### **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 14:54:54

Project Information:

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

Dwelling Details:

**NEW DWELLING DESIGN STAGE** Total Floor Area: 73.31m<sup>2</sup> Plot Reference: Site Reference : Hermitage Lane Plot 15

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))

18.76 kg/m<sup>2</sup> Target Carbon Dioxide Emission Rate (TER)

Dwelling Carbon Dioxide Emission Rate (DER) 12.12 kg/m<sup>2</sup> OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 53.3 kWh/m<sup>2</sup>

Dwelling Fabric Energy Efficiency (DFEE) 42.8 kWh/m<sup>2</sup>

OK 2 Fabric U-values

**Element Average Highest** 

0.15 (max. 0.70) External wall 0.15 (max. 0.30) OK Floor 0.12 (max. 0.25) 0.12 (max. 0.70) OK

Roof (no roof)

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

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals 3.00 (design value)

OK Maximum 10.0

4 Heating efficiency

Main Heating system: Community heating schemes - mains gas

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

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

programmer and at least two room thermostats

No cylinder thermostat Hot water controls:

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:	1.02	
Maximum	1.5	OK
MVHR efficiency:	93%	
Minimum	70%	OK
9 Summertime temperature		
Overheating risk (Thames valley):	Slight	OK
Based on:		
Overshading:	Average or unknown	
Windows facing: North East	7.66m²	
Windows facing: South East	3.82m²	
Ventilation rate:	6.00	
10 Key features		
Air permeablility	3.0 m³/m²h	
Floors U-value	0.12 W/m <sup>2</sup> K	
Floors U-value	0.12 W/m²K	
Community heating, heat from boilers – mains gas		
Photovoltaic array		

		l Iser I	Details:							
Assessor Name: Software Name:	Zahid Ashraf Stroma FSAP 2012	<del>- 036</del> FL	Strom Softwa					0001082 on: 1.0.5.9		
	F	Property	Address	Plot 15						
Address :										
Overall dwelling dime	ensions:	Δro	a(m²)		Δν Ηο	ight(m)		Volume(m <sup>3</sup>	31	
Ground floor				(1a) x		2.5	(2a) =	183.28	(3a)	
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1			(4)			]`			
Dwelling volume		′ <u> </u>	10.01		)+(3c)+(3c	d)+(3e)+	.(3n) =	183.28	(5)	
				(==) - (==	, (00)	., ( ,	-()	103.20	(3)	
2. Ventilation rate:	main seconda	ry	other		total			m³ per hou	ır	
Number of chimneys	heating heating beauting heating	<b>-</b> + -	0	] = [	0	x	40 =	0	(6a)	
Number of open flues		╣ -  -	0	]	0	x 2	20 =	0	(6b)	
Number of intermittent fa				J L	0	x	10 =	0	(7a)	
Number of passive vents				Ļ			10 =		Ⅎ``	
·				Ļ	0		40 =	0	(7b)	
Number of flueless gas f	iles			L	0	^	+0 =	0	(7c)	
Air changes per hour										
Infiltration due to chimne	ys, flues and fans = (6a)+(6b)+(	7a)+(7b)+	(7c) =	Γ	0		÷ (5) =	0	(8)	
	peen carried out or is intended, procee	ed to (17),	otherwise (	continue fr	rom (9) to	(16)			<b>-</b>	
Number of storeys in the	he dwelling (ns)					1(0)	41.04	0	(9)	
Additional infiltration	.25 for steel or timber frame o	r 0 35 fo	r masoni	v constr	ruction	[(9)	-1]x0.1 =	0	(10)	
	resent, use the value corresponding t			•	dollori			0	(11)	
deducting areas of openia	· · ·	4 (	ماد الم						<b></b>	
If no draught lobby, en	floor, enter 0.2 (unsealed) or 0 ter 0.05, else enter 0	. i (seai	ea), eise	enter 0				0	(12)	
•	s and doors draught stripped							0	(14)	
Window infiltration			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 metre	es per ho	our per s	quare m	etre of e	envelope	area	3	(17)	
•	lity value, then $(18) = [(17) \div 20] + (18)$							0.15	(18)	
Air permeability value applie Number of sides sheltere	es if a pressurisation test has been do	ne or a de	gree air pe	rmeability	is being u	sed			7(10)	
Shelter factor	tu .		(20) = 1 -	[0.0 <b>75</b> x (1	19)] =			0.85	(19) (20)	
Infiltration rate incorpora	ting shelter factor		(21) = (18	) x (20) =				0.13	(21)	
Infiltration rate modified f	or monthly wind speed									
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec			
Monthly average wind sp	peed from Table 7									
(22)m= 5.1 5	4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7			
Wind Factor (22a)m = (2	2)m <i>÷ 4</i>									
(22a)m = 1.27  1.25	1.23 1.1 1.08 0.95	0.95	0.92	1	1.08	1.12	1.18	]		
· / L   - L	1 1 2		1					J		

Adjusted infiltr	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 effe		_	rate for t	he appli	cable ca	se	!			!	•	•	
If mechanic			andiv N. (2	3h) - (22c	) v Emy (c	auation (	VEVV othor	nuico (22h	) - (222)			0.5	(23
									) = (23a)			0.5	(23
If balanced with		-	-	_					21. )	001.)	4 (00)	79.05	(23
a) If balance (24a)m= 0.27	0.26	o.26	0.25	0.24	0.23	0.23	1R) (24a 0.22	0.23	2D)M + ( 0.24	23D) <b>x</b> [	1 – (23C) 0.25	÷ 100] 	(24
		<u> </u>	ļ.		<u> </u>	<u> </u>	ļ	l	<u>l</u>	<u>l</u>	0.25		(24
b) If balance (24b)m= 0	o mech	anicai ve	niliation 0	without	neat red	overy (r	0 (240	$\int_{0}^{\infty} \int_{0}^{\infty} dx = (22)$	20)m + (. 0	230)	0		(24
		<u> </u>											(2.
c) If whole h				•	•		c) = (22b		5 × (23h	o)			
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
d) If natural	ventilatio	on or wh	ole hous	e positiv	/e input	ventilatio	on from I	oft	<u> </u>	<u> </u>			
,				•	•		0.5 + [(2		0.5]				
(24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
Effective air	change	rate - er	nter (24a	) or (24k	o) or (24	c) or (24	d) in box	(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 losse	s and he	at loss r	naramete	⊃r.									
ELEMENT	Gros	_	Openin		Net Ar	ea	U-valı	IE.	AXU		k-value	Δ Δ	Χk
	area		m		A ,r		W/m2		(W/I	K)	kJ/m²-l		J/K
Doors					2	X	1.4	=	2.8				(26
Windows Type	e 1				7.661	x1.	/[1/( 1.4 )+	0.04] =	10.16				(27
Windows Type	2				3.819	x1	/[1/( 1.4 )+	0.04] =	5.06	Ħ			(27
Floor Type 1					25.83	7 X	0.12	─	3.1004	<u></u>			(28
Floor Type 2					47.47	4 x	0.12	<b>=</b>	5.69688			ī 💳	(28
Walls Type1	48.1	7	11.48	8	36.69	) x	0.15	╡┇	5.5	≓ i			(29
Walls Type2	17.6	_	2		15.68	=	0.14	╡┇	2.22	<b>=</b>		7 =	(29
Total area of e					139.1	_							\` (31
* for windows and		•	effective wi	ndow U-va			formula 1	/[(1/U-valu	ıe)+0.04] a	as given in	paragraph	3.2	(0)
** include the are								•	, ,	Ü	, , ,		
Fabric heat lo	ss, W/K :	= S (A x	U)				(26)(30)	+ (32) =				34.54	(33
Heat capacity	Cm = S	(Axk)						((28)	(30) + (32	2) + (32a).	(32e) =	7893.16	(34
Thermal mass	parame	ter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	: Low		100	(35
For design asses				construct	ion are no	t known pr	ecisely the	indicative	values of	TMP in Ta	able 1f		
can be used inste Thormal bridg				icina Ar	nondiy l						1	40.00	
Thermal bridg  if details of therma	,	,		• .	•	`						13.33	(36
Total fabric he		are not kii	OWII (30) -	- 0.00 x (3	1)			(33) +	(36) =			47.87	(37
Ventilation hea	at loss ca	alculated	l monthly	y				(38)m	= 0.33 × (	25)m x (5)	)		`
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m= 16.17	15.97	15.78	14.82	14.63	13.66	13.66	13.47	14.05	14.63	15.01	15.4		(38
Heat transfer	coefficie	nt. W/K		<u> </u>	!	<u> </u>		(39)m	= (37) + (37)	38)m		ı	
					04.50	04.50					20.07	Ī	
(39)m= 64.04	63.85	63.65	62.69	62.5	61.53	61.53	61.34	61.92	62.5	62.88	63.27		

Heat loss para	ameter (I	HLP), W	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 0.87	0.87	0.87	0.86	0.85	0.84	0.84	0.84	0.84	0.85	0.86	0.86		
		!							Average =	Sum(40) <sub>1</sub>	12 /12=	0.85	(40)
Number of day	<u> </u>	<u> </u>	<u> </u>					-					
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(44)
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water hea	ting ene	rgy requi	irement:								kWh/ye	ar:	
Assumed occurring TFA > 13.1 if TFA £ 13.1	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9	)2)] + 0.0	0013 x (¯	TFA -13		32		(42)
Annual average Reduce the annual not more that 125	al average	hot water	usage by	5% if the $a$	lwelling is	designed t			se target c		.09		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage i								· '	!				
(44)m= 103.5	99.74	95.98	92.21	88.45	84.68	84.68	88.45	92.21	95.98	99.74	103.5		
									Total = Su	m(44) <sub>112</sub> =	=	1129.13	(44)
Energy content of	f hot water	used - cal	culated mo	onthly = 4.	190 x Vd,r	n x nm x D	OTm / 3600	) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m= 153.49	134.25	138.53	120.77	115.88	100	92.66	106.33	107.6	125.4	136.89	148.65		
If instantaneous v	vator booti	'na at naint	of upo (no	bot water	, ataragal	antar O in	haves (46		Total = Su	m(45) <sub>112</sub> =	-	1480.46	(45)
If instantaneous v			·	1	,.		· · ·	, , , I		1	i I		(40)
(46)m= 23.02 Water storage	20.14 loss:	20.78	18.12	17.38	15	13.9	15.95	16.14	18.81	20.53	22.3		(46)
Storage volum		) includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community h	neating a	and no ta	ınk in dw	elling, e	nter 110	litres in	(47)						
Otherwise if no	o stored	hot wate	er (this in	icludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (	(47)			
Water storage													
a) If manufact				or is kno	wn (kWł	n/day):					0		(48)
Temperature f											0		(49)
Energy lost fro		•	•				(48) x (49)	) =		1	10		(50)
<ul><li>b) If manufact</li><li>Hot water stor</li></ul>			-							0	02		(51)
If community h	-			_ (	,,,,,,	-77				0.	02		()
Volume factor	from Ta	ble 2a								1.	03		(52)
Temperature f	actor fro	m Table	2b							0	.6		(53)
Energy lost fro		_	, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =	1.	03		(54)
Enter (50) or	(54) in (	55)								1.	03		(55)
Water storage	loss cal	culated t	for each	month			((56)m = (	(55) × (41)	m				
(56)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinder contain	s dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (	H11)] ÷ (5	0), else (5	7)m = (56)	m where (	H11) is fro	m Appendi	хH	
(57)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Primary circuit	t loss (ar	nnual) fro	m Table	<u></u>							0		(58)
Primary circuit	`	,			59)m = (	(58) ÷ 36	65 × (41)	m					
(modified by	/ factor f	rom Tab	le H5 if t	here is s	olar wat	ter heatii	ng and a	cylinde	r thermo	stat)			
(59)m= 23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)

