		(95)
Monthly ave	rage exte	rnal tem	perature	from T	abl	e 8		<u> </u>			<u> </u>	ļ.	<u>!</u>		
(96)m= 4.3	4.9	6.5	8.9	11.7	_	14.6	16.6	16	6.4	14.1	10.6	7.1	4.2		(96)
Heat loss rat	e for me	an intern	al tempe	erature,	Lm	, W =	-[(39)m	x [(9	3)m	– (96)m]	•	•	ı	
(97)m= 786.54	764.58	699.52	593.6	466.1	3	18.31	213.53	222	2.98	338.8	499.32	653.12	782.22		(97)
Space heatir	ng require	ement fo	r each n	nonth, k	Wh	/mon	th = 0.02	24 x	[(97)m – (95)m] x (4	11)m		•	
(98)m= 331.32	270.83	237.24	145.94	75.83		0	0)	0	142.24	240.08	336.13		

	Total per year (kWh/year) = $Sum(98)_{15,912}$ =	1779.6	(98)
Space heating requirement in kWh/m²/year		33.49	(99)
9b. Energy requirements – Community heating scheme			
This part is used for space heating, space cooling or water heating Fraction of space heat from secondary/supplementary heating (Tab		0	(301)
Fraction of space heat from community system 1 – (301) =	,	1	(302)
The community scheme may obtain heat from several sources. The procedure allow	vs for CHP and up to four other heat sources:		`
includes boilers, heat pumps, geothermal and waste heat from power stations. See	•		_
Fraction of heat from Community boilers		1	(303a)
Fraction of total space heat from Community boilers	(302) x (303a) =	1	(304a)
Factor for control and charging method (Table 4c(3)) for community	y heating system	1	(305)
Distribution loss factor (Table 12c) for community heating system		1.05	(306)
Space heating		kWh/yea	r_
Annual space heating requirement		1779.6	╛
Space heat from Community boilers	(98) x (304a) x (305) x (306) =	1868.58	(307a)
Efficiency of secondary/supplementary heating system in % (from 7	Гable 4a or Appendix E)	0	(308
Space heating requirement from secondary/supplementary system	(98) x (301) x 100 ÷ (308) =	0	(309)
Water heating Annual water heating requirement		1918.54	٦
If DHW from community scheme: Water heat from Community boilers	(64) x (303a) x (305) x (306) =	2014.47	(310a)
Electricity used for heat distribution			(313)
•	0.01 × [(307a)(307e) + (310a)(310e)] =	38.83	╡
Cooling System Energy Efficiency Ratio	(407) (044)	0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314) =	0	(315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from out	side	184.38	(330a)
warm air heating system fans		0	(330b)
pump for solar water heating		0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330b) + (330g) =	184.38	(331)
Energy for lighting (calculated in Appendix L)		254.39	(332)
Electricity generated by PVs (Appendix M) (negative quantity)		-535.18	(333)
Electricity generated by wind turbine (Appendix M) (negative quant	ity)	0	(334)
12b. CO2 Emissions – Community heating scheme			
	Energy Emission factor kWh/year kg CO2/kWh	Emissions kg CO2/year	
CO2 from other sources of space and water heating (not CHP) Efficiency of heat source 1 (%) If there is CHP using two	o fuels repeat (363) to (366) for the second fue	94	(367a)
CO2 associated with heat source 1 [(307b)+(310	(ab)] x 100 ÷ (367b) x 0.22	892.28	(367)
Electrical energy for heat distribution [(31:	3) x 0.52 =	20.15	(372)

Total CO2 associated with community sys	stems	(363)(366) + (368)(37	2)	=	912.43	(373)
CO2 associated with space heating (second	ondary)	(309) x	0	=	0	(374)
CO2 associated with water from immersion	on heater or instantar	neous heater (312) x	0.22	=	0	(375)
Total CO2 associated with space and wat	ter heating	(373) + (374) + (375) =			912.43	(376)
CO2 associated with electricity for pumps	and fans within dwe	lling (331)) x	0.52	=	95.69	(378)
CO2 associated with electricity for lighting	J	(332))) x	0.52	=	132.03	(379)
Energy saving/generation technologies (3 Item 1	33) to (334) as appli	cable	0.52 × 0.01 =	= [-277.76	(380)
Total CO2, kg/year	sum of (376)(382) =				862.4	(383)
Dwelling CO2 Emission Rate	383) ÷ (4) =				16.23	(384)
El rating (section 14)					88.23	(385)

SAP 2012 Overheating Assessment

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

Property Details: Plot 10

Dwelling type:FlatLocated in:EnglandRegion:Thames valley

Cross ventilation possible: No 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): 4 (Windows fully open)

Overheating Details

Summer ventilation heat loss coefficient: 175.38 (P1)

Transmission heat loss coefficient: 45.6

Summer heat loss coefficient: 220.97 (P2)

Overhangs:

Orientation: Ratio: Z_overhangs:

North East (NE) 0 1

Solar shading:

Orientation:Z blinds:Solar access:Overhangs:Z summer:North East (NE)10.910.9

Solar gains:

Orientation FF Area Flux Shading Gains g_{-} 98.85 0.9 305.45 North East (NE) 0.9 x8.65 0.63 0.7 **Total** 305.45 (P3/P4)

Internal gains:

June July **August** 378.29 371.83 Internal gains 364.98 708.05 670.43 (P5) Total summer gains 621.73 Summer gain/loss ratio 3.2 3.03 2.81 (P6) Mean summer external temperature (Thames valley) 16 17.9 17.8 Thermal mass temperature increment 1.3 1.3 1.3 (P7) Threshold temperature 20.5 22.23 21.91 Likelihood of high internal temperature Slight Medium Slight

Assessment of likelihood of high internal temperature: Medium

User Details:	
Assessor Name: Zahid Ashraf Stroma Number: STRO00: Software Name: Stroma FSAP 2012 Software Version: Version:	
Property Address: Plot 10 Address:	
1. Overall dwelling dimensions:	
<u> </u>	/olume(m³)
Ground floor 53.15 (1a) x 2.5 (2a) =	132.86 (3a)
Total floor area TFA = $(1a)+(1b)+(1c)+(1d)+(1e)+(1n)$ 53.15 (4)	
Dwelling volume $(3a)+(3b)+(3c)+(3d)+(3e)+(3n) =$	132.86 (5)
2. Ventilation rate:	
main secondary other total n heating heating	n³ per hour
Number of chimneys $0 + 0 = 0 \times 40 =$	0 (6a)
Number of open flues $0 + 0 + 0 = 0 \times 20 =$	0 (6b)
Number of intermittent fans 2 x 10 =	20 (7a)
Number of passive vents 0 x 10 =	0 (7b)
Number of flueless gas fires 0 x 40 =	0 (7c)
Air change	ges per hour
Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) =$ 20 $\div (5) =$	0.15 (8)
If a pressurisation test has been carried out or is intended, proceed to (17), otherwise continue from (9) to (16) Number of storeys in the dwelling (ns)	0 (9)
Additional infiltration [(9)-1]x0.1 =	0 (10)
Structural infiltration: 0.25 for steel or timber frame or 0.35 for masonry construction	0 (11)
if both types of wall are present, use the value corresponding to the greater wall area (after deducting areas of openings); if equal user 0.35	
If suspended wooden floor, enter 0.2 (unsealed) or 0.1 (sealed), else enter 0	0 (12)
If no draught lobby, enter 0.05, else enter 0	0 (13)
Percentage of windows and doors draught stripped	0 (14)
Window infiltration $0.25 - [0.2 \times (14) \div 100] =$	0 (15)
Infiltration rate $(8) + (10) + (11) + (12) + (13) + (15) =$	0 (16)
Air permeability value, q50, expressed in cubic metres per hour per square metre of envelope area	3 (17)
If based on air permeability value, then $(18) = [(17) \div 20] + (8)$, otherwise $(18) = (16)$ Air permeability value applies if a pressurisation test has been done or a degree air permeability is being used	0.3 (18)
Number of sides sheltered	2 (19)
Shelter factor (20) = 1 - [0.075 x (19)] =	0.85 (20)
Infiltration rate incorporating shelter factor (21) = (18) x (20) =	0.26 (21)
Infiltration rate modified for monthly wind speed	
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec	
Monthly average wind speed from Table 7	
(22)m= 5.1 5 4.9 4.4 4.3 3.8 3.8 3.7 4 4.3 4.5 4.7	
Wind Factor (22a)m = (22)m ÷ 4	
Villa i dotor (22a) (22)	

Adjusted infiltr	ation rat	e (allowi	ng for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m					
0.33	0.32	0.31	0.28	0.27	0.24	0.24	0.24	0.26	0.27	0.29	0.3]	
Calculate effe If mechanic		•	rate for t	he appli	cable ca	se							
If exhaust air h			andiv N (2	3h) - (23s	a) v Emy (e	Aguation (1	J5)) other	rwisa (23h) – (23a)			0	()
If balanced with		0		, ,	,	. `	,, .	,) = (23a)			0	(1
a) If balance		•	•	_					2h\m . /	22h) v [1 (220)	0 . 1001	(:
24a)m= 0	0		0	0	0	0	0	0	0	0	0	- 100] 	(:
b) If balance	<u> </u>						<u> </u>					J	`
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(
c) If whole h	ouse ex	tract ver	tilation o	r positiv	re input v	ventilatio	n from c	utside	<u> </u>	<u> </u>	ļ	J	
,		(23b), t		•					5 × (23b)			
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(
d) If natural													
		en (24d)	<u> </u>		· `							1	
24d)m= 0.55	0.55	0.55	0.54	0.54	0.53	0.53	0.53	0.53	0.54	0.54	0.55	J	(:
Effective air	<u>_</u>		<u> </u>	, <u> </u>	``	<u> </u>		` ´ 	0.54	0.54	1 0.55	1	
25)m= 0.55	0.55	0.55	0.54	0.54	0.53	0.53	0.53	0.53	0.54	0.54	0.55	J	(
3. Heat losse	s and he	eat loss p	paramete	er:									
LEMENT	Gros area		Openin m		Net Ar A ,r		U-valı W/m2		A X U (W/I	K)	k-value kJ/m²-		A X k kJ/K
oors					2	х	1.4	=	2.8				(
Vindows					8.651	x1.	/[1/(1.4)+	0.04] =	11.47				(
Valls Type1	47.2	21	8.65		38.56	x	0.15	i	5.78	= [(:
Valls Type2	10.5	51	2		8.51	x	0.14	<u> </u>	1.2	Ħ i		7 6	
Roof Type1	44.3	36	0		44.36	x	0.15	<u> </u>	6.65	Ħ i		7 6	(;
Roof Type2	8.78	8	0		8.78	x	0.24	<u> </u>	2.11	=		7 6	
otal area of e	lements	, m²			110.8	6							(
for windows and	roof wind	ows, use e	ffective wi	ndow U-va	alue calcul	 ated using	formula 1	/[(1/U-valu	ıe)+0.04] a	as given in	paragraph	1 3.2	·
include the area	as on both	sides of in	iternal wal	ls and par	titions								
abric heat los		,	U)				(26)(30)) + (32) =				30.02	2 (
leat capacity	,	` ,						((28)	(30) + (32	2) + (32a).	(32e) =	1137.	22 (
hermal mass	•	,		•					tive Value			100	(
or design assess an be used inste				construct	ion are not	t known pr	ecisely the	e indicative	values of	TMP in T	able 1f		
hermal bridge				using Ap	pendix k	<						15.5	7 (
details of therma					-								`
otal fabric he	at loss							(33) +	(36) =			45.59	(
entilation hea	at loss ca	alculated	monthly	/				(38)m	= 0.33 × (25)m x (5)		
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
38)m= 24.25	24.16	24.07	23.65	23.58	23.21	23.21	23.15	23.35	23.58	23.73	23.9		(
leat transfer o	coefficier	nt, W/K						(39)m	= (37) + (3	38)m		_	
89)m= 69.83	69.74	69.65	69.24	69.16	68.8	68.8	68.73	68.94	69.16	69.32	69.48		

leat loss para	meter (H	HLP), W/	m²K					(40)m	= (39)m ÷	· (4)			
40)m= 1.31	1.31	1.31	1.3	1.3	1.29	1.29	1.29	1.3	1.3	1.3	1.31		
Jumber of day	e in moi	oth (Tabl	la 1a)			•			Average =	Sum(40) ₁ .	12 /12=	1.3	(40)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water heat	ing ener	gy requi	rement:								kWh/yea	ar:	
Assumed occu if TFA > 13.9 if TFA £ 13.9	0, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.(0013 x (TFA -13.		78		(42)
Annual averag Reduce the annua ot more that 125	l average	hot water	usage by	5% if the a	lwelling is	designed t			se target o		.57		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
lot water usage ir	n litres per	day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)						
14)m= 88.63	85.41	82.18	78.96	75.74	72.51	72.51	75.74	78.96	82.18	85.41	88.63	066.96	(44
nergy content of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	n x nm x D	Tm / 3600			m(44) ₁₁₂ = ables 1b, 1		966.86	(44
45)m= 131.43	114.95	118.62	103.42	99.23	85.63	79.35	91.05	92.14	107.38	117.21	127.29		
instantanasus w	ator hooti	na ot noint	of upo (no	hot water	r otorogo)	ontor O in	hayaa (16		Total = Su	m(45) ₁₁₂ =	=	1267.7	(45
instantaneous w	0	ng at point	0			0	0			0			(46
^{46)m=} 0 Vater storage	-	U	U	0	0		U	0	0	U	0		(40
Storage volum	e (litres)	includin	g any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47
community h	•			•			` '						
Otherwise if no Vater storage		hot wate	er (this in	icludes i	nstantar	neous co	mbi boil	ers) ente	er 'O' in (47)			
a) If manufact		eclared lo	oss facto	or is kno	wn (kWł	n/day):					0		(48
emperature fa	actor fro	m Table	2b								0		(49
nergy lost fro	m water	storage	, kWh/ye	ear			(48) x (49)) =			0		(50
o) If manufact lot water stora			-										/5/
community h	•			e z (KVV	n/nue/ua	iy <i>)</i>					0		(51
olume factor	_										0		(52
emperature fa	actor fro	m Table	2b								0		(53
nergy lost fro	m water	storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54
Enter (50) or (54) in (5	55)									0		(55
Vater storage	loss cal	culated f	or each	month			((56)m = (55) × (41)	m				
66)m= 0 cylinder contains	0 dedicate	0 d solar sto	0 rage. (57) ₁	0 n = (56)m	0 x [(50) – (0 H11)] ÷ (5	0 0), else (5	0 7)m = (56)	0 m where (0 H11) is fro	0 m Appendix	Н	(56
57)m= 0	0	0	0	0	0	0	0	0	0	0	0		(57
,							_				0		(58
Primary circuit	•	•			50\m - /	(EQ) · 26	·F (44)				U		(50
TILLIALV CITCION			UI HALLI	HIGHNI	ວອກກ=າ	301 - 3r	O X (41)	111					
rimary circuit (modified by				,	•	. ,	, ,		r thermo	stat)			