Combi loss calculated	for each	month (	(61)m =	(60) ÷ 3	65 × (41	)m							
(61)m= 0 0	0	0	0	0	00 % (11)	)   0		0	0	0	0	1	(61)
Total heat required for	· water he	eating ca	Lulated	L I for eac	h month	(62)ı	—— m =	0 85 x (	45)m +	(46)m +	(57)m +	ı · (59)m + (61)m	
(62)m= 208.77 184.17	193.81	174.27	171.16	153.49	147.94	161.	_	161.1	180.68	190.38	203.93	]	(62)
Solar DHW input calculated	using Appe	endix G or	Appendix	L H (negat	I ive quantity	v) (ent	<b></b> l er '0'	if no sola	r contribu	tion to wate	r heating)	1	
(add additional lines if											0,		
(63)m= 0 0	0	0	0	0	0	0		0	0	0	0	]	(63)
Output from water hea	ter					•					•		
(64)m= 208.77 184.17	193.81	174.27	171.16	153.49	147.94	161.	.61	161.1	180.68	190.38	203.93	1	
				Į.		•	Outp	out from wa	ater heate	er (annual)	12	2131.3	(64)
Heat gains from water	heating,	kWh/mo	onth 0.2	5 ´ [0.85	5 × (45)m	ı + (6	1)m	n] + 0.8 x	: [(46)m	+ (57)m	+ (59)m	ı ]	
(65)m= 95.26 84.58	90.28	82.95	82.75	76.04	75.03	79.	58	78.57	85.92	88.31	93.65	1	(65)
include (57)m in cal	culation c	of (65)m	only if c	ylinder i	is in the	dwell	ing	or hot w	ater is f	rom com	munity h	neating	
5. Internal gains (see	e Table 5	and 5a	):										
Metabolic gains (Table	e 5), Watt	:S											
Jan Feb	Mar	Apr	May	Jun	Jul	Αι	ug	Sep	Oct	Nov	Dec	]	
(66)m= 116.19 116.19	116.19	116.19	116.19	116.19	116.19	116.	.19	116.19	116.19	116.19	116.19		(66)
Lighting gains (calcula	ted in Ap	pendix	L, equat	ion L9 o	r L9a), a	lso s	ee T	Table 5		-		•	
(67)m= 19.14 17	13.82	10.47	7.82	6.61	7.14	9.2	8	12.45	15.81	18.45	19.67	]	(67)
Appliances gains (cald	culated in	Append	dix L, eq	uation L	.13 or L1	3a), a	also	see Tal	ole 5	-		•	
(68)m= 204.9 207.02	201.67	190.26	175.86	162.33	153.29	151.	.16	156.52	167.93	182.32	195.86		(68)
Cooking gains (calcula	ated in Ap	pendix	L, equat	ion L15	or L15a	), als	o se	e Table	5	-		•	
(69)m= 34.62 34.62	34.62	34.62	34.62	34.62	34.62	34.6	62	34.62	34.62	34.62	34.62		(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. evaporation	on (negat	ive valu	es) (Tab	le 5)	-					-	-	•	
(71)m= -92.95 -92.95	-92.95	-92.95	-92.95	-92.95	-92.95	-92.	95	-92.95	-92.95	-92.95	-92.95		(71)
Water heating gains (	Γable 5)			-	-						-	•	
(72)m= 128.03 125.86	121.35	115.21	111.23	105.62	100.85	106.	.96	109.13	115.48	122.65	125.87		(72)
Total internal gains =	• •			(66	)m + (67)m	n + (68	3)m +	- (69)m + (	70)m + (	71)m + (72)	)m	•	
(73)m= 409.93 407.74	394.69	373.79	352.77	332.41	319.13	325.	.25	335.96	357.07	381.29	399.26	]	(73)
6. Solar gains:													
Solar gains are calculated	•	flux from	Table 6a	and assoc	ciated equa	tions t	to co	nvert to th	e applica		tion.		
Orientation: Access I		Area m²		Flu			_	g_ able 6b	-	FF able 6c		Gains	
Table 6c	! 				ble 6a		1	able ob	_ '	able 60		(W)	7
Northeast 0.9x 0.77	X	7.6	66	X	11.28	X		0.63	X	0.7	=	26.42	(75)
Northeast 0.9x 0.77	X	7.6	66	x	22.97	X		0.63	x	0.7	=	53.77	(75)
Northeast 0.9x 0.77	X	7.6	66	X A	41.38	X		0.63	X	0.7	=	96.88	(75)
Northeast 0.9x 0.77	X	7.6	66	× (	67.96	X		0.63	x	0.7	=	159.11	(75)
Northeast 0.9x 0.77	X	7.6	66	x	91.35	X		0.63	X	0.7	=	213.87	(75)

		_			_		- 1		_				_			
Northeast <sub>0.9x</sub>	0.77	X	7.6	66	X	97.38	X	0.63	X	0.7	=	228.01	(75)			
Northeast <sub>0.9x</sub>	0.77	X	7.6	66	X	91.1	X	0.63	X	0.7	=	213.3	(75)			
Northeast <sub>0.9x</sub>	0.77	X	7.6	66	x	72.63	x	0.63	X	0.7	=	170.04	(75)			
Northeast <sub>0.9x</sub>	0.77	X	7.6	66	X	50.42	X	0.63	X	0.7	=	118.05	(75)			
Northeast <sub>0.9x</sub>	0.77	X	7.6	66	x	28.07	x	0.63	x	0.7	=	65.71	(75)			
Northeast <sub>0.9x</sub>	0.77	X	7.6	66	x	14.2	x	0.63	X	0.7	=	33.24	(75)			
Northeast 0.9x	0.77	×	7.6	66	x	9.21	x	0.63	x	0.7	=	21.57	(75)			
Southeast 0.9x	0.77	x	3.8	32	x	36.79	x	0.63	X	0.7	=	42.94	(77)			
Southeast 0.9x	0.77	x	3.8	32	x	62.67	x	0.63	X	0.7	=	73.15	(77)			
Southeast 0.9x	0.77	×	3.8	32	x	85.75	x	0.63	x	0.7	=	100.08	(77)			
Southeast <sub>0.9x</sub>	0.77	×	3.8	32	x	106.25	x	0.63	X	0.7	=	124.01	(77)			
Southeast <sub>0.9x</sub>	0.77	×	3.8	32	x	119.01	x	0.63	x	0.7	=	138.9	(77)			
Southeast 0.9x	0.77	×	3.8	32	x	118.15	x	0.63	x	0.7	=	137.9	(77)			
Southeast 0.9x	0.77	×	3.8	32	x	113.91	x	0.63	x	0.7	_ =	132.95	(77)			
Southeast <sub>0.9x</sub>	0.77	×	3.8	32	x	104.39	x	0.63	x	0.7		121.84	(77)			
Southeast <sub>0.9x</sub>	0.77	×	3.8	32	x	92.85	x	0.63	x	0.7		108.37	(77)			
Southeast 0.9x	0.77	×	3.8	32	x	69.27	x	0.63	x	0.7	=	80.84	(77)			
Southeast <sub>0.9x</sub>	0.77	x	3.8	32	x	44.07	x	0.63	x	0.7	=	51.44	(77)			
Southeast 0.9x	0.77	×	3.8	32	x	31.49	x	0.63	x	0.7		36.75	(77)			
Solar gains in $(83)m=$ 69.36 Total gains – i $(84)m=$ 479.29	126.92 19	96.97	283.12	352.77	365.9 + (83)ı 698.3	n , watts	(83)m 291	<u> </u>	(82)m 146.56 503.63	<u> </u>	58.32 457.58	 	(83) (84)			
7. Mean inter	nal tompor	oturo /	(hooting	coacon	\		<u> </u>									
	•		`			a from Tal	hle 9					24	(95)			
•	Ū	٠.			•	Temperature during heating periods in the living area from Table 9, Th1 (°C)										
Jan		$\overline{}$	viiig air		(see	Table 9a)	ыо о,	Th1 (°C)				21	(65)			
		Mar i	Apr		<u> </u>	Table 9a)			Oct	Nov	Dec	21	(00)			
(86)m = 0.95	0.93	Mar ).89	Apr 0.81	May 0.68	Jur 0.52	Jul		ug Sep	Oct	Nov 0.93	Dec 0.96	21	(86)			
` '		).89	0.81	May 0.68	Jur 0.52	0.39	At 0.4	ug Sep 4 0.65		+		21				
Mean interna	l temperatu	).89 re in l	0.81 iving are	May 0.68 ea T1 (fo	Jur 0.52 ollow s	0.39 teps 3 to 7	0.4 7 in T	ug Sep 4 0.65 able 9c)	0.85	0.93	0.96					
Mean interna (87)m= 19.35	l temperatu	ne in l	0.81 iving are 20.39	May 0.68 ea T1 (fo 20.73	Jur 0.52 ollow s 20.92	0.39 teps 3 to 7	7 in T	ug Sep 4 0.65  able 9c) 96 20.83		0.93		21	(86)			
Mean interna (87)m= 19.35  Temperature	l temperatu 19.57 19	ne in l 9.94 ting p	0.81 iving are 20.39 eriods ir	May 0.68 ea T1 (for 20.73	Jur 0.52 ollow s 20.92 dwellin	Jul 0.39 teps 3 to 7 2 20.97	Au 0.4 7 in T 20.9 able 9	ug Sep 4 0.65  Table 9c) 96 20.83  9, Th2 (°C)	20.39	0.93	0.96		(86)			
Mean interna (87)m= 19.35  Temperature (88)m= 20.19	19.57 19.57 19.57 19.57 20.19 20.19 20.19	ne in l 9.94 ting p	0.81 iving are 20.39 eriods ir 20.21	May 0.68 ea T1 (for 20.73 or rest of 20.21	Jur 0.52 ollow s 20.92 dwellii 20.22	Jul 0.39 teps 3 to 7 2 20.97 ng from Ta 2 20.22	Au 0.4 7 in T 20.9 able 9	ug Sep 4 0.65  Table 9c) 96 20.83  9, Th2 (°C)	0.85	0.93	0.96		(86)			
Mean interna (87)m= 19.35  Temperature (88)m= 20.19  Utilisation fac	temperatu  19.57 11  during head  20.19 2  ctor for gains	ne in l 9.94 ting p 0.19	0.81 iving are 20.39 eriods ir 20.21 est of d	May 0.68 ea T1 (for 20.73 or rest of 20.21 welling, I	Jur 0.52 bllow s 20.92 dwellii 20.22	Jul 0.39 teps 3 to 7 20.97 ng from Ta 2 20.22 see Table	Au 0.4 7 in T 20.9 able 9 20.3	ug Sep  4 0.65  able 9c)  96 20.83  9, Th2 (°C)  22 20.21	20.39	0.93	0.96 19.31 20.2		(86) (87) (88)			
Mean interna (87)m= 19.35  Temperature (88)m= 20.19	temperatu  19.57 11  during head  20.19 2  ctor for gains	ne in l 9.94 ting p	0.81 iving are 20.39 eriods ir 20.21	May 0.68 ea T1 (for 20.73 or rest of 20.21	Jur 0.52 ollow s 20.92 dwellii 20.22	Jul 0.39 teps 3 to 7 20.97 ng from Ta 2 20.22 see Table	Au 0.4 7 in T 20.9 able 9	ug Sep  4 0.65  able 9c)  96 20.83  9, Th2 (°C)  22 20.21	20.39	0.93	0.96		(86)			
Mean interna (87)m= 19.35  Temperature (88)m= 20.19  Utilisation fac (89)m= 0.95  Mean interna	during hear 20.19 20 ctor for gains 0.92 0 1 temperatu	ne in I 9.94 ting p 0.19 s for r	0.81 iving are 20.39 eriods ir 20.21 est of do 0.79 the rest	May 0.68 ea T1 (for 20.73 n rest of 20.21 welling, I 0.64 of dwelli	Jur 0.52  bllow s 20.92  dwellii 20.22  n2,m (  0.47  ng T2	Jul 0.39  teps 3 to 7 2 20.97  ng from Ta 2 20.22  see Table 0.33  (follow ste	Au 0.4 7 in T 20.9 able 9 20.3 9a) 0.3	ug Sep 4 0.65  Table 9c) 96 20.83  9, Th2 (°C) 22 20.21  17 0.6  to 7 in Tabl	0.85 20.39 20.21	0.93	0.96 19.31 20.2		(86) (87) (88) (89)			
Mean interna (87)m= 19.35  Temperature (88)m= 20.19  Utilisation factors (89)m= 0.95	during hear 20.19 20 ctor for gains 0.92 0 1 temperatu	ne in l 9.94 ting p 0.19 s for r	0.81 iving are 20.39 eriods ir 20.21 est of do 0.79	May 0.68 ea T1 (for 20.73 or rest of 20.21 welling, I 0.64	Jur 0.52 ollow s 20.92 dwellii 20.22 n2,m (	Jul 0.39  teps 3 to 7 2 20.97  ng from Ta 2 20.22  see Table 0.33  (follow ste	Au 0.4 7 in T 20.9 able 9 20.3 9a) 0.3	ug Sep 4 0.65  fable 9c) 96 20.83  9, Th2 (°C) 22 20.21  67 0.6  to 7 in Tabl 2 20.04	0.85  20.39  20.21  0.82  e 9c)  19.47	0.93 19.81 20.2 0.92	0.96 19.31 20.2 0.95		(86) (87) (88) (89)			
Mean interna (87)m= 19.35  Temperature (88)m= 20.19  Utilisation fact (89)m= 0.95  Mean interna	during hear 20.19 20 ctor for gains 0.92 0 1 temperatu	ne in I 9.94 ting p 0.19 s for r	0.81 iving are 20.39 eriods ir 20.21 est of do 0.79 the rest	May 0.68 ea T1 (for 20.73 n rest of 20.21 welling, I 0.64 of dwelli	Jur 0.52  bllow s 20.92  dwellii 20.22  n2,m (  0.47  ng T2	Jul 0.39  teps 3 to 7 2 20.97  ng from Ta 2 20.22  see Table 0.33  (follow ste	Au 0.4 7 in T 20.9 able 9 20.2 9 9a) 0.3 eps 3	ug Sep 4 0.65  fable 9c) 96 20.83  9, Th2 (°C) 22 20.21  67 0.6  to 7 in Tabl 2 20.04	0.85  20.39  20.21  0.82  e 9c)  19.47	0.93	0.96 19.31 20.2 0.95	0.32	(86) (87) (88) (89)			
Mean interna (87)m= 19.35  Temperature (88)m= 20.19  Utilisation fact (89)m= 0.95  Mean interna	temperatu   19.57	ne in l 9.94 ting po 0.19 s for r 0.88 re in t	0.81 iving are 20.39 eriods ir 20.21 est of do 0.79 the rest 19.45	May 0.68 ea T1 (for 20.73 n rest of 20.21 welling, if 0.64 of dwelling, if 19.9	Jur 0.52 ollow s 20.92 dwellii 20.22 n2,m ( 0.47 ng T2 20.14	Jul 0.39  teps 3 to 7 2 20.97  ng from Ta 2 20.22  see Table 0.33  (follow sters)	Au 0.4 7 in T 20.9 able 9 20.2 9a) 0.3 eps 3	ug Sep  4 0.65  Table 9c)  96 20.83  0, Th2 (°C)  22 20.21  7 0.6  to 7 in Tabl  2 20.04	0.85  20.39  20.21  0.82  e 9c)  19.47	0.93 19.81 20.2 0.92	0.96 19.31 20.2 0.95		(86) (87) (88) (89)			
Mean interna (87)m= 19.35  Temperature (88)m= 20.19  Utilisation factors (89)m= 0.95  Mean interna (90)m= 17.97	during hear 20.19 20 ctor for gains 0.92 0 1 temperatu 18.29 1 temperatu	ne in l 9.94 ting po 0.19 s for r 0.88 re in t	0.81 iving are 20.39 eriods ir 20.21 est of do 0.79 the rest 19.45	May 0.68 ea T1 (for 20.73 n rest of 20.21 welling, if 0.64 of dwelling, if 19.9	Jur 0.52 ollow s 20.92 dwellii 20.22 n2,m ( 0.47 ng T2 20.14	Jul 0.39  teps 3 to 7 2 20.97  ng from Ta 2 20.22  see Table 0.33  (follow steel 2 20.2	Au 0.4 7 in T 20.9 able 9 20.2 9a) 0.3 eps 3	ug Sep 4 0.65  Table 9c) 96 20.83  9, Th2 (°C) 22 20.21  67 0.6  to 7 in Tabl 2 20.04  f  - fLA) × T2	0.85  20.39  20.21  0.82  e 9c)  19.47	0.93  19.81  20.2  0.92  18.64  ring area ÷ (-	0.96 19.31 20.2 0.95		(86) (87) (88) (89)			

			•	•									
(93)m= 18.41	18.7	19.17	19.75	20.17	20.39	20.45	20.44	20.29	19.76	19.01	18.36		(93)
8. Space hea													
Set Ti to the the utilisation			•		ed at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(	76)m an	d re-calc	culate	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fac	l	<u> </u>	· ·				_ 3						
(94)m= 0.93	0.91	0.86	0.77	0.64	0.48	0.35	0.39	0.6	0.81	0.9	0.94		(94)
Useful gains,	hmGm	, W = (9	4)m x (8	4)m	•								
(95)m= 445.68	484.11	508.91	507.71	453.11	334.82	231.17	239.78	338.54	406.26	420.29	428.76		(95)
Monthly aver	age exte	ernal tem	perature	from T	able 8							ı	
(96)m= 4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat loss rate	1	î .	<del> </del>		i	- ,	<u> </u>	<u> </u>				1	(07)
(97)m= 903.38	880.97	806.33	679.97	529.06	356.25	236.79	247.86	383.5	572.62	748.86	895.94		(97)
Space heatin (98)m= 340.53	g requir	ement fo	r each n 124.03	56.51	/Vh/mon	$\ln = 0.02$	24 x [(97]	)m – (95 0	)MJ X (4 123.77	1)m 236.57	347.58		
(98)m= 340.53	200.09	221.20	124.03	36.31		U					L	1716.06	(98)
							rota	l per year	(kvvn/year	) = Sum(9	8)15,912 =	1716.96	╡``
Space heatin	g requir	ement in	kWh/m²	<sup>2</sup> /year								23.42	(99)
9b. Energy red	quireme	nts – Coi	mmunity	heating	scheme								
This part is us										unity sch	neme.	0	7(201)
Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none									0	(301)			
Fraction of spa	ace heat	from co	mmunity	system	1 – (30	1) =						1	(302)
The community so		-							up to four	other heat	sources; tl	he latter	
includes boilers, here		_			rom powei	stations.	See Appei	naix C.			ſ	1	(303a)
Fraction of total			•		oilers				(3	02) x (303	a) =	1	(304a)
Factor for con	•			•		r commı	unity hea	iting sys	tem			1	(305)
Distribution los				,	` ''		•	0 ,				1.05	(306)
Space heating		`	,		,	5 ,					l	kWh/yea	
Annual space	_	requiren	nent									1716.96	<u></u>
Space heat fro	m Com	munity b	oilers					(98) x (30	04a) x (30	5) x (306) :	= [	1802.81	(307a)
Efficiency of s	econdar	y/supple	mentary	heating	system	in % (fro	om Table	4a or A	ppendix	E)	İ	0	(308
Space heating	require	ment fro	m secon	dary/su	oplemen	tary sys	tem	(98) x (30	01) x 100 -	÷ (308) =	ĺ	0	(309)
Water heating	י												
Annual water		requirem	ent									2131.3	7
If DHW from c	ommuni	ty schen	ne:										<b>-</b>
Water heat fro	m Comr	munity bo	oilers					(64) x (30	03a) x (30	5) x (306) :	=	2237.87	(310a)
Electricity use	d for hea	at distribi	ution				0.01	× [(307a).	(307e) +	(310a)(	(310e)] =	40.41	(313)
Cooling Syste	m Energ	y Efficie	ncy Rati	0								0	(314)
Space cooling	(if there	is a fixe	d coolin	g systen	n, if not e	enter 0)		= (107) ÷	(314) =			0	(315)
Electricity for p											ı		<b>¬</b>
mechanical ve	ntilation	- baland	ed, extra	act or po	sitive in	out from	outside					285.09	(330a)