Combi loss calculated	for each	month ((61)m =	(60) <u>+</u> 3	65 v (41)m							
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	0	0	0	00) - 3	00 x (41)) 0		0	0	0	0	1	(61)
Total heat required for	water he	eating ca	alculated	for eac	h month	<u>. </u>				Ļ	ļ	l (59)m + (61)m	, ,
(62)m= 111.72 97.71	100.83	87.9	84.35	72.78	67.45	77.3		78.32	91.27	99.63	108.19]	(62)
Solar DHW input calculated	usina Appe				1	<u> </u>					l .	l	` ,
(add additional lines if													
(63)m= 0 0	0	0	0	0	0	0		0	0	0	0]	(63)
Output from water hea	ter						!			-!		ı	
(64)m= 111.72 97.71	100.83	87.9	84.35	72.78	67.45	77.3	39	78.32	91.27	99.63	108.19	1	
							Outp	ut from wa	ater heat	er (annual)	112	1077.55	(64)
Heat gains from water	heating,	kWh/mo	onth 0.2	5 ´ [0.85	5 × (45)m	ı + (6	1)m	ı] + 0.8 x	c [(46)m	n + (57)m	+ (59)m	 .]	_
(65)m= 27.93 24.43	25.21	21.98	21.09	18.2	16.86	19.3	35	19.58	22.82	24.91	27.05]	(65)
include (57)m in cald	culation o	of (65)m	only if c	ylinder i	is in the	dwelli	ing (or hot w	ater is t	from com	munity h	ı neating	
5. Internal gains (see		· , ,	•	•							•	J	
Metabolic gains (Table		·											
Jan Feb	Mar	Apr	May	Jun	Jul	Αι	Jg	Sep	Oct	Nov	Dec		
(66)m= 89.14 89.14	89.14	89.14	89.14	89.14	89.14	89.	14	89.14	89.14	89.14	89.14		(66)
Lighting gains (calcula	ted in Ap	pendix l	L, equati	ion L9 o	r L9a), a	lso s	ee 7	Table 5		•		•	
(67)m= 14.4 12.79	10.4	7.88	5.89	4.97	5.37	6.9	8	9.37	11.9	13.89	14.81		(67)
Appliances gains (calc	ulated in	Append	dix L, eq	uation L	.13 or L1	3a), a	also	see Tal	ble 5	•	•	•	
(68)m= 155.4 157.01	152.94	144.29	133.37	123.11	116.25	114.	.64	118.71	127.36	138.28	148.54]	(68)
Cooking gains (calcula	ted in Ap	pendix	L, equat	ion L15	or L15a), also	o se	e Table	5	•	•	•	
(69)m= 31.91 31.91	31.91	31.91	31.91	31.91	31.91	31.9	91	31.91	31.91	31.91	31.91	1	(69)
Pumps and fans gains	(Table 5	a)			•		•			•	•	•	
(70)m= 0 0	0	0	0	0	0	0		0	0	0	0		(70)
Losses e.g. evaporatio	n (negati	ive valu	es) (Tab	le 5)			•			•		•	
(71)m= -71.31 -71.31	-71.31	-71.31	-71.31	-71.31	-71.31	-71.	31	-71.31	-71.31	-71.31	-71.31		(71)
Water heating gains (T	able 5)				•	•				•	•	•	
(72)m= 37.54 36.35	33.88	30.52	28.34	25.27	22.66	26.0	01	27.19	30.67	34.59	36.36		(72)
Total internal gains =	•			(66)m + (67)m	n + (68)m +	- (69)m + ((70)m + (71)m + (72))m	•	
(73)m= 257.08 255.9	246.97	232.44	217.35	203.1	194.03	197.	.37	205.01	219.67	236.5	249.44		(73)
6. Solar gains:						,				•	•		
Solar gains are calculated	using solar	flux from	Table 6a	and assoc	ciated equa	ations t	o co	nvert to th	e applica	ble orienta	tion.		
Orientation: Access F	actor	Area		Flu			т.	g_ chla Ch	-	FF		Gains	
Table 6d		m²		Ta	ble 6a	. ,	16	able 6b	_ '	Table 6c		(W)	_
Northeast 0.9x 0.77	X	8.6	55	X	11.28	X		0.63	x	0.7	=	29.83	(75)
Northeast 0.9x 0.77	Х	8.6	55	X :	22.97	X		0.63	x [0.7	=	60.72	(75)
Northeast 0.9x 0.77	Х	8.6	55	X .	41.38	X		0.63	x [0.7	=	109.4	(75)
Northeast 0.9x 0.77	х	8.6	55	x	67.96	X		0.63	x [0.7	=	179.67	(75)
Northeast 0.9x 0.77	X	8.6	65	X !	91.35	X		0.63	X	0.7	=	241.51	(75)

Northeast _{0.9x}	0.77	X	8.6	65	x	97.38	X		0.63	X	0.7	=	257.47	(75)
Northeast _{0.9x}	0.77	x	8.6	65	x	91.1	X		0.63	x	0.7	=	240.86	(75)
Northeast _{0.9x}	0.77	X	8.6	55	x	72.63	X		0.63	x	0.7	=	192.02	(75)
Northeast _{0.9x}	0.77	Х	8.6	65	x	50.42	x		0.63	x	0.7	=	133.31	(75)
Northeast _{0.9x}	0.77	х	8.6	55	x	28.07	x		0.63	x	0.7	=	74.21	(75)
Northeast _{0.9x}	0.77	x	8.6	55	x	14.2	X		0.63	_ x	0.7		37.53	(75)
Northeast _{0.9x}	0.77	х	8.6	65	x	9.21	X		0.63	x	0.7	=	24.36	(75)
•														_
Solar gains in	watts, ca	alculated	for eacl	h month			(83)m	n = Si	um(74)m .	(82)m				
(83)m= 29.83	60.72	109.4	179.67	241.51	257.4	7 240.86	192	2.02	133.31	74.21	37.53	24.36		(83)
Total gains – i	internal a	nd solar	(84)m =	= (73)m	+ (83)	m , watts							•	
(84)m= 286.91	316.62	356.37	412.1	458.85	460.5	7 434.89	389	.39	338.32	293.87	274.04	273.8		(84)
7. Mean inte	rnal temp	erature	(heating	season)									
Temperature	during h	eating p	eriods ir	the livi	ng are	a from Ta	ble 9	, Th	1 (°C)				21	(85)
Utilisation fac	ctor for g	ains for I	iving are	ea, h1,m	(see	Table 9a)								_
Jan	Feb	Mar	Apr	May	Jur	n Jul	Α	ug	Sep	Oct	Nov	Dec		
(86)m= 0.97	0.97	0.95	0.9	0.82	0.69	0.57	0.6	63	0.82	0.93	0.97	0.98		(86)
Mean interna	al temper	ature in	living are	ea T1 (fo	ollow s	steps 3 to	7 in T	Γable	e 9c)		•	•	•	
(87)m= 18.18	18.4	18.86	19.51	20.14	20.6		20.		20.36	19.57	18.77	18.13		(87)
Temperature	during h	oating n	oriode ir	rest of	dwelli	na from T	ahla (—— о ті	^2 (°C\	<u> </u>	ļ.			
(88)m= 19.83	19.83	19.83	19.84	19.84	19.8	<u> </u>	19.		19.84	19.84	19.84	19.84		(88)
` '	ļ.				<u> </u>	<u> </u>					1 .0.0 .	10.0		, ,
Utilisation fac	otor for g	1	est of d	welling, 0.78	I	`	T	- 2	0.76	0.01	0.96	0.97	Ī	(89)
` '	ļ.	0.94			0.62	<u> </u>	0.5			0.91	0.96	0.97		(00)
Mean interna	T .					<u>` </u>	i 				ı	I	1	(0.0)
(90)m= 17.27	17.48	17.94	18.58	19.18	19.6	19.77	19.	.74	19.4	18.65	17.86	17.22		(90)
									Ī	LA = LIVII	ng area ÷ (4) =	0.47	(91)
Mean interna	al temper	ature (fo	r the wh	ole dwe	lling) =	= fLA × T1	+ (1	– fL	A) × T2				•	
(92)m= 17.7	17.92	18.37	19.02	19.64	20.08		20.		19.86	19.09	18.29	17.65		(92)
Apply adjusti	1				1		т —			i —	1	1	Ī	
(93)m= 17.7	17.92	18.37	19.02	19.64	20.0	3 20.27	20.	.23	19.86	19.09	18.29	17.65		(93)
8. Space hea	· ·								.1	. —	(- 0)			
Set Ti to the the utilisation					ied at	step 11 of	labi	ie 9t	o, so tha	t II,m=((76)m an	d re-calc	culate	
Jan	Feb	Mar	Apr	May	Jur	n Jul	Та	ug	Sep	Oct	Nov	Dec		
Utilisation fac		l	•	,		1	1	- 9			1			
(94)m= 0.96	0.95	0.92	0.86	0.77	0.63	0.5	0.5	56	0.76	0.9	0.95	0.96		(94)
Useful gains	, hmGm	, W = (94	4)m x (84	4)m		•						•		
(95)m= 275.18	299.9	328.19	356.05	352.48	292.4	1 219.16	218	3.74	257.93	263.62	259.33	263.69		(95)
Monthly aver	age exte	rnal tem	perature	from T	able 8								•	
(96)m= 4.3	4.9	6.5	8.9	11.7	14.6	16.6	16	5.4	14.1	10.6	7.1	4.2		(96)
Heat loss rat							- ``				1	Ī	1	(0=)
(97)m= 935.73	907.98	827.13	700.77	548.86	377.0		263		396.92	587.28	775.75	934.79		(97)
Space heatin							_	<u> </u>		ŕ	- 	400.0	[
(98)m= 491.45	408.63	371.21	248.2	146.1	0	0	C	J	0	240.8	371.82	499.3		

								Tota	l per year	(kWh/year	r) = Sum(9	8) _{15,912} =	2777.53	(98)
Space	e heating	g require	ement in	kWh/m²	/year								52.26	(99)
8c. Sp	pace co	oling req	luiremen	nt										
Calcu	lated fo	r June, J	luly and	August.	See Tal	ole 10b							•	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Heat I	loss rate	Lm (ca	lculated	using 25	°C inter	nal temp	erature	and exte	ernal ten	nperatur	e from T	able 10)		
(100)m=	0	0	0	0	0	646.71	509.11	522.36	0	0	0	0		(100)
Utilisa	ation fac	tor for lo	ss hm											
(101)m=	0	0	0	0	0	0.68	0.75	0.71	0	0	0	0		(101)
Usefu	ıl loss, h	mLm (V	/atts) = ((100)m x	(101)m									
(102)m=	0	0	0	0	0	442.9	381.74	370.08	0	0	0	0		(102)
Gains	(solar	gains cal	lculated	for appli	cable we	eather re	gion, se	e Table	10)			_		
(103)m=	0	0	0	0	0	605.52	574.27	522.14	0	0	0	0		(103)
						lwelling,	continu	ous (kW	h = 0.0	24 x [(10)3)m – (102)m] :	x (41)m	
set (1	04)m to	zero if (104)m <	3 × (98)m								•	
(104)m=	0	0	0	0	0	117.09	143.24	113.13	0	0	0	0		
									Total	= Sum(104)	=	373.47	(104)
	fraction								f C =	cooled	area ÷ (4	4) =	1	(105)
r		actor (Ta	able 10b)							1		1	
(106)m=	0	0	0	0	0	0.25	0.25	0.25	0	0	0	0		
	Total = Sum(104) =												0	(106)
· .	Ť	requirer	nent for	month =	(104)m	× (105)				1	Т	1	1	
(107)m=	0	0	0	0	0	29.27	35.81	28.28	0	0	0	0		
									Total	= Sum(107)	=	93.37	(107)
Space	cooling	requirer	ment in k	:Wh/m²/y	/ear				(107)	÷ (4) =			1.76	(108)
8f. Fab	ric Ener	gy Effici	ency (ca	alculated	only un	der spec	cial cond	litions, s	ee sectio	on 11)				
Fabric	c Energy	/ Efficier	псу					(99) -	+ (108) =	=		54.02	(109)	