				_
warm air heating system fans			0	(330b)
pump for solar water heating			0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330	9b) + (330g) =	285.09	(331)
Energy for lighting (calculated in Appendix L)			338.01	(332)
Electricity generated by PVs (Appendix M) (negative quantity	<b>'</b> )		-741.01	(333)
Electricity generated by wind turbine (Appendix M) (negative	quantity)		0	(334)
12b. CO2 Emissions – Community heating scheme				
	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
CO2 from other sources of space and water heating (not CH Efficiency of heat source 1 (%)	P) using two fuels repeat (363) to	(366) for the second fue	el 94	(367a)
CO2 associated with heat source 1 [(307	'b)+(310b)] x 100 ÷ (367b) x	0.22	928.5	(367)
Electrical energy for heat distribution	[(313) x	0.52	20.97	(372)
Total CO2 associated with community systems	(363)(366) + (368)(37	2)	949.47	(373)
CO2 associated with space heating (secondary)	(309) x	0	- 0	(374)
CO2 associated with water from immersion heater or instanta	aneous heater (312) x	0.22	= 0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =		949.47	(376)
CO2 associated with electricity for pumps and fans within dw	velling (331)) x	0.52	147.96	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	175.43	(379)
Energy saving/generation technologies (333) to (334) as applitem 1	licable	0.52 x 0.01 =	-384.59	(380)
Total CO2, kg/year sum of (376)(382) =			888.27	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =			12.12	(384)
El rating (section 14)			89.94	(385)

### **SAP 2012 Overheating Assessment**

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

#### Property Details: Plot 15

Dwelling type:FlatLocated in:EnglandRegion:Thames valley

Cross ventilation possible: Yes
Number of storeys: 1

Front of dwelling faces: South West

Overshading: Average or unknown

Overhangs: None

Thermal mass parameter: Indicative Value Low

**Night ventilation:** False

Blinds, curtains, shutters:

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

#### Overheating Details:

Summer ventilation heat loss coefficient: 362.89 (P1)

Transmission heat loss coefficient: 47.9

Summer heat loss coefficient: 410.76 (P2)

### Overhangs:

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

North East (NE) 0 1 South East (SE) 0 1

#### Solar shading:

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

#### Solar gains:

Orientation		Area	Flux	<b>g</b> _	FF	Shading	Gains
North East (NE)	0.9 x	7.66	98.85	0.63	0.7	0.9	270.5
South East (SE)	0.9 x	3.82	119.92	0.63	0.7	0.9	163.6
						Total	434.09 <b>(P3/P4)</b>

#### Internal gains.

	June	July	August
Internal gains	462.15	445.22	453.51
Total summer gains	925.91	879.32	827.42 <b>(P5)</b>
Summer gain/loss ratio	2.25	2.14	2.01 <b>(P6)</b>
Mean summer external temperature (Thames valley)	16	17.9	17.8
Thermal mass temperature increment	1.3	1.3	1.3
Threshold temperature	19.55	21.34	21.11 <b>(P7)</b>
Likelihood of high internal temperature	Not significant	Slight	Slight

Assessment of likelihood of high internal temperature: Slight

		l Iser I	)etails: _						
Assessor Name: Software Name:	Zahid Ashraf Stroma FSAP 2012	<u> </u>	Strom						
Contware Hame.		Property					VOIOIC	71. 1.0.0.0	
Address :									
1. Overall dwelling dime	ensions:								
Ground floor	Software Version:   Version: 1.0.5.9		<u>^</u>						
	a) . (4 la) . (4 a) . (4 a)					2.5	(2a) =	183.28	(3a)
	a)+(1b)+(1c)+(1d)+(1e)+(1	n)	73.31						_
Dwelling volume	Stroma Number:   Stroma FSAP 2012   Software Version:   Version: 1.0.5.9								
2. Ventilation rate:	Stroma Name:   Zahid Ashraf   Stroma Number:   STRO001082   Version: 1.0.5.9								
	Stroma Number:   Stroma FSAP 2012   Software Version:   Version: 1.0.5.9								
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	ins				3	X '	10 =	30	(7a)
Number of passive vents	Name: Zahid Ashraf Stroma Number: STRC Software Version: Version: Stroma FSAP 2012 Software Version: Version: Stroma FSAP 2012 Software Version: Version: Version: Stroma FSAP 2012 Software Version: Version: Stroma FSAP 2012 Software Version: Version: Stroma FSAP 2012 Software Version: Version: Version: Stroma FSAP 2012 Software Version: Version: Version: Stroma FSAP 2014 Software Version: Version		0	(7b)					
Number of flueless gas fi	ires			Ē	0	X 4	40 =	0	(7c)
				<u> </u>					
							Air ch	nanges per ho	our
	•						÷ (5) =	0.16	(8)
		ed to (17),	otherwise (	continue fr	om (9) to	(16)			<b>—</b> (0)
Additional infiltration	ne aweiling (ns)					[(9)	-1]x0.1 =		_
	.25 for steel or timber frame o	r 0.35 fo	r masoni	y constr	ruction	1(-)	1		=
		o the grea	ter wall are	a (after					
•	<b>3</b> /· 1	1 (seal	ed) else	enter ()					(12)
•	,	. i (ocai	ou), 0.00	critor o					=
	•								=
Window infiltration			0.25 - [0.2	x (14) ÷ 1	00] =			0	(15)
Infiltration rate			(8) + (10)	+ (11) + (1	12) + (13)	+ (15) =		0	(16)
•	·	-	•	•	etre of e	envelope	area	3	(17)
•	•							0.31	(18)
		ne or a de	gree air pe	rmeability	is being u	sed		2	(19)
Shelter factor	, ,		(20) = 1 -	[0.0 <b>75</b> x (1	19)] =				<b>→</b> ' ' '
Infiltration rate incorporate	ting shelter factor		(21) = (18	) x (20) =				0.27	(21)
Infiltration rate modified f	or monthly wind speed								
Jan Feb	area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n) 73.31 (4)  olume (3a)+(3b)+(3c)+(3d)+(3e)+(3n) = 183.28 (5)  Iton rate:    main   secondary   theating   heating   he								
Monthly average wind sp	peed from Table 7								
(22)m= 5.1 5	4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m - (2	2)m <i>÷ 1</i>								
<u> </u>	<del></del>	0.95	0.92	1	1.08	1.12	1.18	1	
1.20	1 0.99	1 0.00	1 3.32		L	12	Lo	J	