SAP Input

Property Details: Plot 10

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 53.146 m² 2.5 m

Living area: 25.244 m² (fraction 0.475)

Front of dwelling faces: South West

Opening types:

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

SW Manufacturer Solid

NE Manufacturer Windows double-glazed Yes

Name: Gap: Frame Factor: g-value: **U-value:** Area: No. of Openings: 1.4 SW mm 0 0 2 NE 16mm or more 0.7 0.63 1.4 8.651

Name: Type-Name: Location: Orient: Width: Height:

SW Corridor Wall South West 0 0
NE External Wall North East 0 0

Overshading: Average or unknown

Opaque Elements:

Туре:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Elements							
External Wall	47.207	8.65	38.56	0.15	0	False	N/A
Corridor Wall	10.509	2	8.51	0.15	0.4	False	N/A
Flat Roof (200mm in	ns) 44.364	0	44.36	0.15	0		N/A
Flat Roof (100mm in	ns) 8.782	0	8.78	0.24	0		N/A

Internal Elements
Party Elements

Thermal bridges

Thermal bridges: User-defined (individual PSI-values) Y-Value = 0.1404

Length Psi-value

4.795 0.289 E2 Other lintels (including other steel lintels)

13.2 0.047 E4 Jamb

SAP Input

	17.634	0.07	E7	Party floor between dwellings (in blocks of flats)
[Approved]	2.725	0.09	E16	Corner (normal)
	2.725	-0.072	E17	Corner (inverted internal area greater than external area)
	2.725	0.096	E25	Staggered party wall between dwellings
	8.175	0.056	E18	Party wall between dwellings
	10.538	0.086	E24	Eaves (insulation at ceiling level - inverted)
	3.856	0.068	E14	Flat roof
	17.324	0.56	E15	Flat roof with parapet
	9.754	0	P3	Intermediate floor between dwellings (in blocks of flats)
	2.864	0.24	P4	Roof (insulation at ceiling level)

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: 0.65 Tilt of collector: 30°

Overshading: None or very little

SAP Input

Collector Orientation: South West

Assess Zero Carbon Home:

Nο

		l Iser I	Details:						
Assessor Name: Software Name:	Zahid Ashraf Stroma FSAP 2012	<u> </u>	Strom Softwa					0001082 on: 1.0.5.9	
Address :	F	roperty	Address	Plot 10					
1. Overall dwelling dime	ensions:								
<u> </u>		Are	a(m²)		Av. He	ight(m)		Volume(m ³	³)
Ground floor		į	53.15	(1a) x	2	2.5	(2a) =	132.86	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1	n) (53.15	(4)					
Dwelling volume				(3a)+(3b)+(3c)+(3c	d)+(3e)+	.(3n) =	132.86	(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	Ī - Ē	0	x2	20 =	0	(6b)
Number of intermittent fa	ins				2	x '	10 =	20	(7a)
Number of passive vents	3			Ē	0	x	10 =	0	(7b)
Number of flueless gas f	ires			F	0	x 4	40 =	0	(7c)
				L					
							Air ch	nanges per ho	our
	ys, flues and fans = $(6a)+(6b)+(6b)+(6a)$				20		÷ (5) =	0.15	(8)
Number of storeys in t	peen carried out or is intended, procee he dwelling (ns)	ea 10 (17),	otrierwise	onunue ir	om (9) to	(10)		0	(9)
Additional infiltration	3 \					[(9)	-1]x0.1 =	0	(10)
	.25 for steel or timber frame o			•	ruction			0	(11)
if both types of wall are p deducting areas of openi	resent, use the value corresponding t nas): 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)
•	s and doors draught stripped							0	(14)
Window infiltration			0.25 - [0.2	. ,	-	. (45)		0	(15)
Infiltration rate	q50, expressed in cubic metre	se nar h	(8) + (10)				area	0	(16)
,	lity value, then $(18) = [(17) \div 20] + (18)$	-	•	•	elle oi e	rivelope	aica	0.4	(17)
•	es if a pressurisation test has been do				is being u	sed		<u> </u>	(\ -/
Number of sides sheltered	ed		(00) 4	10 07F ·· //	10)1			2	(19)
Shelter factor	ting chalter factor		(20) = 1 - (21) = (18)		19)] =			0.85	(20)
Infiltration rate incorporations and infiltration rate modified f			(21) = (10	/ X (20) =				0.34	(21)
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
Monthly average wind sp		1	<u> </u>	•	•			ı	
(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 Faster (00s) (2	2)	•			•		-	•	
Wind Factor $(22a)m = (2(22a)m = 1.27 1.25)$	2)m ÷ 4 1.23 1.1 1.08 0.95	0.95	0.92	1	1.08	1.12	1.18]	
(ΔΔα)111- 1.20	1.20 1.1 1.00 0.95	1 0.95	0.32	'	1.00	1.12	1.10	J	

0.43 Calculate effec If mechanica If exhaust air he	0.43 tive air (0.42	0.37	0.37	0.00					1			
If mechanica	tive air d				0.32	0.32	0.31	0.34	0.37	0.38	0.4		
	Lyontila	•	rate for t	he appli	cable ca	se							(
ii omiaaat aii iio			endix N (2	3h) = (23a	a) × Fmv (e	equation (N	N5)) other	wise (23h) = (23a)			0	
If balanced with		0		, ,	,	. `	,, .	,) = (20 0)			0	(
a) If balance		-	•	_					2h\m + (23P) ^ [-	1 _ (23c)	0 . 1001	(
24a)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(
b) If balance	d mecha	anical ve		without	heat rec	overv (N	/\\/) (24h	lm = (2)	2b)m + (23h)		J	·
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0	1	(
c) If whole ho	use ext	tract ven	tilation o	r positiv	re input v	rentilatio	n from c	utside	ļ		<u>!</u>	J	
if (22b)m				•					5 × (23b	o)			
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(
d) If natural v					•							_	
if (22b)m		<u> </u>	<u> </u>				<u></u>			1		1	,
24d)m= 0.59	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.57	0.58		(
Effective air			<u> </u>	<u> </u>	<u> </u>							1	,
25)m= 0.59	0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.57	0.58		(
3. Heat losses	and he	at loss p	paramete	er:									
LEMENT	Gros	_	Openin		Net Ar		U-valu		AXU		k-value		AXk
	area	(m²)	m	l ²	A ,r	_	W/m2		(W/I	K)	kJ/m²-l	K	kJ/K
oors					2	×	1	= [2	=			(
Vindows					8.651	x1,	/[1/(1.4)+	0.04] = [11.47	ᆜ ,			(
Valls Type1	47.2	1	8.65		38.56	X	0.18	=	6.94	<u> </u>		_	(
Valls Type2	10.5	1	2		8.51	X	0.18	= [1.53	<u></u>			(
Roof Type1	44.3	6	0		44.36	x	0.13	=	5.77				(
Roof Type2	8.78	3	0		8.78	X	0.13	=	1.14				(
otal area of el	ements,	, m²			110.8	6							(
for windows and i						ated using	formula 1	/[(1/U-valu	ıe)+0.04] a	as given in	paragraph	3.2	
* include the areas -abric heat loss				is and pan	uuoris		(26)(30)	+ (32) =				20.00	5 (
leat capacity (,	0)				(==):::(==)		(30) + (32	2) + (32a)	(32e) =	28.8	
hermal mass	,	•	2 – Cm <u>-</u>	- ΤΕΔ) ir	n k I/m²K				tive Value	, , ,	(020) =	1137.	
or design assessi		,		•			ecisely the				able 1f	250	(
an be used instea						,							
hermal bridge	s : S (L	x Y) cal	culated (using Ap	pendix ł	<						15.6	7 (
details of thermal		are not kn	own (36) =	= 0.05 x (3	1)				,,				
otal fabric hea								` '	(36) =			44.52	2 (
entilation heaf	1								= 0.33 × (<u> </u>	1	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	-	,
38)m= 26.05	25.89	25.74	25	24.86	24.22	24.22	24.1	24.46	24.86	25.14	25.43	J	(
leat transfer c								· · ·	= (37) + (Г	1	
39)m= 70.57	70.41	70.26	69.52	69.38	68.74	68.74	68.62	68.98	69.38	69.66	69.95	1	

eat loss para	meter (H	HLP), W/	m²K					(40)m	= (39)m ÷	- (4)			
0)m= 1.33	1.32	1.32	1.31	1.31	1.29	1.29	1.29	1.3	1.31	1.31	1.32		
umber of day	e in moi	oth (Tahl	la 1a)			•			Average =	Sum(40) ₁ .	12 /12=	1.31	(40
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
1)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41
4. Water heat	ing ener	rgy requi	rement:								kWh/yea	ar:	
ssumed occu if TFA > 13.9 if TFA £ 13.9	0, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (⁻	TFA -13		78		(42
nnual averag educe the annua ot more that 125	e hot wa Il average	hot water	usage by	5% if the a	lwelling is	designed t			se target o		.54		(43
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
ot water usage ir	n litres per	day for ea	nch month	Vd,m = fa	ctor from	Table 1c x	(43)			•			
4)m= 84.2	81.14	78.07	75.01	71.95	68.89	68.89	71.95	75.01	78.07	81.14	84.2		— ,,,
nergy content of	hot water	used - cal	culated mo	onthly = 4 .	190 x Vd,r	m x nm x E	0Tm / 3600			m(44) ₁₁₂ = ables 1b, 1		918.52	(44
5)m= 124.86	109.21	112.69	98.25	94.27	81.35	75.38	86.5	87.53	102.01	111.35	120.92		
in at a standard and a standard at			-f (havea (40		Total = Su	m(45) ₁₁₂ =		1204.32	(4
instantaneous w													(4)
6)m= 0 /ater storage	0 loss:	0	0	0	0	0	0	0	0	0	0		(4)
torage volum	e (litres)	includin	g any so	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(4
community h	•			•			` '						
therwise if no		hot wate	er (this in	cludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (47)			
/ater storage i) If manufact		eclared lo	oss facto	or is kno	wn (kWł	n/dav):					0		(4
emperature fa					(, , .					0		(4
nergy lost fro				ear			(48) x (49)) =			0		(5
) If manufact			-										
ot water stora community h	•			e 2 (kW	h/litre/da	ay)					0		(5
olume factor	_		JII 4.3								0		(5:
emperature fa			2b							-	0		(5
nergy lost fro				ear			(47) x (51)) x (52) x (53) =		0		` (5
Inter (50) or (_	,, .				, , , , ,		,	-	0		(5
/ater storage	loss cal	culated f	or each	month			((56)m = (55) × (41)	m				
6)m= 0	0	0	0	0	0	0	0	0	0	0	0		(5
cylinder contains	dedicate	d solar sto	rage, (57)ı	n = (56)m	x [(50) – (<u>H</u> 11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Appendix	Н	
7)m= 0	0	0	0	0	0	0	0	0	0	0	0		(5
rimary circuit	loss (an	nual) fro	m Table	3							0		(58
rimary circuit	•	•			59)m = ((58) ÷ 36	65 × (41)	m					
•				,	•	. ,	ng and a		r thermo	stat)			
(modified by							-	•		,			