0.34		<del>`</del>	ng for sh			<del>`                                    </del>	r <del>`</del>	<u> </u>	0.20	0.0	0.24	1		
Calculate effe	0.33 ctive air o	0.33 change r	0.29 rate for t	0.29 he appli	0.25 Cable ca	0.25 <b>SE</b>	0.25	0.27	0.29	0.3	0.31	]		
If mechanic		•										(	)	(23
If exhaust air h	eat pump ι	using Appe	endix N, (2	3b) = (23a	ı) × Fmv (e	equation (N	N5)) , other	rwise (23b	) = (23a)			(	)	(23k
If balanced wit	h heat reco	very: effici	iency in %	allowing f	or in-use f	actor (from	Table 4h	) =				(	)	(230
a) If balance	ed mecha	anical ve	ntilation	with hea	at recove	ery (MVI	HR) (24a	m = (22)	2b)m + (2	23b) × [	1 – (23c)	÷ 100]		
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	0			(24
b) If balance	1 1					· · · · ·	/IV) (24b	m = (22)	2b)m + (2	23b)		1		
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0			(24
c) If whole h if (22b)r	nouse extends $1 < 0.5 \times 10^{-1}$			-	-				5 × (23b	o)				
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0	]		(24
d) If natural	ventilation = 1, the								0.5]		•	•		
(24d)m= 0.56	0.56	0.55	0.54	0.54	0.53	0.53	0.53	0.54	0.54	0.54	0.55	]		(24
Effective air	change	rate - en	iter (24a	or (24b	o) or (24	c) or (24	d) in box	(25)			·			
(25)m= 0.56	0.56	0.55	0.54	0.54	0.53	0.53	0.53	0.54	0.54	0.54	0.55			(25)
3. Heat losse	es and he	at loss r	naramete	ar.										
ELEMENT	Gros	·	Openin		Net Ar	ea	U-valı	16	AXU		k-value	<u> </u>	Α >	( k
	area		m		A ,r		W/m2		(W/I	<b>〈</b> )	kJ/m²·l		kJ/	
Doors					2	X	1.4	= [	2.8					(26
Windows Type	ə 1				7.661	x1,	/[1/( 1.4 )+	0.04] =	10.16					(27
Windows Type	e 2				3.819	x1,	/[1/( 1.4 )+	0.04] =	5.06					(27)
Floor Type 1					25.83	7 x	0.12	=	3.10044	4				(28)
Floor Type 2					47.47	4 x	0.12		5.69688	<u>,                                     </u>				7,00
Malla Torra							0.12	=	3.03000	<u> </u>				(28
vvalis Type1	48.1	7	11.48	3	36.69	) x	0.15	= [ = [	5.5					╡
• •	48.1 17.6		11.48	3	36.69 15.68	_		=						(29
Walls Type2	17.6	68		3		x	0.15	= [	5.5					(29
Walls Type2 Total area of e	17.6 elements	, m <sup>2</sup> ows, use e	2	ndow U-ve	15.68 139.1	3 x	0.15	= [	5.5		paragraph	13.2		(29
Walls Type2 Total area of e * for windows and ** include the are	17.6 elements d roof windo	, m <sup>2</sup> ows, use e sides of in	2 ffective will ternal wall	ndow U-ve	15.68 139.1	X 7 Pated using	0.15 0.14	= [ = [ /[(1/U-valu	5.5		paragraph			(29 (29 (31
Walls Type2 Total area of e * for windows and ** include the are Fabric heat lo	17.6 elements d roof winder as on both	ows, use e sides of in	2 ffective will ternal wall	ndow U-ve	15.68 139.1	X 7 Pated using	0.15	= [ = [ /[(1/U-valu + (32) =	5.5 2.22 e)+0.04] a	s given in		34		(29 (29 (31)
Walls Type2 Total area of e * for windows and ** include the are Fabric heat lo Heat capacity	17.6 elements of roof windown ss, W/K = Cm = S(	ows, use e sides of in = S (A x K)	2 ffective wi iternal wall	ndow U-va	15.68 139.1' alue calcul	3 × 7	0.15 0.14	= [ = [ /[(1/U-value) + (32) = ((28)	5.5 2.22 e)+0.04] a	as given in 2) + (32a).		789	3.16	(29 (29 (31 (33 (34
Walls Type2 Total area of e * for windows and ** include the are Fabric heat lo Heat capacity Thermal mass	17.6 elements d roof windd as on both ss, W/K = Cm = S(	, m² ows, use e sides of in = S (A x k) eter (TMF	ffective winternal walk U) $P = Cm \div$	ndow U-va s and part	15.68 139.1 alue calculations	X 7 lated using	0.15 0.14 formula 1. (26)(30)	= [   = [ 	5.5 2.22 e)+0.04] a .(30) + (32 tive Value:	as given in 2) + (32a).	(32e) =	34	3.16	(29 (29 (31 (33 (34
Walls Type2 Total area of e * for windows and ** include the are Fabric heat lo Heat capacity Thermal mass For design asses	17.6 elements d roof windo as on both ss, W/K = Cm = S( s parame sments who	ows, use e sides of in S (A x k) eter (TMF)	ffective winternal walk U)  P = Cm ÷	ndow U-va s and part	15.68 139.1 alue calculations	X 7 lated using	0.15 0.14 formula 1. (26)(30)	= [   = [ 	5.5 2.22 e)+0.04] a .(30) + (32 tive Value:	as given in 2) + (32a).	(32e) =	789	3.16	(29 (29 (31 (33 (34
Walls Type2 Total area of e * for windows and ** include the are Fabric heat lo Heat capacity Thermal mass For design asses can be used inste	17.6 elements. It roof winder as on both as s, W/K = Cm = S( as parame sments who ad of a details.	ows, use e sides of in = S (A x k) ter (TMF) ere the detailed calculations	ffective winternal walk  U)  P = Cm ÷ tails of the ulation.	ndow U-va s and part - TFA) ir constructi	15.68 139.1 alue calculations kJ/m²K	3 x 7 Pated using	0.15 0.14 formula 1. (26)(30)	= [   = [ 	5.5 2.22 e)+0.04] a .(30) + (32 tive Value:	as given in 2) + (32a).	(32e) =	789	3.16	(29) (29) (31) (33) (34) (35)
Walls Type2 Total area of e * for windows and ** include the are Fabric heat lo Heat capacity Thermal mass For design asses can be used inste	17.6 elements of roof windows, W/K = Cm = S( as parame sments who add of a detection estimated in the control of the control o	ows, use e sides of in S (A x k) eter (TMF) ere the detailed calcu	ffective winternal walk  U)  P = Cm ÷ tails of the ulation. culated to	ndow U-vals and part - TFA) ir constructi	15.68 139.1 alue calculatitions kJ/m²K ion are not	3 x 7 Pated using	0.15 0.14 formula 1. (26)(30)	= [   = [ 	5.5 2.22 e)+0.04] a .(30) + (32 tive Value:	as given in 2) + (32a).	(32e) =	34 789	3.16	(29 (29 (31 (33 (34 (35
Walls Type2 Total area of e * for windows and ** include the are Fabric heat lo Heat capacity Thermal mass For design asses can be used inste Thermal bridg if details of therm	17.6 elements d roof windo as on both ss, W/K = Cm = S( s parame sments who ead of a det es : S (L al bridging	ows, use e sides of in S (A x k) eter (TMF) ere the detailed calcu	ffective winternal walk  U)  P = Cm ÷ tails of the ulation. culated to	ndow U-vals and part - TFA) ir constructi	15.68 139.1 alue calculatitions kJ/m²K ion are not	3 x 7 Pated using	0.15 0.14 formula 1. (26)(30)	= [ = [ /[(1/U-valu + (32) = ((28) Indica	5.5 2.22 e)+0.04] a .(30) + (32 tive Value:	as given in 2) + (32a).	(32e) =	34 789	3.16	(29 (29 (31 (33 (34 (35) (36)
Walls Type2 Total area of e * for windows and ** include the are Fabric heat lo Heat capacity Thermal mass For design asses can be used inste Thermal bridg if details of therm Total fabric he	17.6 elements of roof windows, W/K = Cm = S( as parame sments who ad of a detect of a loring part loss	, m² ows, use e sides of in = S (A x k) eter (TMF) ere the detailed calculated alculated	ffective winternal walk U)  P = Cm ÷ tails of the plation. culated to cown (36) =	ndow U-vals and part - TFA) ir constructi using Ap	15.68 139.1 alue calculatitions kJ/m²K ion are not	x 7 Pated using	0.15 0.14 formula 1. (26)(30)	= [ = [ - (1/U-value) + (32) = ((28) Indicative indicative (33) + (38)m	5.5 2.22 ee)+0.04] a .(30) + (32 tive Values e values of	2) + (32a).: : Low	(32e) =	34 789 10	3.16	(29 (31 (33 (34 (35) (36)
Walls Type1 Walls Type2 Total area of e * for windows and ** include the are Fabric heat lo Heat capacity Thermal mass For design asses can be used inste Thermal bridg if details of therm Total fabric he Ventilation he	17.6 elements of roof windows, W/K = Cm = S( s parame sments who add of a det es : S (L al bridging eat loss at loss called the second of the	, m² ows, use e sides of in = S (A x K) ter (TMF) ere the detailed calculated Mar	ffective winternal walk U)  P = Cm ÷ tails of the ulation. culated u own (36) =	ndow U-vals and part  - TFA) ir  constructi  using Ap  = 0.05 x (3	15.68 139.1 alue calculatitions kJ/m²K fon are not spendix k	x 7 ated using	0.15 0.14 formula 1. (26)(30) ecisely the	= [ = [ -   = [ -   (1/U-value) + (32) = ((28) Indicative indicative (33) + (38)m Sep	5.5 2.22  2.22  2.30) + (32) 2.	2) + (32a).: Low TMP in Ta	(32e) = able 1f  Dec	34 789 10	3.16	(29 (29 (31 (33 (34 (35 (36 (37
Walls Type2 Total area of e * for windows and ** include the are Fabric heat lo Heat capacity Thermal mass For design asses can be used inste Thermal bridg if details of therm Total fabric he Ventilation he	17.6 elements of roof windows on both as on both as on both as on both as parame sments who ad of a detect at loss cat loss cat	, m² ows, use e sides of in = S (A x k) eter (TMF) ere the detailed calculated alculated	ffective winternal walk  U)  P = Cm ÷ tails of the plation. culated to cown (36) =	ndow U-vels and part - TFA) ir construction using Ap	15.68 139.1 alue calculations  kJ/m²K fon are not	x 7 Pated using	0.15 0.14 formula 1. (26)(30)	= [ = [ - (1/U-value) + (32) = ((28) Indicative indicative (33) + (38)m	5.5 2.22 2.22 2.(30) + (32) 2.(30) + (32) 2.(30) + (32) 2.(30) + (32) 3.(30) + (32) 4.	2) + (32a).: Low TMP in Ta	(32e) = able 1f	34 789 10	3.16	(29 (29 (31 (33 (34 (35 (36 (37
Walls Type2 Total area of e * for windows and ** include the are Fabric heat lo Heat capacity Thermal mass For design asses can be used inste Thermal bridg if details of therm Total fabric he Ventilation he Jan	17.6 elements d roof windo as on both ss, W/K = Cm = S( s parame sments whe ead of a det es : S (L al bridging eat loss at loss ca Feb 33.6	, m² ows, use e sides of in = S (A x k) eter (TMF) ere the detailed calculated are not known alculated Mar 33.47	ffective winternal walk U)  P = Cm ÷ tails of the ulation. culated u own (36) =	ndow U-vals and part  - TFA) ir  constructi  using Ap  = 0.05 x (3	15.68 139.1 alue calculatitions kJ/m²K fon are not spendix k	x 7 ated using	0.15 0.14 formula 1. (26)(30) ecisely the	= [   = [   = [   /[(1/U-valu   + (32) =   ((28)   Indica   indicative   (33) +   (38)m   Sep   32.39	5.5 2.22  2.22  2.30) + (32) 2.	2) + (32a). Low TMP in To 25)m x (5) Nov 32.96	(32e) = able 1f  Dec	34 789 10	3.16	(28) (29) (29) (31) (33) (34) (35) (36) (37) (38)

Heat loss para	ameter (I	HLP), W	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 1.11	1.11	1.11	1.1	1.1	1.09	1.09	1.09	1.09	1.1	1.1	1.11		
							ı		Average =	Sum(40) <sub>1</sub>	12 /12=	1.1	(40)
Number of day	<del></del>	nth (Tab	le 1a)	1	ı	1			1				
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		()
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water hea	ting ene	rgy requi	rement:								kWh/ye	ear:	
Assumed occurring TFA > 13.1 if TFA £ 13.1	9, N = 1		[1 - exp	0.0003	349 x (TF	FA -13.9	)2)] + 0.0	0013 x (¯	TFA -13.		32		(42)
Annual average Reduce the annual not more that 125	al average	hot water	usage by	$5\%$ if the $\alpha$	lwelling is	designed	,		se target o		.09		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage i	in litres pe	r day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)						
(44)m= 103.5	99.74	95.98	92.21	88.45	84.68	84.68	88.45	92.21	95.98	99.74	103.5		
_	·					· _				m(44) <sub>112</sub> =		1129.13	(44)
Energy content of											c, 1d)		
(45)m= 153.49	134.25	138.53	120.77	115.88	100	92.66	106.33	107.6	125.4	136.89	148.65		<b>–</b>
If instantaneous v	vater heati	ina at point	of use (no	o hot water	r storage).	enter 0 in	boxes (46		Total = Su	m(45) <sub>112</sub> =	=	1480.46	(45)
(46)m= 0	0	0	0	0	0	0	0	0	0	0	0		(46)
Water storage	1 *		0								Ů		()
Storage volum	ne (litres)	) includir	ig any s	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community h	neating a	and no ta	nk in dw	velling, e	nter 110	) litres in	(47)						
Otherwise if no		hot wate	er (this in	ncludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (	(47)			
Water storage		oolorod l	ooo foot	or io kno		2/d0x/):							(40)
a) If manufact				or is kno	wn (Kvvr	i/day):					0		(48)
Temperature f							(40) (40)				0		(49)
Energy lost from b) If manufact		_	-		or is not		(48) x (49)	) =			0		(50)
Hot water stor			-								0		(51)
If community h	_		on 4.3										
Volume factor			Ol-								0		(52)
Temperature f											0		(53)
Energy lost fro Enter (50) or		_	, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =		0		(54)
Water storage	` , ` `	,	or oach	month			((56)m - (	55) × (41)	m		0		(55)
	1	1							1				(50)
(56)m= 0 If cylinder contain	0 s dodicato	0	0	0 = (56)m	0 (50) /	0	0 0 0 0 0	0 7\m = (56)	0 m whore (	0 H11) is fro	0 m Append	iv Ll	(56)
	1							1				IX I I	<b></b> \
(57)m= 0	0	0	0	0	0	0	0	0	0	0	0		(57)
Primary circuit	,	•									0		(58)
Primary circuit				,	•	. ,	, ,		414				
(modified by	1	1			i		<del></del>	<del></del>		<del>'</del>			(50)
(59)m= 0	0	0	0	0	0	0	0	0	0	0	0		(59)