On male: James		.		(04)	(00) - 0	OF (44)	\						
Combi loss (61)m= 0	calculated 0	or each	montn ((61)m =	(60) ÷ 3	05 × (41))m 0	0	0	0	0		(61)
. ,	!	<u> </u>		<u> </u>			<u> </u>	Ļ	<u> </u>	<u> </u>	<u> </u>	(F0)m + (G1)m	(01)
(62)m= 106.1	-i	95.79	83.51	80.13	69.15	64.07	73.52	74.4	86.71	94.65	102.78	(59)m + (61)m	(62)
Solar DHW input								1					(02)
(add addition									ii continbu	lion to wate	er rieatiriy)		
(63)m= 0	0	0	0	0	0	0	0		0	0	0]	(63)
Output from	water hea	ter					ļ	!		ļ			
(64)m= 106.1		95.79	83.51	80.13	69.15	64.07	73.52	74.4	86.71	94.65	102.78		
	_ I			l			Ou	put from w	ater heate	r (annual)₁	l12	1023.67	(64)
Heat gains f	rom water	heating,	kWh/m	onth 0.2	5 ′ [0.85	× (45)m	ı + (61)ı	n] + 0.8 x	x [(46)m	+ (57)m	+ (59)m	1	-
(65)m= 26.53	1	23.95	20.88	20.03	17.29	16.02	18.38	18.6	21.68	23.66	25.7]	(65)
include (5	7)m in cald	culation o	of (65)m	only if c	vlinder i	s in the	dwelling	or hot w	ater is f	rom com	munity h	ı neating	
5. Internal			. ,		,						,	<u> </u>	
Metabolic ga				,									
Jar		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 89.14	4 89.14	89.14	89.14	89.14	89.14	89.14	89.14	89.14	89.14	89.14	89.14		(66)
Lighting gair	ns (calcula	ted in Ap	pendix	L, equat	on L9 o	r L9a), a	lso see	Table 5	•		•	ı	
(67)m= 14.4	12.79	10.4	7.88	5.89	4.97	5.37	6.98	9.37	11.9	13.89	14.81		(67)
Appliances (gains (calc	ulated in	Append	dix L, eq	uation L	13 or L1	3a), als	o see Ta	ble 5		•	•	
(68)m= 155.4	157.01	152.94	144.29	133.37	123.11	116.25	114.64	118.71	127.36	138.28	148.54		(68)
Cooking gair	ns (calcula	ted in Ap	pendix	L, equat	ion L15	or L15a), also s	ee Table	5	•	•	•	
(69)m= 31.9°	1 31.91	31.91	31.91	31.91	31.91	31.91	31.91	31.91	31.91	31.91	31.91		(69)
Pumps and	fans 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= -71.3	1 -71.31	-71.31	-71.31	-71.31	-71.31	-71.31	-71.31	-71.31	-71.31	-71.31	-71.31		(71)
Water heatir	ng gains (T	able 5)		-		-	-		-	-	-		
(72)m= 35.66	34.53	32.19	29	26.93	24.01	21.53	24.71	25.83	29.14	32.86	34.54		(72)
Total intern	al gains =	:			(66)m + (67)m	n + (68)m	+ (69)m +	(70)m + (7	71)m + (72))m		
(73)m= 255.2	1 254.08	245.28	230.91	215.93	201.83	192.9	196.07	203.65	218.13	234.77	247.63		(73)
6. Solar ga	ins:												
Solar gains ar		ŭ	flux from	Table 6a		•	itions to c	onvert to th	ne applica		tion.		
Orientation:	Access F Table 6d		Area m²		Flu	ıx ble 6a		g_ Fable 6b	т	FF able 6c		Gains	
					Га	DIE Ga	. –	i able ob	_ '	able oc		(W)	7
Northeast 0.9		X	8.6	55	X	11.28	X	0.63	x	0.7	=	29.83	(75)
Northeast 0.9	-	X	8.6	35	x	22.97	X	0.63	x	0.7	=	60.72	(75)
Northeast 0.9	0	X	8.6	35	x	41.38	X	0.63	x	0.7	=	109.4	(75)
Northeast 0.9		X	8.6	35	X	67.96	X	0.63	x	0.7	=	179.67	(75)
Northeast 0.9	× 0.77	X	8.6	S5	x .	91.35	X	0.63	X	0.7	=	241.51	(75)

Northeast _{0.9x}	0.77	X	8.6	65	X	97.38	x[0.63	x	0.7	=	257.47	(75)
Northeast 0.9x	0.77	X	8.6	65	x	91.1	x[0.63	x	0.7	=	240.86	(75)
Northeast _{0.9x}	0.77	X	8.6	55	x	72.63	_ x [0.63	x	0.7	=	192.02	(75)
Northeast _{0.9x}	0.77	X	8.6	55	X .	50.42] x		0.63	x	0.7	=	133.31	(75)
Northeast _{0.9x}	0.77	x	8.6	55	x	28.07	×		0.63	x	0.7	=	74.21	(75)
Northeast _{0.9x}	0.77	x	8.6	55	x	14.2	×		0.63	x	0.7	=	37.53	(75)
Northeast 0.9x	0.77	x	8.6	55	x	9.21	x		0.63	x	0.7	=	24.36	(75)
_														
Solar gains in	watts, ca	lculated	for eac	h month			(83)m	= Sur	m(74)m .	(82)m				
(83)m= 29.83	60.72	109.4	179.67	241.51	257.47	240.86	192.	02	133.31	74.21	37.53	24.36		(83)
Total gains – ir	nternal a	nd solar	(84)m =	= (73)m ·	+ (83)m	, watts								
(84)m= 285.04	314.8	354.68	410.58	457.44	459.3	433.76	388.	09	336.96	292.34	272.31	271.99		(84)
7. Mean inter	nal temp	erature	(heating	season)									
Temperature	during h	eating p	eriods ir	the livii	ng area	from Tal	ble 9,	Th1	(°C)				21	(85)
Utilisation fac	tor for ga	ains for I	iving are	ea, h1,m	(see Ta	able 9a)								_
Jan	Feb	Mar	Apr	May	Jun	Jul	Αι	ıg	Sep	Oct	Nov	Dec		
(86)m= 1	1	0.99	0.98	0.93	0.8	0.65	0.7	3	0.93	0.99	1	1		(86)
Mean internal	l tempera	ature in	living are	ea T1 (fo	ollow ste	eps 3 to 7	7 in T	able	9c)		-	-		
(87)m= 19.47	19.6	19.86	20.25	20.62	20.88	20.97	20.9		20.72	20.26	19.8	19.45		(87)
Temperature	during b	eating n	eriods ir	rest of	dwelling	from Ta	ahla 0	Th:	2 (°C)					
(88)m= 19.82	19.82	19.82	19.83	19.84	19.85	19.85	19.8		19.84	19.84	19.83	19.83		(88)
Litiliantian for	l	.:		المدال	L		. 0 =)							
Utilisation fac	1 101 ga	0.99	0.97	0.89	0.71	0.5	9a) 0.5	<u>8</u> T	0.88	0.98	1 1	1		(89)
					<u> </u>	<u> </u>					<u> </u>	'		(00)
Mean internal					, ` ` `	1	i 	-			10.70	40.40		(90)
(90)m= 18.43	18.56	18.82	19.21	19.57	19.79	19.84	19.8	33	19.67	19.23	18.78 ng area ÷ (18.42	0.47	_ ` ′
									'	LA - LIVII	ig area + (+) -	0.47	(91)
Mean internal							- ` -	-				1		
(92)m= 18.92	19.05	19.31	19.7	20.07	20.3	20.37	20.3		20.17	19.72	19.26	18.91		(92)
Apply adjustm	1			· ·	ì	1	T	-		·	10.00	40.04		(02)
(93)m= 18.92	19.05	19.31	19.7	20.07	20.3	20.37	20.3	36	20.17	19.72	19.26	18.91		(93)
8. Space hear			nn orotuu	ra abtair	and at at	on 11 of	Toble	o 0h	oo tho	t Time /	76\m an	d ro oolo	uloto	
Set Ti to the r the utilisation					ieu ai si	ерттог	Table	e an,	, so ma	t 11,111=(10)III ali	u re-caic	uiale	
Jan	Feb	Mar	Apr	May	Jun	Jul	Αι	ıg	Sep	Oct	Nov	Dec		
Utilisation fac	tor for ga	ains, hm	•	,	'			<u> </u>	•					
(94)m= 1	1	0.99	0.97	0.9	0.75	0.57	0.6	5	0.9	0.98	1	1		(94)
Useful gains,	hmGm ,	W = (94	1)m x (84	4)m										
(95)m= 284.39	313.58	351.42	398.14	412.69	344.69	248.85	253.	25	302.17	287.57	271.23	271.49		(95)
Monthly avera					i									
(96)m= 4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.		14.1	10.6	7.1	4.2		(96)
Heat loss rate					1	 					1			(07)
(97)m= 1032.12		900.32	751.08	580.63	392.12	259.33	271.		418.67	632.6	847.35	1028.91		(97)
Space heating			r each n 254.12		Wh/mon	$\frac{1 + 0.02}{1}$	24 x [(Ť		<u> </u>	 	560 E4		
(98)m= 556.31	458.92	408.39	234.12	124.94	Ι ^U	I ^U	I ⁰		0	256.7	414.81	563.51		

								Tota	l per year	(kWh/year	r) = Sum(9	8) _{15,912} =	3037.7	(98)
Space	e heating	g require	ement in	kWh/m²	² /year								57.16	(99)
8c. Sp	pace cod	oling req	uiremen	it										
Calcu	lated for	r June, J	luly and	August.	See Tal	ole 10b							-	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Heat I	oss rate	Lm (ca	lculated	using 25	5°C inter	nal temp	perature	and exte	ernal ten	nperatur	e from T	able 10)	1	
(100)m=	0	0	0	0	0	646.12	508.65	521.49	0	0	0	0		(100)
Utilisa	ation fac	tor for lo	ss hm										•	
(101)m=	0	0	0	0	0	0.79	0.87	0.82	0	0	0	0		(101)
Usefu	l loss, h	mLm (V	/atts) = (100)m x	(101)m								•	
(102)m=	0	0	0	0	0	511.88	440.51	427.86	0	0	0	0		(102)
Gains	(solar g	gains cal	culated	for appli	cable we	eather re	egion, se	e Table	10)				-	
(103)m=	0	0	0	0	0	604.26	573.13	520.84	0	0	0	0		(103)
			ement fo. 104)m <			lwelling,	continue	ous (kW	h = 0.0	24 x [(10	03)m – (102)m] :	x (41)m	
(104)m=		0	0	0 7 (30	0	66.51	98.67	69.17	0	0	0	0		
(101)	ا ا	ŭ	ŭ	ŭ	ŭ	00.01	00.07	00.17		= Sum(=	234.36	(104)
Cooled	I fraction	1									area ÷ (4		1	(105)
			able 10b)								-,	·	 ` ′
(106)m=	0	0	0	0	0	0.25	0.25	0.25	0	0	0	0		
'									Total	= Sum(104)	=	0	(106)
Space	cooling	requirer	nent for	month =	(104)m	× (105)	× (106)r	n						_
(107)m=	0	0	0	0	0	16.63	24.67	17.29	0	0	0	0		
•									Total	= Sum(107)	=	58.59	(107)
Space	cooling	requirer	nent in k	:Wh/m²/y	/ear				(107)	÷ (4) =			1.1	(108)
8f. Fab	ric Ener	gy Effici	ency (ca	alculated	only un	der spec	cial cond	litions, se	ee sectio	on 11)				
Fabrio	Energy	/ Efficier	псу						(99) -	+ (108) =	=		58.26	(109)
Targe	et Fabrio	c Energ	y Efficie	ency (TF	EE)								67	(109)

		User F	Details:						
Assessor Name: Software Name:	Zahid Ashraf Stroma FSAP 2012		Strom Softwa	are Ve	rsion:			001082 on: 1.0.5.9	
Address :	F	Property	Address	: Plot 10					
Overall dwelling dime	ensions:								
		Are	a(m²)		Av. He	ight(m)		Volume(m ³	3)
Ground floor		Ę	53.15	(1a) x	2	2.5	(2a) =	132.86	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1	n) [53.15	(4)					
Dwelling volume				(3a)+(3b)+(3c)+(3c	d)+(3e)+	(3n) =	132.86	(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	0	x 1	10 =	0	(7a)
Number of passive vents	;			Ī	0	x 1	10 =	0	(7b)
Number of flueless gas fi	res			Ē	0	x 4	40 =	0	(7c)
				_					
				_			Air ch	anges per ho	our —
•	ys, flues and fans = $(6a)+(6b)+(6b)+(6b)$ een carried out or is intended, proceed			oontinuo fi	0		÷ (5) =	0	(8)
Number of storeys in the		eu 10 (17),	ourerwise (conunue 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	ry consti	ruction			0	(11)
if both types of wall are pudeducting areas of openia	resent, use the value corresponding t	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 autic mate		(8) + (10)					0	(16)
•	q50, expressed in cubic metro lity value, then $(18) = [(17) \div 20] + (18)$	•		•	etre or e	envelope	area	3	(17)
· ·	es if a pressurisation test has been do				is being u	sed		0.15	(10)
Number of sides sheltere	ed							2	(19)
Shelter factor			(20) = 1 -		19)] =			0.85	(20)
Infiltration rate incorporat	•		(21) = (18	s) x (20) =				0.13	(21)
Infiltration rate modified f	- 1 	1	1 .					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 /	3.8	3.7	4	4.3	4.5	4.7	1	
(22)m= 5.1 5	7.0 4.4 4.3 3.8] 3.6	3.1	<u> </u>	4.3	J 4.0	4.1		
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 infiltra	ation rat	e (allowi	ng for sh	nelter an	d wind s	peed) =	(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 effect		•	rate for t	he appli	cable ca	se			l				_
If mechanica			andia N. (O	10h) (00-	· \		\[\ \\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\) (00-)			0.5	(23a)
If exhaust air he) = (23a)			0.5	(23b)
If balanced with		•	•	J		`		,	21.)	001-) [4 (00)	79.05	(23c)
a) If balance	ı —			.		- ` ` 	, ``	í `	– `	- 	- `) ÷ 100] 1	(24a)
(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	ea mecha			without	neat red	overy (i	r ´`	$\int_{0}^{\infty} \int_{0}^{\infty} dt = (22)$	 	r ´	Ι ,	1	(24b)
(1)		0	0		<u> </u>		0		0	0	0		(240)
c) If whole he if (22b)m				•	•				5 × (23h))			
(24c)m = 0	0	0	0	0	0	0	0	0	0	0	0]	(24c)
d) If natural	L ventilatio	n or wh	ole hous	L se positiv	/e input	L ventilatio	n from l	l	<u> </u>	<u>!</u>	<u>!</u>	J	
if (22b)m				•	•				0.5]				
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24d)
Effective air	change	rate - er	ter (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)
3. Heat losses	s and he	at loss r	naramet	≏r·									
ELEMENT	Gros	·	Openin		Net Ar	ea	U-valı	ue	AXU		k-value	e A	X k
LLLIVILIAI	area	-	'n		A ,r		W/m2		(W/I	K)	kJ/m²-		
Doors					2	X	1.4	= [2.8				(26)
Windows					8.651	x1.	/[1/(1.4)+	0.04] =	11.47				(27)
Walls Type1	47.2	21	8.65	5	38.56	x	0.15	= [5.78				(29)
Walls Type2	10.5	51	2		8.51	X	0.14	=	1.2	₹ i			(29)
Roof Type1	44.3	36	0		44.36	3 x	0.15	<u> </u>	6.65				(30)
Roof Type2	8.78	B	0		8.78	x	0.24	<u> </u>	2.11	≓ i			(30)
Total area of e					110.8	6							(31)
* for windows and	roof wind	ows, use e	ffective wi	ndow U-va	alue calcul	 ated using	formula 1	/[(1/U-valu	ıe)+0.04] a	as given in	paragraph	h 3.2	
** include the area				ls and pan	titions								
Fabric heat los		•	U)				(26)(30)) + (32) =				30.02	(33)
Heat capacity	,	,						((28)	(30) + (32	2) + (32a).	(32e) =	1137.22	(34)
Thermal mass	parame	ter (TMF	P = Cm -	: TFA) ir	n kJ/m²K			Indica	tive Value	: Low		100	(35)
For design assess can be used instead				construct	ion are no	t known pr	ecisely the	e indicative	values of	TMP in Ta	able 1f		
Thermal bridge				usina An	pendix l	<						15.57	(36)
if details of therma					-	•						10.07	
Total fabric hea			, ,	,	,			(33) +	(36) =			45.59	(37)
Ventilation hea	at loss ca	alculated	monthl	У				(38)m	= 0.33 × ((25)m x (5))		_
la.a	Eab	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
Jan	Feb	IVIGI	7 (0)										
(38)m= 11.72	11.58	11.44	10.74	10.6	9.9	9.9	9.76	10.18	10.6	10.88	11.16		(38)
	11.58	11.44		— <u> </u>	9.9	9.9	Ť	10.18	10.6		11.16]	(38)
(38)m= 11.72	11.58	11.44		— <u> </u>	9.9 55.49	9.9 55.49	Ť	10.18	<u> </u>		11.16 56.75]	(38)