Combi loss calc	ulated fo	or each	month (	(61)m =	(60) ÷ '	365 <b>v</b> (41	)m							
(61)m= 0	0	0	0	0	0	0	) 0		0	0	0	0	]	(61)
Total heat requi	red for v	water he	eating ca	alculated	L I for ea	 ch month	(62)ı	— n =	0.85 × (	′45)m +	(46)m +	(57)m +	ı · (59)m + (61)m	
		117.75	102.66	98.5	85	78.76	90.3	_	91.46	106.59	116.35	126.35	]	(62)
Solar DHW input ca	lculated u	sing Appe	endix G or	· Appendix	H (nega	tive quantity	y) (ent	er '0'	if no sola	r contribu	tion to wate	r heating)	<b>.</b>	
(add additional I												•		
(63)m= 0	0	0	0	0	0	0	0		0	0	0	0	]	(63)
Output from wat	ter heate	er									•	•	•	
(64)m= 130.47	114.11	117.75	102.66	98.5	85	78.76	90.3	38	91.46	106.59	116.35	126.35	]	
	•	•						Outp	ut from wa	ater heate	er (annual) <sub>1</sub>	l12	1258.39	(64)
Heat gains from	water h	neating,	kWh/mo	onth 0.2	5 ´ [0.8	5 × (45)m	+ (6	1)m	i] + 0.8 x	((46)m	+ (57)m	+ (59)m	ı ]	
(65)m= 32.62	28.53	29.44	25.66	24.63	21.25	19.69	22.	6	22.87	26.65	29.09	31.59	]	(65)
include (57)m	in calcu	ulation o	of (65)m	only if c	ylinder	is in the	dwell	ing	or hot w	ater is f	rom com	munity h	- neating	
5. Internal gair	ns (see	Table 5	and 5a	):										
Metabolic gains	(Table	5), Watt	ts											
Jan	Feb	Mar	Apr	May	Jun	Jul	Αι	Jg	Sep	Oct	Nov	Dec	]	
(66)m= 116.19	116.19	116.19	116.19	116.19	116.19	116.19	116.	.19	116.19	116.19	116.19	116.19	]	(66)
Lighting gains (d	calculate	ed in Ap	pendix	L, equat	ion L9	or L9a), a	lso s	ee 7	Γable 5				-	
(67)m= 19.14	17	13.82	10.47	7.82	6.61	7.14	9.2	8	12.45	15.81	18.45	19.67	]	(67)
Appliances gain	ıs (calcu	lated in	Append	dix L, eq	uation	L13 or L1	3a), a	also	see Tal	ble 5		-	-	
(68)m= 204.9	207.02	201.67	190.26	175.86	162.33	153.29	151.	.16	156.52	167.93	182.32	195.86	]	(68)
Cooking gains (	calculat	ed in Ap	pendix	L, equat	ion L1	or L15a	), als	o se	e Table	5		•	•	
(69)m= 34.62	34.62	34.62	34.62	34.62	34.62	34.62	34.6	62	34.62	34.62	34.62	34.62	]	(69)
Pumps and fans	s gains (	Table 5	ia)										•	
(70)m= 0	0	0	0	0	0	0	0		0	0	0	0	]	(70)
Losses e.g. eva	poration	n (negat	ive valu	es) (Tab	le 5)							-	-	
(71)m= -92.95	-92.95	-92.95	-92.95	-92.95	-92.95	-92.95	-92.	95	-92.95	-92.95	-92.95	-92.95	]	(71)
Water heating g	ains (Ta	able 5)				-					-	-	-	
(72)m= 43.84	42.45	39.57	35.64	33.1	29.51	26.47	30.3	37	31.76	35.82	40.4	42.46	]	(72)
Total internal g	jains =				(6	6)m + (67)m	า + (68	)m +	- (69)m + (	(70)m + (7	71)m + (72)	)m	-	
(73)m= 325.73	324.33	312.91	294.23	274.64	256.3	244.75	248.	.67	258.59	277.41	299.03	315.84	]	(73)
6. Solar gains:														
Solar gains are cal	lculated u	sing solar	flux from	Table 6a	and asso	ciated equa	tions t	о со	nvert to th	e applica		tion.		
Orientation: Ac		actor	Area			ux able 6a		т.	g_ able 6b	т	FF		Gains	
	able 6d		m²			abie 6a		- 1	able ob	_ '	able 6c		(W)	,
Northeast <sub>0.9x</sub>	0.77	X	7.6	66	x	11.28	X		0.63	x	0.7	=	26.42	(75)
Northeast <sub>0.9x</sub>	0.77	X	7.6	66	X	22.97	X		0.63	x	0.7	=	53.77	(75)
Northeast <sub>0.9x</sub>	0.77	X	7.6	66	x	41.38	X		0.63	x	0.7	=	96.88	(75)
Northeast <sub>0.9x</sub>	0.77	X	7.6	66	x	67.96	X		0.63	x	0.7	=	159.11	(75)
Northeast <sub>0.9x</sub>	0.77	X	7.6	66	X	91.35	X		0.63	X	0.7	=	213.87	(75)

		_			_		_		_				_
Northeast <sub>0.9x</sub>	0.77	X	7.6	66	X	97.38	×	0.63	X	0.7	=	228.01	(75)
Northeast <sub>0.9x</sub>	0.77	X	7.6	66	x	91.1	X	0.63	X	0.7	=	213.3	(75)
Northeast <sub>0.9x</sub>	0.77	X	7.6	66	x	72.63	X	0.63	X	0.7	=	170.04	(75)
Northeast <sub>0.9x</sub>	0.77	X	7.6	66	X	50.42	X	0.63	X	0.7	=	118.05	(75)
Northeast <sub>0.9x</sub>	0.77	x	7.6	66	x	28.07	X	0.63	X	0.7	=	65.71	(75)
Northeast <sub>0.9x</sub>	0.77	X	7.6	66	x	14.2	X	0.63	X	0.7	=	33.24	(75)
Northeast <sub>0.9x</sub>	0.77	x	7.6	66	x	9.21	X	0.63	X	0.7	=	21.57	(75)
Southeast <sub>0.9x</sub>	0.77	x	3.8	32	x	36.79	X	0.63	X	0.7	=	42.94	(77)
Southeast <sub>0.9x</sub>	0.77	x	3.8	32	x	62.67	x	0.63	X	0.7	=	73.15	(77)
Southeast 0.9x	0.77	x	3.8	32	x	85.75	x	0.63	X	0.7	=	100.08	(77)
Southeast <sub>0.9x</sub>	0.77	x	3.8	32	x	106.25	X	0.63	X	0.7		124.01	(77)
Southeast <sub>0.9x</sub>	0.77	x	3.8	32	x	119.01	X	0.63	X	0.7		138.9	(77)
Southeast <sub>0.9x</sub>	0.77	×	3.8	32	x	118.15	X	0.63	x	0.7	=	137.9	(77)
Southeast <sub>0.9x</sub>	0.77	×	3.8	32	x	113.91	X	0.63	x	0.7		132.95	(77)
Southeast <sub>0.9x</sub>	0.77	×	3.8	32	x	104.39	X	0.63	X	0.7		121.84	(77)
Southeast <sub>0.9x</sub>	0.77	×	3.8	32	x	92.85	X	0.63	x	0.7	<del>-</del>	108.37	(77)
Southeast <sub>0.9x</sub>	0.77	×	3.8	32	x	69.27	X	0.63	x	0.7		80.84	(77)
Southeast <sub>0.9x</sub>	0.77	×	3.8	32	x	44.07	X	0.63	X	0.7		51.44	(77)
Southeast <sub>0.9x</sub>	0.77	×	3.8	32	x	31.49	X	0.63	x	0.7	<del>=</del>	36.75	(77)
Solar gains in	· · ·					-	<del>``</del>	n = Sum(74)m	<del>-                                    </del>	-	ī	1	(0.0)
(83)m= 69.36		96.97	283.12	352.77	365.		291	.88 226.42	146.5	84.68	58.32		(83)
Total gains – i		-			<u>`</u>		1 - 40	55 405 04	100.0	7   000 74	07447	1	(0.4)
(84)m= 395.09	451.25 50	09.88	577.34	627.41	622.2	590.99	540	.55 485.01	423.9	7 383.71	374.17		(84)
7. Mean inter	•		`		′								_
Temperature	Ū	٠.			•		ble 9	, Th1 (°C)				21	(85)
Utilisation fac	<del></del>				<del>r`                                    </del>	<del></del>	_	ı	1	<u> </u>	1	1	
Jan	-	Mar	Apr	May	Jui	-	+	ug Sep	Oct	+	Dec		(0.0)
(86)m= 0.97	0.96	0.94	0.88	0.79	0.66	0.53	0.5	0.78	0.91	0.96	0.98		(86)
Mean interna	l temperatu	re in I	iving ar	ea T1 (fo	ollows	steps 3 to	7 in T	able 9c)	1		1	1	
(87)m= 18.59	18.83 1	9.27	19.84	20.37	20.7	4 20.9	20.	86 20.56	19.88	19.13	18.53		(87)
Temperature	during hea	ting p	eriods ir	rest of	dwelli	ng from Ta	able 9	9, Th2 (°C)				_	
(88)m= 19.99	19.99 1	9.99	20	20	20.0	1 20.01	20.	01 20.01	20	20	20		(88)
Utilisation fac	tor for gain	s for r	est of d	welling,	h2,m	(see Table	9a)						
(89)m= 0.97	0.96	0.93	0.86	0.75	0.59	0.43	0.4	18 0.72	0.89	0.96	0.97		(89)
Mean interna	l temperatu	re in t	the rest	of dwell	ing T2	(follow st	eps 3	to 7 in Tab	le 9c)		-		
(90)m= 17.77		8.45	19.01	19.51	19.8	<u> </u>	19.		19.06	18.32	17.73		(90)
		!							fLA = Liv	/ing area ÷ (₄	4) =	0.32	(91)
Mean interna	l temperatu	ire (fo	r the wh	ole dwe	lling) -	= fl A <b>∨</b> T1	+ (1	_ fl Δ\ <b>⊻</b> Τ2					
(92)m= 18.03	<del> </del>	8.71	19.28	19.79	20.1	1	20.	<del></del>	19.32	18.58	17.98		(92)
Apply adjustr					<u> </u>						<u> </u>	1	• •
				•			,	' '	•				