Heat Ic	oss parai	meter (H	HLP), W/	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m=	1.08	1.08	1.07	1.06	1.06	1.04	1.04	1.04	1.05	1.06	1.06	1.07		
										Average =	Sum(40) ₁	12 /12=	1.06	(40)
Numbe	er of day		, 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. Wa	iter heati	ing ener	gy requi	rement:								kWh/ye	ar:	
if TF	ed occu A > 13.9 A £ 13.9	N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (¯	TFA -13		78		(42)
Reduce	l average the annual e that 125 l	l average	hot water	usage by	5% if the a	lwelling is	designed t			se target o).57		(43)
!	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot wate	er usage in				,			,	1		1			
(44)m=	88.63	85.41	82.18	78.96	75.74	72.51	72.51	75.74	78.96	82.18	85.41	88.63		
` ′										I Total = Su	m(44) ₁₁₂ =	=	966.86	(44)
Energy o	content of I	hot water	used - cal	culated mo	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=	131.43	114.95	118.62	103.42	99.23	85.63	79.35	91.05	92.14	107.38	117.21	127.29		
				. ,						Total = Su	m(45) ₁₁₂ =	=	1267.7	(45)
It instant	taneous wa	ater heatıı	ng at point	of use (no) hot water	storage),	enter 0 ın	boxes (46)	to (61)			11		
(46)m=		17.24	17.79	15.51	14.88	12.84	11.9	13.66	13.82	16.11	17.58	19.09		(46)
	storage e volume		includin	na anv so	olar or W	/WHRS	storane	within sa	ame ves	ല		0		(47)
•	munity h	, ,					_		a	00.		<u> </u>		(47)
	vise if no	-			-			` '	ers) ente	er '0' in ((47)			
Water	storage	loss:		`					,	·	,			
a) If m	nanufactu	urer's de	eclared l	oss facto	or is kno	wn (kWh	n/day):					0		(48)
Tempe	erature fa	actor fro	m Table	2b								0		(49)
٠,	/ lost from		•					(48) x (49)) =		1	10		(50)
	nanufactu			-										(5.4)
	iter stora munity h	-			e Z (KVVI	n/litre/da	ıy)				0.	02		(51)
	e factor f	•		JII 4.5							1.	03		(52)
	erature fa			2b							-	.6		(53)
Energy	/ lost from	m water	storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =	1.	03		(54)
• • • • • • • • • • • • • • • • • • • •	(50) or (_	,								03		(55)
Water	storage	loss cal	culated f	or 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)
		dedicate	d solar sto	L rage, (57)ı	m = (56)m		<u>L</u> H11)] ÷ (5	0), else (5	<u>I</u> 7)m = (56)	m where (H11) is fro	m Appendi	хН	
							20.04	20.04	30.98	32.01	30.98	32.01		
(57)m=	32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.90	J 32.01	30.90	32.01		(57)
						30.98	32.01	32.01	30.98	32.01				, ,
Primar	y circuit	loss (an	nual) fro	m Table	3	<u> </u>	<u> </u>		Į	32.01		0		(57) (58)
Primar Primar		loss (an loss cal	nual) fro	m Table for each	e 3 month (59)m = ((58) ÷ 36	65 × (41)	ım					

Combi loss o	·alculated	for each	month ((61)m –	(60) ÷	365 🗸 (41	/m							
(61)m= 0	0	0	0	0	00) -	0))	0	0	0	0	1	(61)
				alculated	l for ea	ch month							J · (59)m + (61)m	` ,
(62)m= 186.7		173.9	156.91	154.51	139.12		146		145.63	162.66	170.71	182.56	1	(62)
Solar DHW inpu					<u> </u>		ļ		if no sola	r contribu	1		<u></u>	` ,
(add addition												-: ····································		
(63)m= 0	0	0	0	0	0	0	0	_	0	0	0	0	7	(63)
Output from	water hea	ter				-!	!						_	
(64)m= 186.7		173.9	156.91	154.51	139.12	134.62	146	.33	145.63	162.66	170.71	182.56	1	
						Į.		Outp	out from w	ater heate	er (annual)	112	1918.54	(64)
Heat gains fr	om water	heating,	kWh/m	onth 0.2	5 ′ [0.8	5 × (45)m	า + (6	31)m	n] + 0.8 x	k [(46)m	+ (57)m	+ (59)m	 n]	_
(65)m= 87.92	78.16	83.66	77.18	77.22	71.27	70.6	74	.5	73.43	79.93	81.77	86.54	1	(65)
include (57	7)m in cald	culation	of (65)m	only if c	ylinder	is in the	dwell	ling	or hot w	ater is f	rom com	munity h	neating	
5. Internal	gains (see	Table 5	and 5a):										
Metabolic ga	ins (Table	5), Wat	ts										_	
Jan	Feb	Mar	Apr	May	Jun	Jul	А	ug	Sep	Oct	Nov	Dec]	
(66)m= 106.9	7 106.97	106.97	106.97	106.97	106.97	106.97	106	.97	106.97	106.97	106.97	106.97]	(66)
Lighting gain	s (calcula	ted in Ap	pendix	L, equat	ion L9	or L9a), a	ılso s	ee -	Table 5					
(67)m= 36.01	31.99	26.01	19.69	14.72	12.43	13.43	17.	46	23.43	29.75	34.72	37.01]	(67)
Appliances g	ains (calc	ulated ir	Append	dix L, eq	uation	L13 or L1	3a),	also	see Ta	ble 5			_	
(68)m= 231.9	3 234.34	228.28	215.36	199.07	183.75	173.51	171	.11	177.17	190.08	206.38	221.7]	(68)
Cooking gair	ns (calcula	ited in A	ppendix	L, equat	ion L1	5 or L15a), als	o se	ee Table	5				
(69)m= 47.48	47.48	47.48	47.48	47.48	47.48	47.48	47.	48	47.48	47.48	47.48	47.48		(69)
Pumps and f	ans gains	(Table 5	5a)											
(70)m= 0	0	0	0	0	0	0	0)	0	0	0	0]	(70)
Losses e.g.	evaporatio	n (nega	tive valu	es) (Tab	le 5)								_	
(71)m= -71.3°	1 -71.31	-71.31	-71.31	-71.31	-71.31	-71.31	-71.	.31	-71.31	-71.31	-71.31	-71.31]	(71)
Water heatin	g gains (T	able 5)											_	
(72)m= 118.1	8 116.32	112.45	107.2	103.78	98.98	94.9	100	.13	101.99	107.43	113.57	116.32]	(72)
Total interna	al gains =				(6	6)m + (67)n	n + (68	3)m +	+ (69)m +	(70)m + (7	71)m + (72))m	_	
(73)m= 469.2	6 465.78	449.88	425.39	400.71	378.29	364.98	371	.83	385.73	410.4	437.81	458.17		(73)
6. Solar gai														
Solar gains are		•				•	ations	to co		ne applica		tion.		
Orientation:	Access F Table 6d	actor	Area m²			lux able 6a		Т	g_ able 6b	Т	FF able 6c		Gains (W)	
Northeast 0.9				·-	_		1					_	. ,	7(75)
Northeast 0.9		×	8.6		×	11.28] x] ,	L	0.63	×	0.7	=	29.83	(75)
Northeast 0.9		×	8.6		×	22.97	」× 1、		0.63	×	0.7	╡ -	60.72](75)](75)
Northeast 0.9		×	8.6		×	41.38	」× 1、	<u></u>	0.63		0.7	┥ -	109.4	-
Northeast 0.9		×	8.6		×	67.96] x] ,	L	0.63	×	0.7	=	179.67](75)] ₍₇₅₎
(4011116a5t (1.9)	0.77	X	8.6	5	X	91.35	X		0.63	X	0.7	=	241.51	(75)

Northeast _{0.9x}	0.77	x	8.6	55	x	97.38		x	0.63	x	0.7		257.47	(75)
Northeast _{0.9x}	0.77	x	8.6	55	x	91.1		x	0.63	x	0.7	=	240.86	(75)
Northeast _{0.9x}	0.77	X	8.6	55	x	72.63		x	0.63	x	0.7	=	192.02	(75)
Northeast _{0.9x}	Northeast 0, 0x		(75)											
Northeast _{0.9x}	0.77	x	8.6	55	x	28.07		x	0.63	x	0.7		74.21	(75)
Northeast _{0.9x}	0.77	x	8.6	55	x [14.2	一	x Γ	0.63	x	0.7	= =	37.53	(75)
Northeast _{0.9x}	0.77	x	8.6	55	x	9.21	一	x	0.63		0.7	= =	24.36	(75)
Solar gains in	watts, ca	alculated	for eacl	n month			(8	83)m =	: Sum(74)m .	(82)m				
(83)m= 29.83	60.72	109.4	179.67	241.51	257	7.47 240	0.86	192.0	2 133.31	74.21	37.53	24.36		(83)
Total gains – i	nternal a	and solar	(84)m =	(73)m	+ (83	3)m , wat	tts						•	
(84)m= 499.09	526.5	559.28	605.06	642.21	635	5.76 605	5.84	563.8	4 519.03	484.6	475.34	482.53		(84)
7. Mean inter	rnal tem	perature	(heating	season)	-								
						rea from	Table	e 9. ⁻	Γh1 (°C)				21	(85)
•	•	• •			_			,	,					`
					Ė.			Aud	Sep	Oct	Nov	Dec		
	 	_	·		0.		-			-	+	0.92		(86)
Moon interne	l tompor	oturo in	living or	DO T1 /f/	سامال	u stope 2	+o 7 i	in To	blo Oo)	<u> </u>		ļ		
				<u> </u>		i				20.31	19 73	19 23		(87)
` ′	ļ					!			!	20.01	10.70	10.20		(-)
· -	T					<u> </u>				T 00 04	T 00 00		1	(00)
(88)m= 20.02	20.02	20.02	20.03	20.04	20	.05 20.	.05	20.05	20.04	20.04	20.03	20.03		(00)
	ctor for g	ains for i	rest of d	welling,	h2,n	n (see Ta	able 9	9a)		,			•	
(89)m= 0.9	0.88	0.84	0.75	0.61	0.	44 0.3	31	0.34	0.56	0.77	0.87	0.91		(89)
Mean_interna	al temper	ature in	the rest	of dwelli	ng T	Γ2 (follow	v step	s 3 t	o 7 in Tabl	le 9c)			_	
(90)m= 17.74	17.99	18.49	19.14	19.65	19	.94 20.	.02	20.01	19.83	19.23	18.41	17.69		(90)
									t	fLA = Livi	ng area ÷ (4	4) =	0.47	(91)
Mean interna	al temper	ature (fo	r the wh	ole dwe	lling) = fLA ×	: T1 +	- (1 –	fLA) × T2					
		· `						•		19.74	19.04	18.42		(92)
Apply adjustr	ment to t	he mean	internal	temper	atur	e from Ta	able 4	4e, w	here appro	opriate				
(93)m= 18.46	18.68	19.11	19.67	20.12	20	.38 20.	.46	20.45	5 20.28	19.74	19.04	18.42		(93)
8. Space hea	ating requ	uirement												
					ned a	at step 11	1 of T	Table	9b, so tha	nt Ti,m=	(76)m an	d re-calc	culate	
	1				.		. 1		 		1		l	
	!			May	J	un Ju	ul	Au	g Sep	Oct	Nov	Dec		
	,	1		0.61	<u> </u>	46 0 3	24	0.38	0.57	0.75	0.85	0.00		(94)
	<u> </u>				0.	40 0.0	54	0.30	0.57	0.73	0.83	0.88		(04)
	1	<u>`</u>	<u> </u>		295	5 12 206	3.53	213.5	8 297.04	365.6	401.67	426 84		(95)
										000.0	1			, ,
	, 	1			_	1	6.6	16.4	14.1	10.6	7.1	4.2		(96)
	e for me		al tempe)m x			<u> </u>	1	I	1	•
					_	- `_		- ,	<u> </u>	ř –	674.21	807.11		(97)
Space heating	ng require	ement fo	r each n	nonth, k	Wh/r	month = (0.024	4 x [(9	97)m – (95	5)m] x (4	l1)m	•	1	
· -	ř								i `	í - `	 	282.92		
	•	•				-			-	•	•		•	