(93)m=	18.03	18.28	18.71	19.28	19.79	20.13	20.26	20.23	19.97	19.32	18.58	17.98		(93)
` '			uirement		10.70	20.10	20.20	20.20	10.01	10.02	10.00	17.00		(==)
					ro obtair	and at et	on 11 of	Table Or	o so tha	t Ti m-(	76)m an	d re-calc	ulato	
				using Ta		ieu at st	ер 11 ог	Table 31	), 30 tria	( 11,111–(	r O)III air	u re-caic	uiate	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	ation fac		ains, hm	· ·			Į.		•					
(94)m=	0.96	0.94	0.91	0.85	0.74	0.6	0.45	0.51	0.72	0.88	0.94	0.96		(94)
Usefu	ıl gains,	hmGm .	W = (94	1)m x (8	4)m		!	!				<u> </u>		
(95)m=	378.82	425.03	464.04	488.72	465.69	371.31	268.82	273.85	348.49	372.74	361.75	360.59		(95)
Month	nly avera	age exte	rnal tem	perature	from Ta	able 8	ļ	ļ				<u> </u>		
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat	loss rate	for mea	an intern	al tempe	erature,	Lm , W =	=[(39)m :	x [(93)m-	– (96)m	1				
		1089.96	993.04	837.75	651.65	442.5	292.87	306.61	471.23	703.15	928.08	1117.7		(97)
Space	e heatin	g require	ement fo	r each n	nonth, k	Wh/mon	th = 0.02	24 x [(97)	m – (95	)m] x (4 <sup>-</sup>	1)m			
(98)m=	552	446.83	393.58	251.3	138.35	0	0	0	0	245.83	407.76	563.29		
					<u> </u>			Tota	l per year	(kWh/year	) = Sum(9	8) <sub>15,912</sub> =	2998.94	(98)
Space	hootin.	a roquir	omont in	kWh/m²	2/voor						,	, I	40.04	□ □(99)
					ува							l	40.91	(99)
8c. Sp	pace co	oling rec	uiremen	nt										
Calcu				August.	l .		1			_				
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
1		<u> </u>			1	<del></del>		and exte		_		r i		(100)
(100)m=	0	0	0	0	0	752.5	592.4	607.64	0	0	0	0		(100)
ĺ		tor for lo			i							<del>- 1</del>		(151)
(101)m=		0	0	0	0	0.76	0.82	0.79	0	0	0	0		(101)
				(100)m x	<u> </u>	1								
(102)m=	0	0	0	0	0	569.86	485.07	478.38	0	0	0	0		(102)
						1		e Table						
(103)m=		0	0	0	0	813.73	775.54	718.08	0	0	0	0		(103)
						dwelling,	continu	ous ( kW	h) = 0.02	24 x [(10	03)m – (	102)m] x	(41)m	
`	04)m to	2ero II (		3 × (98	)m 0	175.58	216.11	178.33	0	0	0			
(104)m=	U	U	0	0	U U	175.56	216.11	176.33	0 T-1-1	0	0	0		7(101)
Coolog	I fraction	,								= Sum(	104) area ÷ (4	=	570.03	(104) (105)
			able 10b	)					10=	coolea	aiea - (²	+) =	1	(103)
(106)m=		0	0	0	0	0.25	0.25	0.25	0	0	0	0		
(100)	Ů	ŭ	ŭ			0.20	0.20	0.20		' = Sum(		=	0	(106)
Space	cooling	requirer	nent for	month =	: (104)m	× (105)	× (106)r	m	rotar	= <i>Sum</i> (	I <del>MT</del> )	_		(100)
(107)m=		0	0	0	0	43.9	54.03	44.58	0	0	0	0		
( - /		-	-				<u> </u>	<u> </u>	Total	= Sum(		=	142.51	(107)
Caaaa	ممالمم			·\						`	16081 )	_		┥
•		•		:Wh/m²/y					` ′	÷ (4) =			1.94	(108)
				alculated	only un	ider spec	cial cond	litions, se		· ·				
Fabrio	Energy	/ Efficier	псу						(99) -	+ (108) =	=		42.85	(109)

### **SAP Input**

#### Property Details: Plot 15

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 73.311 m<sup>2</sup> 2.5 m

Living area: 23.389 m<sup>2</sup> (fraction 0.319)

Front of dwelling faces: South West

#### Opening types:

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

SW Manufacturer Solid

NEManufacturerWindowsdouble-glazedYesSEManufacturerWindowsdouble-glazedYes

Name:	Gap:	Frame Factor	: g-value:	U-value:	Area:	No. of Openings:
SW	mm	0	0	1.4	2	1
NE	16mm or more	0.7	0.63	1.4	7.661	1

SE 16mm or more 0.7 0.63 1.4 3.819 1

Name: Type-Name: Location: Orient: Width: Hei

Name:Type-Name:Location:Orient:Width:Height:SWCorridor WallSouth West00NEExternal WallNorth East00SEExternal WallSouth East00

Overshading: Average or unknown

#### Opaque Elements:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Element	<u>s</u>						
External Wall	48.174	11.48	36.69	0.15	0	False	N/A
Corridor Wall	17.681	2	15.68	0.15	0.4	False	N/A
Exposed Floor	25.837			0.12			N/A
Ground Floor	47.474			0.12			N/A
Internal Element	S						

Dorty Clomonto

Party Elements

Thermal bridges: User-defined (individual PSI-values) Y-Value = 0.0958

Length Psi-value

4.918 0.29 E2 Other lintels (including other steel lintels)

### **SAP Input**

	17.7	0.048	E4	Jamb
	24.168	0.067	E7	Party floor between dwellings (in blocks of flats)
[Approved]	5.45	0.06	E18	Party wall between dwellings
	5.45	0.098	E25	Staggered party wall between dwellings
	8.175	0.085	E16	Corner (normal)
[Approved]	2.725	-0.09	E17	Corner (inverted internal area greater than external area)
	9.176	0.279	E20	Exposed floor (normal)
[Approved]	14.992	0.16	E5	Ground floor (normal)
	19.219	0	P3	Intermediate floor between dwellings (in blocks of flats)
	11.007	0.16	P7	Exposed floor (normal)
	8.792	0.16	P1	Ground floor

Ventilation:

Pressure test: Yes (As designed)

Ventilation: Balanced with heat recovery

Number of wet rooms: Kitchen + 2

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

 $Piping \! > = \! 1991, pre\text{-}insulated, low temp, variable flow$ 

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: 0.9 Tilt of collector: 30°

## **SAP Input**

Overshading: None or very little Collector Orientation: South West

Assess Zero Carbon Home:

Nο

		User	Details: _						
Assessor Name: Software Name:	Zahid Ashraf Stroma FSAP 2012								
		Property	Address	: Plot 15	;				
Address :									
1. Overall dwelling dime	nsions:	Δ = 4	na/m²\		۸۰، ۵۰	iaht/m\		Valuma/m³	1
Ground floor	Secondary   Seco		<u>^</u>						
Total floor area TEA - (1s	Name: Zahid Ashraf Stroma Number: Software Version:  Property Address: Plot 15  Area(m²) Av. Height(m. 73.31 (1a) × 2.5  a TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n) 73.31 (4) × 2.5  a TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n) 73.31 (4)  The (3a)+(3b)+(3c)+(3d)+(3e)+.  Area(m²) Av. Height(m. 73.31 (1a) × 2.5  a TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n) 73.31 (4)  The (3a)+(3b)+(3c)+(3d)+(3e)+.  Trate:    main			100.20	(227)				
	me: Stroma FSAP 2012  Property Address: Plot 15  Area(m²)  73.31  (1a) ×  TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n)  Ta.31  (4)  (3a)+(3b)  (3a)+(3b)  (3a)  (4)  (3a)+(3b)  (3a)  (4)  (3a)+(3b)  (3a)  (4)  (3a)+(3b)  (3a)  (4)  (3a)+(3b)  (4)  (3a)+(3b)  (5a)  (6b)  (7a)		V (30) (30	4) 1 (30) 1	(3n) -		<b>7</b>		
Dwelling volume				(3a)+(3b	1)+(30)+(30	i)+(3e)+	(311) =	183.28	(5)
2. Ventilation rate:	Stroma Number:   Stroma FSAP 2012   Software Version:   Version: 1.0.5.9								
Number of abises are	heating heating	<u>g</u> _		- 			40 -	-	_
Number of chimneys		ᆜ 날	0	╛╘	0			0	╡``
Number of open flues		+	0	」 <u> </u>	0	X	20 =	0	(6b)
Number of intermittent far	Stroma Number:   Stroma FSAP 2012   Software Version:		10 =	30	(7a)				
Number of passive vents					0	X	10 =	0	(7b)
Number of flueless gas fire	res				0	X	40 =	0	(7c)
							Air ch	anges ner he	SUP.
Inditration due to abicomo	re fluer and fame (60) (6h)	. (7a) . (7b) .	(70) –	Г					_
•				continue fi		(16)	÷ (5) =	0.16	(8)
			0.1.01.11.00		o (o) to	(1.5)		0	(9)
Additional infiltration						[(9	)-1]x0.1 =	0	(10)
				•	ruction			0	(11)
• • • • • • • • • • • • • • • • • • • •	·	g to the grea	ater wall are	ea (after					
= -		0.1 (seal	ed), else	enter 0				0	(12)
If no draught lobby, ent	er 0.05, else enter 0							0	(13)
<u>-</u>	and doors draught stripped	t						0	(14)
Window infiltration						. (45)		0	= ' '
Infiltration rate	aEO ayaraaad in aybia ma	traa nar b					- oroo		= ' '
•		•	•	•	ietre or e	envelope	e area		=
•	•				is being u	sed		0.41	(10)
Number of sides sheltere	d							2	(19)
Shelter factor			•	`	19)] =			0.85	(20)
•	-		(21) = (18	s) x (20) =				0.35	(21)
	<del></del>	<del></del>	1 ,			T	T 5	1	
		n   Jul	Aug	Sep	Oct	Nov	Dec		
<del> </del>	<del>-                                    </del>	1 20	1 27	<u> </u>	1 42	1.5	1 4 7	1	
(22)m= 5.1 5	4.5 4.4 4.3 3.8	3.8	3.1	<u> </u>	4.3	4.5	1 4.7	J	
Wind Factor (22a)m = $(22$	2)m ÷ 4							_	
(22a)m= 1.27 1.25	1.23 1.1 1.08 0.95	0.95	0.92	1	1.08	1.12	1.18		

Adjusted infiltr	ation rat	e (allowi	ng for sh	nelter an	d wind s	speed) =	(21a) x	(22a)m					
0.45	0.44	0.43	0.39	0.38	0.33	0.33	0.33	0.35	0.38	0.4	0.41	]	
Calculate effe		_	rate for t	he appli	cable ca	se	•		•	•			
If mechanical If exhaust air h			endix N (2	(23a) = (23a	a) × Fmv (e	equation (N	NS)) othe	rwise (23h	) = (23a)			0	(23
If balanced with									) = (23a)			0	(23
		•	-	_					Oh)m ı (	22h) v [	1 (220)	0	(23
a) If balance (24a)m= 0		o l	nillation 0	o with ne	0		1K) (24a	$\frac{1}{0} = \frac{2}{2}$	0	230) × [	$\frac{1 - (230)}{1}$	1 <del>-</del> 100] ]	(24
b) If balance												l	(= .
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0	1	(24
c) If whole h												J	`
,		(23b), t		•	•				.5 × (23b	o)			
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0	]	(24
d) If natural	ventilation	on or wh	ole hous	se positiv	ve input	ventilatio	on from I	oft				J	
if (22b)r	n = 1, th	en (24d)	m = (22l	o)m othe	erwise (2	4d)m =	0.5 + [(2	2b)m² x	0.5]				
(24d)m= 0.6	0.6	0.59	0.57	0.57	0.56	0.56	0.55	0.56	0.57	0.58	0.59		(24
Effective air	change	rate - er	iter (24a	) or (24k	o) or (24	c) or (24	d) in box	(25)			,		
(25)m= 0.6	0.6	0.59	0.57	0.57	0.56	0.56	0.55	0.56	0.57	0.58	0.59		(25
3. Heat losse	s and he	eat loss r	paramet	er:									
ELEMENT	Gros	_	Openin		Net Ar	ea	U-valı	ue	AXU		k-value	9	AXk
	area		'n		A ,r	m²	W/m2		(W/I	K)	kJ/m²-l		kJ/K
Doors					2	Х	1	=	2				(26
Nindows Type	e 1				7.661	x1.	/[1/( 1.4 )+	0.04] =	10.16				(27
Windows Type	e 2				3.819	x1.	/[1/( 1.4 )+	0.04] =	5.06				(27
Floor Type 1					25.83	7 x	0.13	=	3.3588	1 [			(28
Floor Type 2					47.47	4 x	0.13	<b>-</b>	6.17161	9			(28
Walls Type1	48.1	17	11.4	8	36.69	) x	0.18	=	6.6	₹ i			(29
Walls Type2	17.6	88	2		15.68	3 x	0.18		2.82	₹ i			(29
Total area of e	elements	, m²			139.1	7							(31
* for windows and	l 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				ls and par	titions		(0.0) (0.0)	(00)					
Fabric heat los		,	U)				(26)(30)			_, ,,	, ,	36.18	(33
Heat capacity		. ,						., ,	(30) + (32	, , ,	(32e) =	7893.16	
Thermal mass	•	`		,					tive Value			250	(35
For design asses: can be used inste				construct	ion are no	t known pr	ecisely the	e indicative	e values of	IMP IN I	able 1f		
Thermal bridg	es : S (L	x Y) cal	culated (	using Ap	pendix I	<						11.77	(36
f details of therma	al bridging	are not kn	own (36) =	= 0.05 x (3	11)								
Total fabric he	at loss							(33) +	(36) =			47.94	(37
Ventilation hea	at loss ca	alculated	monthly	У				(38)m	= 0.33 × (	(25)m x (5)	)	1	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(38)m= 36.32	36.08	35.85	34.77	34.56	33.62	33.62	33.44	33.98	34.56	34.97	35.4		(38
Heat transfer	coefficie	nt, W/K						(39)m	= (37) + (3	38)m			
(39)m= 84.26	84.03	83.8	82.71	82.51	81.56	81.56	81.38	81.92	82.51	82.92	83.35		
									Average =	Sum(39) <sub>1</sub>	12 /12=	82.71	(39