Tot	ral per year (kWh/year) = Sum(98) _{15,912} =	1464.8	(98)
Space heating requirement in kWh/m²/year		27.56	(99)
9b. Energy requirements – Community heating scheme			
This part is used for space heating, space cooling or water heating pro Fraction of space heat from secondary/supplementary heating (Table 1		0	(301)
Fraction of space heat from community system 1 – (301) =	[1	(302)
The community scheme may obtain heat from several sources. The procedure allows for		ne latter	_
includes boilers, heat pumps, geothermal and waste heat from power stations. See Appel Fraction of heat from Community boilers	endix C.	1	(303a)
Fraction of total space heat from Community boilers	(302) x (303a) =	1	(304a)
Factor for control and charging method (Table 4c(3)) for community he	ating system	1	(305)
Distribution loss factor (Table 12c) for community heating system		1.05	(306)
Space heating		kWh/year	
Annual space heating requirement		1464.8	
Space heat from Community boilers	(98) x (304a) x (305) x (306) =	1538.04	(307a
Efficiency of secondary/supplementary heating system in % (from Table	e 4a or Appendix E)	0	(308)
Space heating requirement from secondary/supplementary system	(98) x (301) x 100 ÷ (308) =	0	(309)
Water heating Annual water heating requirement	[1918.54	7
If DHW from community scheme: Water heat from Community boilers	(64) x (303a) x (305) x (306) =	2014.47	(310a
Electricity used for heat distribution 0.0	1 × [(307a)(307e) + (310a)(310e)] =	35.53	(313)
Cooling System Energy Efficiency Ratio		0	(314)
Space cooling (if there is a fixed cooling system, if not enter 0)	= (107) ÷ (314) =	0	(315)
Electricity for pumps and fans within dwelling (Table 4f): mechanical ventilation - balanced, extract or positive input from outside	· [184.38	(330a)
warm air heating system fans		0	(330b
pump for solar water heating		0	(330g
Total electricity for the above, kWh/year	=(330a) + (330b) + (330g) =	184.38	(331)
Energy for lighting (calculated in Appendix L)		254.39	(332)
Electricity generated by PVs (Appendix M) (negative quantity)		-535.18	(333)
Electricity generated by wind turbine (Appendix M) (negative quantity)		0	(334)
10b. Fuel costs – Community heating scheme			
Fuel kWh/year	Fuel Price	Fuel Cost	
•	(Table 12)	£/year	
Space heating from CHP (307a) x	(Table 12) 4.24 × 0.01 = [65.21	(340a)

		Fu	uel Price		
Pumps and fans	(331)		13.19 × 0.01 =	24.32	(349)
Energy for lighting	(332)		13.19 × 0.01 =	33.55	(350)
Additional standing charges (Table 12)				120	(351)
Energy saving/generation technologies					
Total energy cost	= (340a)(342e) + (345)(3	354) =		328.5	(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] =	=		1.41	(357)
SAP rating (section12)				80.39	(358)
12b. CO2 Emissions - Community heat	ting scheme	_			
		Energy kWh/year	Emission factor kg CO2/kWh	kg CO2/year	
CO2 from other sources of space and v Efficiency of heat source 1 (%)		two fuels repeat (363)	to (366) for the second fu	ıel 94	(367a)
CO2 associated with heat source 1	[(307b)+([310b)] x 100 ÷ (367b) x	0.22	= 816.32	(367)
Electrical energy for heat distribution]	(313) x	0.52	= 18.44	(372)
Total CO2 associated with community s	systems ((363)(366) + (368)(3	372)	= 834.76	(373)
CO2 associated with space heating (se	condary) ((309) x	0	= 0	(374)
CO2 associated with water from immers	sion heater or instantane	ous heater (312) x	0.22	= 0	(375)
Total CO2 associated with space and w	vater heating ((373) + (374) + (375) =		834.76	(376)
CO2 associated with electricity for pum	ps and fans within dwellir	ng (331)) x	0.52	95.69	(378)
CO2 associated with electricity for lighti	ng ((332))) x	0.52	= 132.03	(379)
Energy saving/generation technologies Item 1	(333) to (334) as applica	able	0.52 x 0.01 =	-277.76	(380)
Total CO2, kg/year	sum of (376)(382) =			784.73	(383)
Dwelling CO2 Emission Rate	(383) ÷ (4) =			14.77	(384)
El rating (section 14)				89.29	(385)
13b. Primary Energy – Community heat	ting scheme	-	Director	D. F	
		Energy kWh/year	Primary factor	P.Energy kWh/year	
Energy from other sources of space and Efficiency of heat source 1 (%)	d water heating (not CHF If there is CHP using	P) g two fuels repeat (363)	to (366) for the second fu	uel 94	(367a)
Energy associated with heat source 1	[(307b)+([310b)] x 100 ÷ (367b) x	1.22	= 4610.71	(367)
Electrical energy for heat distribution]	(313) x		= 109.06	(372)
Total Energy associated with communit	y systems ((363)(366) + (368)(3	372)	= 4719.77	(373)
if it is negative set (373) to zero (unle	ss specified otherwise, s	ee C7 in Appendix	C)	4719.77	(373)
Energy associated with space heating (secondary) ((309) x	0	= 0	(374)

Total Primary Energy, kWh/year sum of (3	76)(382) =			4423.82	(383)
Energy saving/generation technologies Item 1		3.07 × 0.0	1 =	-1642.99	(380)
Energy associated with electricity for lighting	(332))) x	3.07	=	780.98	(379)
Energy associated with electricity for pumps and fans within	dwelling (331))	x 3.07	=	566.06	(378)
Energy associated with space cooling	(315) x	3.07	=	0	(377)
Total Energy associated with space and water heating	(373) + (374) + (375) =			4719.77	(376)
Energy associated with water from immersion heater or insta	antaneous heater(312)	1.22	=	0	(375)

		He	eer Details:						
Stroma Number: Stroma FSAP 2012 Stroma Number: STRO001082									
)							
Contware Hame.	Ottoma 1 O/ (1 2012						V 01010	710.0.0	
Address :		·	-						
1. Overall dwelling dime	ensions:								
Ground floor		Г		(40) v] ₍₂₀₎ _		<u>-</u>
	a) . (4 b) . (4 a) . (4 d) . (4 a)					2.5	(2a) =	132.86	(Sa)
	a)+(1b)+(1c)+(1d)+(1e)	+(1n) L	53.15		\	n (O)	(0.)		_
Dwelling volume				(3a)+(3b)+(3c)+(3c	1)+(3e)+	.(3n) =	132.86	(5)
2. Ventilation rate:	main se	condary	other		total			m³ ner hou	r
Number of allignments	heating he	eating		- -			40 - 1		_
·									=
·		0	0	」	0			0	Ⅎ``
					2			20	(7a)
Number of passive vents	;			L	0	X '	10 =	0	(7b)
Number of flueless gas fi	ires				0	X 4	40 =	0	(7c)
							Air ch	nanges per ho	our
Infiltration due to chimne	vs_flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =	Г	20		ı		_
	•			continue fr			. (0) –	0.13	
	he dwelling (ns)							0	(9)
						[(9)	-1]x0.1 =	0	(10)
				•	uction			0	(11)
		onaing to the	greater wall are	a (arter					
If suspended wooden	floor, enter 0.2 (unseale	ed) or 0.1 (s	sealed), else	enter 0				0	(12)
If no draught lobby, en	ter 0.05, else enter 0							0	(13)
· ·	s and doors draught str	ipped						0	(14)
					_			0	(15)
			. , , , ,	, , ,	, , ,	, ,		0	(16)
•	•	•	•	•	etre of e	envelope	area	5	=
	•				io hoina u	and		0.4	(18)
		been done or	a degree air pe	ппеаышу	is being u	seu		2	(19)
	,		(20) = 1 -	[0.075 x (1	19)] =				⊣
Infiltration rate incorporate	ting shelter factor		(21) = (18) x (20) =				0.34	=
Infiltration rate modified f	or monthly wind speed								_
Jan Feb	Mar Apr May	Jun J	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	3.8 3.7	4	4.3	4.5	4.7		
Wind Easter (22a)m = (2	2)m · 4								
	2)m ÷ 4 1.23	0.95 0.	.95 0.92	1	1.08	1.12	1.18		
(0.00	0.02	<u> </u>		L <u>-</u>		I	

0.43	Adjusted infiltration ra	te (allowi	na for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m						
If mechanical ventilation: If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a) If balanced mith heat recovery: efficiency in % allowing for in-use factor (from Table 4h) = 0 (24a)m = 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	· —	`				` 	`	,	0.37	0.38	0.4]		
If exhaust air heat pump using Appendix N, (23b) = (23a) × Fmv (equation (N5)) , otherwise (23b) = (23a) \ 0 (22		•	rate for t	he appli	cable ca	se	Į.		<u> </u>	!				_
If balanced with heat recovery; efficiency in % allowing for in-use factor (from Table 4h) =			on alice NL (O	ah) (00-	·	(N	IC\\		\ (00-\			C		(23a)
a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) x [1 - (23c) ÷ 100] (24a)m = 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0) = (23a)					(23b)
(24a)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		-		_					SI.) (001) [4 (00.)		1	(23c)
b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b) (24b)m = 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	· -	1			·	- ` ` 	- 	<u> </u>	 	- 	- ` ` `) ÷ 100]]		(24a)
c) If whole house extract ventilation or positive input ventilation from outside if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b) (24c)m = 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	` '										1 0			(244)
c) If whole house extract ventilation or positive input ventilation from outside if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b) (24c)m = 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 (2 d) If natural ventilation or whole house positive input ventilation from loft if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² × 0.5] (24d)m = 0.59 0.59 0.59 0.57 0.57 0.55 0.55 0.55 0.56 0.57 0.57 0.58 (22b)m = 0.59 0.59 0.59 0.57 0.57 0.55 0.55 0.55 0.56 0.57 0.57 0.58 (22b)m = 0.59 0.59 0.59 0.57 0.57 0.55 0.55 0.55 0.55 0.56 0.57 0.57 0.58 (22b)m = 0.59 0.59 0.59 0.59 0.57 0.57 0.55 0.55 0.55 0.55 0.56 0.57 0.57 0.58 (22b)m = 0.59 0.59 0.59 0.59 0.57 0.57 0.55 0.55 0.55 0.56 0.57 0.57 0.58 (22b)m = 0.59 0.59 0.59 0.59 0.57 0.57 0.55 0.55 0.55 0.56 0.57 0.57 0.58 (22b)m = 0.59 0.59 0.59 0.59 0.57 0.57 0.55 0.55 0.55 0.56 0.57 0.57 0.58 (22b)m = 0.59 0.59 0.59 0.59 0.57 0.57 0.55 0.55 0.55 0.55 0.56 0.57 0.57 0.58 (22b)m = 0.59 0.59 0.59 0.59 0.59 0.57 0.57 0.55 0.55 0.55 0.56 0.57 0.57 0.58 (22b)m = 0.59 0.59 0.59 0.59 0.59 0.57 0.57 0.55 0.55 0.55 0.56 0.57 0.57 0.58 (22b)m = 0.59 0.59 0.59 0.59 0.59 0.57 0.57 0.55 0.55 0.55 0.56 0.57 0.57 0.58 (22b)m = 0.59 0.59 0.59 0.59 0.59 0.57 0.57 0.55 0.55 0.55 0.55 0.56 0.57 0.57 0.58 (22b)m = 0.59 0.59 0.59 0.59 0.59 0.57 0.57 0.55 0.55 0.55 0.55 0.56 0.57 0.57 0.58 (22b)m = 0.59 0.59 0.59 0.59 0.59 0.57 0.57 0.55 0.55 0.55 0.55 0.55 0.56 0.57 0.57 0.58 (22b)m = 0.59 0.59 0.59 0.59 0.59 0.57 0.57 0.58 (22b)m = 0.59 0.59 0.59 0.59 0.59 0.59 0.57 0.57 0.58 (22b)m = 0.59 0.59 0.59 0.59 0.59 0.59 0.57 0.57 0.55 0.55 0.55 0.55 0.55 0.56 0.57 0.57 0.58 (22b)m = 0.59 0.59 0.59 0.59 0.59 0.59 0.59 0.59	· -	1			i		- ^ `	<u> </u>	- ` `		T 0	1		(24b)
if (22b)m < 0.5 x (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 x (23b) (24c)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0					ļ	<u> </u>	<u> </u>					J		(- /
(24c)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	,			•					5 × (23b	o)				
if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5] (24d)m = 0.59	<u> </u>	<u> </u>		<u> </u>		· ` `	ŕ		· ` `	ŕ	0]		(24c)
(24d)m= 0.59	d) If natural ventilati	on or wh	ole hous	e positiv	e input	ventilatio	on from I	oft				J		
Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25) (25)m= 0.59 0.59 0.59 0.57 0.57 0.55 0.55 0.55 0.56 0.57 0.57 0.58 (2 3. Heat losses and heat loss parameter: ELEMENT Gross area (m²) m² Net Area A, m² W/m²2K (W/K) kJ/m²-K kJ/K Doors 2 2 x 1 = 2 (2 Windows 8.651 x1/[1/(1.4)+0.04] = 11.47 (2 Walls Type1 47.21 8.65 38.56 x 0.18 = 6.94 (2) Walls Type2 10.51 2 8.51 x 0.18 = 1.53 (2) Roof Type1 44.36 0 44.36 x 0.13 = 5.77 (3) Roof Type2 8.78 0 8.78 x 0.13 = 1.14 (3) Total area of elements, m² (10.86 x 0.13) = 1.14 (3) *for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2 **include the areas on both sides of internal walls and partitions Fabric heat loss, W/K = S (A x U) (26)(30) + (32) = 28.85 (3) Heat capacity Cm = S(A x k) ((28)(30) + (32) + (32a)(32e) = 1137.22 (3)	if (22b)m = 1, th	en (24d)	m = (221)	o)m othe	rwise (2	4d)m =	0.5 + [(2	2b)m² x	0.5]	,		7		
(25)m= 0.59 0.59 0.59 0.57 0.57 0.55 0.55 0.56 0.57 0.57 0.58 (2 3. Heat losses and heat loss parameter: ELEMENT Gross area (m²) Openings Met Area W/m2K A X U (W/K) kJ/m²-K kJ/K Doors 2	(24d)m= 0.59 0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.57	0.58			(24d)
3. Heat losses and heat loss parameter: ELEMENT Gross area (m²) Openings m² Net Area A , m² W/m2K (W/K) kJ/m²-K kJ/K Doors 2 x 1 = 2 (2 Windows 8.651 x1/[1/(1.4)+0.04] = 11.47 (2 Walls Type1 47.21 8.65 38.56 x 0.18 = 6.94 (2) Walls Type2 10.51 2 8.51 x 0.18 = 1.53 (2) Roof Type1 44.36 0 44.36 x 0.13 = 5.77 (3) Roof Type2 8.78 0 8.78 x 0.13 = 1.14 (3) Total area of elements, m² 110.86 (3) * for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2 ** include the areas on both sides of internal walls and partitions Fabric heat loss, W/K = S (A x U) (26)(30) + (32) + (32a)(32e) = 1137.22 (3)		1	<u> </u>	<u> </u>		ŕ		<u> </u>	·			1		
ELEMENT Gross area (m²) Openings m² Net Area A , m² U-value W/m2K A X U (W/K) k-value kJ/m²-K A X k kJ/k Doors 2	(25)m= 0.59 0.59	0.59	0.57	0.57	0.55	0.55	0.55	0.56	0.57	0.57	0.58			(25)
area (m²) m² A ,m² W/m2K (W/K) kJ/m²-K kJ/K Doors 2 x 1 = 2 (2 Windows 8.651 x1/[1/(1.4)+0.04] = 11.47 (2 Walls Type1 47.21 8.65 38.56 x 0.18 = 6.94 (2) Walls Type2 10.51 2 8.51 x 0.18 = 1.53 (2) Roof Type1 44.36 0 44.36 x 0.13 = 5.77 (3) Roof Type2 8.78 0 8.78 x 0.13 = 1.14 (3) Total area of elements, m² (3) * for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2 ** include the areas on both sides of internal walls and partitions Fabric heat loss, W/K = S (A x U) (26)(30) + (32) = (28.85) (3) Heat capacity Cm = S(A x k)	3. Heat losses and h	eat loss p	paramete	er:										
Doors $ \begin{array}{c ccccccccccccccccccccccccccccccccccc$										1.6				
Windows $8.651 \times 1/[1/(1.4) + 0.04] = 11.47$ (2 Walls Type1 47.21 8.65 $38.56 \times 0.18 = 6.94$ (2 Walls Type2 10.51 2 $8.51 \times 0.18 = 1.53$ (2 Roof Type1 44.36 0 $44.36 \times 0.13 = 1.57$ (3 Roof Type2 8.78 0 $8.78 \times 0.13 = 1.14$ (3) Total area of elements, m ² 110.86 (3 * for windows and roof windows, use effective window U-value calculated using formula $1/[(1/U-value) + 0.04]$ as given in paragraph 3.2 ** include the areas on both sides of internal walls and partitions Fabric heat loss, W/K = S (A x U) (28)(30) + (32) = 28.85 (3) Heat capacity Cm = S(A x k) ((28)(30) + (32) + (32a)(32e) = 1137.22 (3)		(m²)	m	l ²		_			`	K)	kJ/m²-	K	KJ/ł	
Walls Type 1 47.21 8.65 38.56 × 0.18 = 6.94 (2) Walls Type 2 10.51 2 8.51 × 0.18 = 1.53 (2) Roof Type 1 44.36 0 44.36 × 0.13 = 5.77 (3) Roof Type 2 8.78 0 8.78 × 0.13 = 1.14 (3) Total area of elements, m ² 110.86 (3) * for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2 ** include the areas on both sides of internal walls and partitions Fabric heat loss, W/K = S (A x U) (26)(30) + (32) = 28.85 (3) Heat capacity Cm = S(A x k) ((28)(30) + (32) + (32a)(32e) = 1137.22 (3)						= .				=				(26)
Walls Type2 10.51 2 8.51 × 0.18 = 1.53 (2 Roof Type1 44.36 0 44.36 × 0.13 = 5.77 (3 Roof Type2 8.78 0 8.78 × 0.13 = 1.14 (3 Total area of elements, m² 110.86 (3) * for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2 ** include the areas on both sides of internal walls and partitions Fabric heat loss, W/K = S (A x U) (28)(30) + (32) = 28.85 (3) Heat capacity Cm = S(A x K) ((28)(30) + (32) + (32a)(32e) = 1137.22 (3)					8.651	x1,		0.04] = [11.47	ᆜ ,				(27) ¬
Roof Type1 44.36 0 44.36 \times 0.13 = 5.77		21	8.65		38.56	x	0.18	=	6.94	<u> </u>		╛╘		(29)
Roof Type2 8.78 0 8.78 \times 0.13 = 1.14 (3) Total area of elements, m ² 110.86 (3) * for windows and roof windows, use effective window U-value calculated using formula $1/[(1/U-value)+0.04]$ as given in paragraph 3.2 *** include the areas on both sides of internal walls and partitions Fabric heat loss, W/K = S (A x U) (26)(30) + (32) = 28.85 (3) Heat capacity Cm = S(A x k) ((28)(30) + (32) + (32a)(32e) = 1137.22 (3)		51	2		8.51	х	0.18	= [1.53	<u> </u>		╛╘		(29)
Total area of elements, m ² * for windows and roof windows, use effective window U-value calculated using formula $1/[(1/U-value)+0.04]$ as given in paragraph 3.2 ** include the areas on both sides of internal walls and partitions Fabric heat loss, W/K = S (A x U) Heat capacity Cm = S(A x k) (26)(30) + (32) = (28.85) (3) (28)(30) + (32) + (32a)(32e) = (3)		36	0		44.36	x	0.13	= [5.77	<u> </u>		╛╘		(30)
* for windows and roof windows, use effective window U-value calculated using formula $1/[(1/U-value)+0.04]$ as given in paragraph 3.2 ** include the areas on both sides of internal walls and partitions Fabric heat loss, W/K = S (A x U) (26)(30) + (32) = (28.85) (3) Heat capacity Cm = S(A x k) ((28)(30) + (32) + (32a)(32e) = (1137.22) (3)			0		8.78	Х	0.13	=	1.14					(30)
** include the areas on both sides of internal walls and partitions Fabric heat loss, W/K = S (A x U) Heat capacity Cm = S(A x k) (26)(30) + (32) = ((28)(30) + (32) + (32a)(32e) = (137.22) (38.85)														(31)
Fabric heat loss, W/K = S (A x U) $ (26)(30) + (32) = $						ated using	formula 1	/[(1/U-valu	ie)+0.04] a	as given in	paragrapl	1 3.2		
Heat capacity Cm = $S(A \times k)$ ((28)(30) + (32) + (32a)(32e) = 1137.22 (3				o ana pan	1110110		(26)(30)	+ (32) =				28	 85	(33)
		,	- /					((28)	.(30) + (32	2) + (32a).	(32e) =			(34)
Thermal mass parameter (TMP = Cm \div TFA) in kJ/m ² K Indicative Value: Medium 250 (3	. ,	` ,	P = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	: Medium				(35)
For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f	For design assessments wi	nere the de	tails of the	construct	ion are no	t known pr	ecisely the	indicative	values of	TMP in T	able 1f			」 ` ′
can be used instead of a detailed calculation.						_								_
		•			•	<						15.	67	(36)
if details of thermal bridging are not known (36) = $0.05 \times (31)$ Total fabric heat loss $(33) + (36) = 44.52$ (3		are not kn	own (36) =	= 0.05 x (3	1)			(33) +	(36) =			11		(37)
Ventilation heat loss calculated monthly $ (33) + (36) = 44.52 $ (38) We also calculated monthly $ (38)m = 0.33 \times (25)m \times (5) $		alculated	l monthly	/					. ,	25)m x (5))	44.	<i>J</i> ∠	J ⁽³⁷⁾
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec		1			Jun	Jul	Aua				<u> </u>]		
							—	·		-	†	1		(38)
Heat transfer coefficient, W/K (39)m = (37) + (38)m	` '	I				Į	Į		<u> </u>	<u> </u>		J		
(39)m= 70.57 70.41 70.26 69.52 69.38 68.74 68.74 68.62 68.98 69.38 69.66 69.95		· ·	69.52	69.38	68.74	68.74	68.62				69.95]		
	, , , , , , , , , , , , , , , , , , , ,									<u> </u>	<u> </u>	69.	 52	(39)

Heat loss para	meter (l	HLP). W/	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 1.33	1.32	1.32	1.31	1.31	1.29	1.29	1.29	1.3	1.31	1.31	1.32		
()						<u> </u>	<u> </u>			Sum(40) ₁ .		1.31	(40)
Number of day	s in mo	nth (Tab	le 1a)						3	(-,			`
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)
LI				!	!	!	Į.						
4. Water heat	ina ene	rav regui	rement								kWh/ye	ar.	
4. Water neat	ing ene	igy requi	rement.								KVVII/ y C	<i>τ</i> αι.	
Assumed occu if TFA > 13.9 if TFA £ 13.9	0, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (⁻	TFA -13		78		(42)
Annual average	l average	hot water	usage by	5% if the c	lwelling is	designed t			se target o		.54		(43)
not more that 125	litres per	person per	aay (all w	ater use, i	not and co	ia) •							
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage ir	n litres per	r day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)						
(44)m= 84.2	81.14	78.07	75.01	71.95	68.89	68.89	71.95	75.01	78.07	81.14	84.2		
Energy content of	hot water	used - cal	culated m	onthly $= 4$.	190 x Vd,r	m x nm x C	OTm / 3600			m(44) ₁₁₂ = ables 1b, 1		918.52	(44)
(45)m= 124.86	109.21	112.69	98.25	94.27	81.35	75.38	86.5	87.53	102.01	111.35	120.92		
				ı	ı				Total = Su	m(45) ₁₁₂ =	=	1204.32	(45)
If instantaneous w	ater heati	ng at point	of use (no	o hot water	r storage),	enter 0 in	boxes (46) to (61)			•		
(46)m= 18.73	16.38	16.9	14.74	14.14	12.2	11.31	12.97	13.13	15.3	16.7	18.14		(46)
Water storage						-		-					
Storage volume	` ′		•			Ū		ame ves	sel		150		(47)
If community h	•			•			` '		(01 ! /	(4 .7)			
Otherwise if no Water storage		not wate	er (this ir	iciuaes i	nstantar	ieous co	mbi boli	ers) ente	er o in ((47)			
a) If manufacti		eclared l	oss facto	or is kno	wn (kWł	n/day).				1	39		(48)
Temperature fa				51 10 Ki10	**** (1444)	"day).							(49)
Energy lost from				aar			(48) x (49)	١ _			54		, ,
b) If manufacti		_	-		or is not		(40) X (49)) =		0.	75		(50)
Hot water stora			-								0		(51)
If community h	eating s	ee section	on 4.3										
Volume factor											0		(52)
Temperature fa	actor fro	m Table	2b								0		(53)
Energy lost fro	m watei	storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54)
Enter (50) or (54) in (5	55)								0.	75		(55)
Water storage	loss cal	culated f	or each	month			((56)m = ((55) × (41)	m				
(56)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		(56)
If cylinder contains	dedicate	d solar sto	rage, (57)	m = (56)m	x [(50) – (H11)] ÷ (5	0), else (5	7)m = (56)	m where (H11) is fro	m Append	ix H	
(57)m= 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	loss (ar	nual) fro	m Table	e 3							0		(58)
Primary circuit (modified by					•	. ,	, ,		r thermo	netat)			
(59)m= 23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	22.26		(59)
(33)111= 23.20	∠1.U1	23.20	ا ن.22	23.20	22.31	23.20	23.20	22.31	23.20	22.31	23.26		(55)

Combi loss	aclaulatad	for oach	month ((61)m -	(60) · 2(SE (41	١m						
(61)m= 0	0 0	0	0	0	00) + 30	05 x (41)	0	0	0	0	0		(61)
	_!	ļ					<u> </u>	<u>!</u>		ļ		(59)m + (61)m	, ,
(62)m= 171.4	-i	159.28	143.34	140.86	126.44	121.98	133.09	132.62	148.61	156.45	167.52		(62)
Solar DHW inpo												I	, ,
(add addition													
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0		(63)
Output from	water hea	ter				ļ.	Į.			•	l	l	
(64)m= 171.4		159.28	143.34	140.86	126.44	121.98	133.09	132.62	148.61	156.45	167.52		
	Į						Out	put from w	ater heate	r (annual)₁	12	1752.94	(64)
Heat gains f	rom water	heating,	kWh/m	onth 0.2	5 ´ [0.85	× (45)m	+ (61)r	n] + 0.8 x	k [(46)m	+ (57)m	+ (59)m]	-
(65)m= 78.79	1	74.75	68.74	68.62	63.12	62.34	66.04	65.18	71.19	73.1	77.48		(65)
include (5	7)m in cal	culation of	of (65)m	only if c	ylinder i	s in the	dwelling	or hot w	ater is f	rom com	munity h	neating	
5. Internal	gains (see	e Table 5	and 5a):	-								
Metabolic ga	ains (Table	e 5), Wat	ts										
Jar		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 89.14	4 89.14	89.14	89.14	89.14	89.14	89.14	89.14	89.14	89.14	89.14	89.14		(66)
Lighting gair	ns (calcula	ted in Ap	pendix	L, equati	ion L9 o	r L9a), a	lso see	Table 5		-		•	
(67)m= 14.4	12.79	10.4	7.88	5.89	4.97	5.37	6.98	9.37	11.9	13.89	14.81		(67)
Appliances (gains (calc	ulated in	Append	dix L, eq	uation L	13 or L1	3a), als	see Ta	ble 5		•	•	
(68)m= 155.4	157.01	152.94	144.29	133.37	123.11	116.25	114.64	118.71	127.36	138.28	148.54		(68)
Cooking gair	ns (calcula	ated in A	pendix	L, equat	ion L15	or L15a), also s	ee Table	5	•	•	•	
(69)m= 31.9°	1 31.91	31.91	31.91	31.91	31.91	31.91	31.91	31.91	31.91	31.91	31.91		(69)
Pumps and	fans gains	(Table 5	āa)							•		•	
(70)m= 3	3	3	3	3	3	3	3	3	3	3	3		(70)
Losses e.g.	evaporatio	n (nega	ive valu	es) (Tab	le 5)		•		•	•	•	•	
(71)m= -71.3	1 -71.31	-71.31	-71.31	-71.31	-71.31	-71.31	-71.31	-71.31	-71.31	-71.31	-71.31		(71)
Water heatir	ng gains (1	rable 5)				•			•		•	•	
(72)m= 105.9	9 104.14	100.46	95.47	92.23	87.67	83.79	88.76	90.53	95.69	101.53	104.14		(72)
Total intern	al gains =				(66))m + (67)m	n + (68)m	+ (69)m +	(70)m + (7	'1)m + (72))m	•	
(73)m= 328.4	5 326.68	316.56	300.39	284.24	268.49	258.16	263.13	271.34	287.69	306.43	320.23		(73)
6. Solar ga	ins:												
Solar gains ar	e calculated	using sola	r flux from	Table 6a	and assoc	iated equa	itions to c	onvert to th	ne applicat	ole orientat	tion.		
Orientation:			Area		Flu		_	g_ 	_	FF		Gains	
	Table 6d		m²			ble 6a	<u> </u>	Table 6b	_ '	able 6c		(W)	_
Northeast 0.9		X	8.6	35	x 1	1.28	х	0.63	x	0.7	=	29.83	(75)
Northeast 0.9	× 0.77	X	8.6	35	x 2	22.97	х	0.63	x	0.7	=	60.72	(75)
Northeast 0.9	•	X	8.6	35	X 4	11.38	х	0.63	x	0.7	=	109.4	(75)
Northeast 0.9		X	8.6	35	x 6	67.96	x	0.63	x	0.7	=	179.67	(75)
Northeast 0.9	× 0.77	X	8.6	35	x g	91.35	x	0.63	х	0.7	=	241.51	(75)

Northeast _{0.9x}	0.77	X	8.6	65	x	97.38	x		0.63	x	0.7	=	257.47	(75)
Northeast _{0.9x}	0.77	x	8.6	65	x	91.1	x		0.63	x	0.7	=	240.86	(75)
Northeast _{0.9x}	0.77	x	8.6	65	x	72.63	x		0.63	x	0.7	=	192.02	(75)
Northeast _{0.9x}	0.77	x	8.6	65	x	50.42	x		0.63	х	0.7	=	133.31	(75)
Northeast _{0.9x}	0.77	x	8.6	55	x	28.07	x		0.63	x	0.7	=	74.21	(75)
Northeast _{0.9x}	0.77	x	8.6	55	x	14.2	x		0.63	x	0.7	=	37.53	(75)
Northeast _{0.9x}	0.77	x	8.6	65	х	9.21	x		0.63	x	0.7		24.36	(75)
•														_
Solar gains in	watts, ca	alculated	for eacl	h month			(83)m	n = S	um(74)m .	(82)m				
(83)m= 29.83	60.72	109.4	179.67	241.51	257.47	240.86	192	.02	133.31	74.21	37.53	24.36		(83)
Total gains – i	internal a	and solar	(84)m =	= (73)m	+ (83)r	n , watts								
(84)m= 358.28	387.4	425.96	480.05	525.74	525.96	499.02	455	.14	404.65	361.9	343.97	344.59		(84)
7. Mean inte	rnal temp	perature	(heating	season)									
Temperature	during h	neating p	eriods ir	the livi	ng area	a from Ta	ble 9,	, Th	1 (°C)				21	(85)
Utilisation fac	ctor for g	ains for I	iving are	ea, h1,m	see 7	able 9a)								
Jan	Feb	Mar	Apr	May	Jun	Jul	A	ug	Sep	Oct	Nov	Dec		
(86)m= 1	0.99	0.99	0.96	0.89	0.74	0.58	0.6	35	0.88	0.98	0.99	1		(86)
Mean interna	l temper	ature in	living ar	22 T1 (f	ollow e	tone 3 to	7 in T	able	2 9c)					
(87)m= 19.59	19.72	19.98	20.35	20.7	20.91	-i	20.		20.79	20.37	19.92	19.57		(87)
` '	<u> </u>					_ <u>i</u>	<u> </u>							, ,
Temperature	19.82	19.82			19.85	<u> </u>	T		` ,	10.04	10.02	10.02		(88)
(88)m= 19.82	19.62	19.02	19.83	19.84	19.00	19.85	19.	00	19.84	19.84	19.83	19.83		(00)
Utilisation fac		ains for i		welling,	h2,m (see Table	9a)						I	
(89)m= 1	0.99	0.98	0.95	0.85	0.64	0.44	0.5	51	0.81	0.97	0.99	1		(89)
Mean interna	al temper	ature in	the rest	of dwell	ing T2	(follow ste	eps 3	to 7	7 in Tabl	e 9c)				
(90)m= 17.97	18.15	18.53	19.07	19.54	19.79	19.84	19.	83	19.67	19.1	18.46	17.94		(90)
									f	LA = Livir	ng area ÷ (4) =	0.47	(91)
Mean interna	al temper	ature (fo	r the wh	ole dwe	lling) =	fLA × T1	+ (1	– fL	A) × T2					
(92)m= 18.74	18.9	19.21	19.68	20.09	20.32	20.38	20.	37	20.2	19.7	19.16	18.72		(92)
Apply adjusti	ment to t	he mean	internal	temper	ature f	rom Table	4e,	whe	re appro	priate		!	l	
(93)m= 18.74	18.9	19.21	19.68	20.09	20.32	20.38	20.	37	20.2	19.7	19.16	18.72		(93)
8. Space hea	ating requ	uirement												
Set Ti to the					ned at s	step 11 of	Tabl	le 9b	o, so tha	t Ti,m=(76)m an	d re-calc	culate	
the utilisation	1				Γ.	1							1	
Jan Jan	Feb	Mar	Apr	May	Jun	Jul	A	ug	Sep	Oct	Nov	Dec		
Utilisation fac	0.99	o.98	0.95	0.86	0.69	0.51	0.5	7	0.84	0.96	0.99	0.99		(94)
Useful gains					0.09	0.51	0.0) (0.04	0.90	0.99	0.99		(04)
(95)m= 356.14		417.88	455.07	451.46	360.68	3 253.36	261	42	338.42	349.03	340.39	342.86		(95)
Monthly aver						200.00			0002	0.000	1 0 .0.00	0 .2.00		,
(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]	1	I .	I	
(97)m= 1019.09	1	893.3	749.28	581.99	393.36		272	_	421.12	631.66	839.79	1015.57		(97)
Space heating	ng require	ement fo	r each n	nonth, k	Wh/mo	nth = 0.02	24 x [[(97)	m – (95)m] x (4	1)m		1	
(98)m= 493.24	404.29	353.72	211.83	97.11	0	0	0)	0	210.28	359.57	500.5		
	-				-	•	-				-	-	•	

							-		7(00)
			lota	l per year	(kWh/year	r) = Sum(9	8) _{15,912} =	2630.53	(98)
Space heating requirement in kWh/m²/year								49.5	(99)
9a. Energy requirements – Individual heating sy	stems incl	luding	micro-C	HP)					
Space heating: Fraction of space heat from secondary/suppler	mentary sy	ıstam						0	(201)
Fraction of space heat from main system(s)	nemary sy		(202) = 1 -	- (201) =				1	(202)
Fraction of total heating from main system 1			(204) = (204)		(203)] =				(204)
Efficiency of main space heating system 1			(204) - (20	02) X [1	(200)] =			93.5	(204)
Efficiency of secondary/supplementary heating	s evetom 0	0/2						0	(208)
	· ·		Δ	0.5.5	0-4	Nierr	Date		
Jan Feb Mar Apr May Space heating requirement (calculated above)	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/ye	ear
493.24 404.29 353.72 211.83 97.11	0	0	0	0	210.28	359.57	500.5		
(211)m = {[(98)m x (204)] } x 100 ÷ (206)					1			<u> </u>	(211)
527.53 432.4 378.31 226.56 103.86	0	0	0	0	224.89	384.56	535.29		
	•	•	Tota	l (kWh/yea	ar) =Sum(2	211),15,1012	=	2813.4	(211)
Space heating fuel (secondary), kWh/month							'		
$= \{[(98)m \times (201)]\} \times 100 \div (208)$								1	
(215)m= 0 0 0 0 0	0	0	0 Tota	0 L(k\\\\h\\\e:	0 ar) =Sum(2	0	0		7(245)
Water besting			Tota	i (KVVII/yea	ai) =3uiii(2	213) _{15,1012}	F	0	(215)
Water heating Output from water heater (calculated above)									
171.46 151.29 159.28 143.34 140.86	126.44 12	21.98	133.09	132.62	148.61	156.45	167.52		
Efficiency of water heater	•	•			•			79.8	(216)
(217)m= 87.47 87.31 86.88 85.85 83.85	79.8	79.8	79.8	79.8	85.74	86.96	87.56		(217)
Fuel for water heating, kWh/month									
(219) m = (64) m x $100 \div (217)$ m (219)m = 196.01 173.28 183.33 166.95 168	158.44 1	52.85	166.79	166.2	173.32	179.89	191.33		
		!		I = Sum(2	19a) ₁₁₂ =	<u> </u>	ļ	2076.4	(219)
Annual totals					k\	Wh/year		kWh/yea	<u></u> <u>ır</u>
Space heating fuel used, main system 1								2813.4	
Water heating fuel used								2076.4	
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 (230a).	(230g) =			75	(231)
Electricity for lighting								254.39	(232)
12a. CO2 emissions – Individual heating syste	ms includi	na mia	cro-CHP)					
TZa. CO2 Omiodeno marviada noding cycle	Ener		510 0111		Emiss	ion fac	tor	Emission	s
	kWh/				kg CO			kg CO2/ye	
Space heating (main system 1)	(211)	X			0.2	16	=	607.69	(261)

Space heating (secondary)	(215) x	0.519	0 (263)
Water heating	(219) x	0.216 =	448.5 (264)
Space and water heating	(261) + (262) + (263) + (264) =		1056.2 (265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519 =	38.93 (267)
Electricity for lighting	(232) x	0.519 =	132.03 (268)
Total CO2, kg/year	sum	of (265)(271) =	1227.15 (272)

TER = 23.09 (273)