eat loss para	meter (H	HLP), W/	′m²K					(40)m	= (39)m ÷	· (4)			
0)m= 1.15	1.15	1.14	1.13	1.13	1.11	1.11	1.11	1.12	1.13	1.13	1.14		
umber of day	s in mor	nth (Tahl	le 1a)		-	-		,	Average =	Sum(40) <sub>1</sub> .	12 /12=	1.13	(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	gy requi	rement:								kWh/ye	ar:	
ssumed occu if TFA > 13.9 if TFA £ 13.9	, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9	)2)] + 0.0	0013 x ( <sup>-</sup>	TFA -13.		32		(42
nnual averago educe the annua ot more that 125	e hot wa I average	hot water	usage by	5% if the a	lwelling is	designed t			se target o		.39		(43
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
ot water usage in	litres per	day for ea	ach month	Vd,m = fa	ctor from	Table 1c x	(43)	•	•	•			
4)m= 98.33	94.75	91.18	87.6	84.03	80.45	80.45	84.03	87.6	91.18	94.75	98.33		<b></b> ,,
nergy content of	hot water	used - cal	culated mo	onthly $= 4$ .	190 x Vd,r	n x nm x E	Tm / 3600			m(44) <sub>112</sub> = ables 1b, 1	<u>L</u>	1072.67	(44
5)m= 145.82	127.53	131.6	114.73	110.09	95	88.03	101.02	102.22	119.13	130.04	141.22		
			. ,						Total = Su	m(45) <sub>112</sub> =		1406.44	(45
instantaneous w						1				<u> </u>			/4/
6)m= 0 /ater storage	0 loss:	0	0	0	0	0	0	0	0	0	0		(4)
torage volum		includin	ig any so	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(4
community h	eating a	nd no ta	nk in dw	elling, e	nter 110	litres in	(47)						
therwise if no		hot wate	er (this in	icludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (	47)			
/ater storage i) If manufacti		eclared lo	oss facto	or is kno	wn (kW/	n/day).					0		(4
emperature fa				) 10 KHO	wii (icvvi	ı, aay).					0		(4
nergy lost fro				ear			(48) x (49)	) =			0		(5
) If manufacti		•	•		or is not		(10)11(10)	•			<u> </u>		(0
ot water stora	•			e 2 (kW	h/litre/da	ay)					0		(5
community h	_		on 4.3										
olume factor	-		Oh.							<b>—</b>	0		(5)
emperature fa											0		(5
nergy lost from		-	, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =		0		(5
Enter (50) or (	, ,	•					((50) (	EE) (44)			0		(5
/ater storage	loss car	culated i	or each	month			((56)m = (	55) × (41)	m -	,			
6)m= 0 cylinder contains	0 dedicated	0 d solar sto	0 rage, (57)ı	0 m = (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	ίΗ	(5
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	55 × (41)	m					•
				,	•	. ,	, ,						
(modified by	factor fr	om Tabl	le H5 if t	here is s	solar wat	ter heatii	ng and a	cylinde	r thermo	stat)			

Combi loss calculated for each month $(61)m = (60) \div 365 \times (41)m$													
(61)m= 0	0	0	0	0 0	00) +	T 0	0	T 0	0	0	0	1	(61)
												J (59)m + (61)m	(- )
(62)m= 123.94		111.86	97.52	93.58	80.75	74.83	85.80		101.26	110.54	120.03	]	(62)
Solar DHW input	<u> </u>											J	(- )
(add additiona										morrio wan	or riodiirig)		
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0	]	(63)
Output from w	rater hea	ter				-1	!		ļ .	-1	!	ı	
(64)m= 123.94		111.86	97.52	93.58	80.75	74.83	85.80	86.89	101.26	110.54	120.03	]	
		<u> </u>		l .			C	utput from w	ater heat	er (annual)	112	1195.47	(64)
Heat gains fro	m water	heating,	kWh/m	onth 0.2	5 ´ [0.8	5 × (45)m	ı + (61	)m] + 0.8	x [(46)m	n + (57)m	+ (59)m	]	_
(65)m= 30.99	27.1	27.97	24.38	23.39	20.19	18.71	21.4	<del></del>	25.32	27.63	30.01	]	(65)
include (57)	m in cal	culation of	of (65)m	only if c	ylinder	is in the	dwellir	ng or hot w	ater is	from com	munity h	neating	
5. Internal g					•						•		
Metabolic gair	ns (Table	e 5), Wat	ts										
Jan	Feb	Mar	Apr	May	Jun	Jul	Au	g Sep	Oct	Nov	Dec	]	
(66)m= 116.19	116.19	116.19	116.19	116.19	116.19	116.19	116.1	9 116.19	116.19	116.19	116.19		(66)
Lighting gains	(calcula	ted in Ap	pendix	L, equat	ion L9	or L9a), a	lso se	e Table 5			-	-	
(67)m= 19.14	17	13.82	10.47	7.82	6.61	7.14	9.28	12.45	15.81	18.45	19.67	]	(67)
Appliances ga	ains (calc	ulated in	Append	dix L, eq	uation	L13 or L1	3a), a	lso see Ta	ıble 5	-	_	-	
(68)m= 204.9	207.02	201.67	190.26	175.86	162.33	153.29	151.1	6 156.52	167.93	182.32	195.86	]	(68)
Cooking gains	s (calcula	ted in A	ppendix	L, equat	ion L1	or L15a	), also	see Table	5	•	-	•	
(69)m= 34.62	34.62	34.62	34.62	34.62	34.62	34.62	34.62	34.62	34.62	34.62	34.62	]	(69)
Pumps and fa	ns gains	(Table 5	5a)					-			-	-	
(70)m= 0	0	0	0	0	0	0	0	0	0	0	0	]	(70)
Losses e.g. e	vaporatio	n (negat	tive valu	es) (Tab	le 5)			-		-	-		
(71)m= -92.95	-92.95	-92.95	-92.95	-92.95	-92.95	-92.95	-92.9	5 -92.95	-92.95	-92.95	-92.95	]	(71)
Water heating	gains (T	able 5)		-				-		-	-		
(72)m= 41.65	40.33	37.59	33.86	31.44	28.04	25.14	28.8	30.17	34.03	38.38	40.33	]	(72)
Total interna	l gains =				(6	6)m + (67)m	n + (68)	m + (69)m +	(70)m + (	71)m + (72)	)m	-	
(73)m= 323.54	322.21	310.94	292.45	272.99	254.83	243.42	247.1	5 257	275.62	297.01	313.72	]	(73)
6. Solar gain	s:												
Solar gains are	calculated	using sola	r flux from	Table 6a	and asso	ciated equa	tions to	convert to the	ne applica		tion.		
Orientation:			Area			ux able 6a		g_ Table 6b	-	FF		Gains	
•	Table 6d		m²			abie 6a	. –	Table 6b		Table 6c		(W)	-
Northeast <sub>0.9x</sub>	0.77	Х	7.6	66	x	11.28	x	0.63	x [	0.7	=	26.42	(75)
Northeast <sub>0.9x</sub>	0.77	X	7.6	66	X	22.97	X	0.63	x	0.7	=	53.77	(75)
Northeast <sub>0.9x</sub>	0.77	X	7.6	66	x	41.38	x	0.63	x [	0.7	=	96.88	(75)
Northeast <sub>0.9x</sub>	0.77	Х	7.6	66	x _	67.96	x	0.63	x [	0.7	=	159.11	(75)
Northeast <sub>0.9x</sub>	0.77	X	7.6	66	X	91.35	X	0.63	X	0.7	=	213.87	(75)

		_			_		_		_				_
Northeast <sub>0.9x</sub>	0.77	X	7.6	6	X	97.38	X	0.63	X	0.7	=	228.01	(75)
Northeast <sub>0.9x</sub>	0.77	X	7.6	6	X	91.1	X	0.63	X	0.7	=	213.3	(75)
Northeast <sub>0.9x</sub>	0.77	X	7.6	66	x	72.63	x	0.63	X	0.7	=	170.04	(75)
Northeast <sub>0.9x</sub>	0.77	X	7.6	66	X	50.42	x	0.63	X	0.7	=	118.05	(75)
Northeast <sub>0.9x</sub>	0.77	X	7.6	66	x	28.07	x	0.63	X	0.7	=	65.71	(75)
Northeast <sub>0.9x</sub>	0.77	X	7.6	6	x	14.2	x	0.63	x	0.7	=	33.24	(75)
Northeast 0.9x	0.77	x	7.6	66	x	9.21	x	0.63	x	0.7	=	21.57	(75)
Southeast 0.9x	0.77	x	3.8	2	x	36.79	x	0.63	x	0.7	=	42.94	(77)
Southeast 0.9x	0.77	x	3.8	2	x	62.67	x	0.63	X	0.7	=	73.15	(77)
Southeast 0.9x	0.77	x	3.8	32	x	85.75	x	0.63	x	0.7	=	100.08	(77)
Southeast <sub>0.9x</sub>	0.77	x	3.8	2	x	106.25	×	0.63	x	0.7	=	124.01	(77)
Southeast <sub>0.9x</sub>	0.77	x	3.8	2	x	119.01	x	0.63	x	0.7	=	138.9	(77)
Southeast <sub>0.9x</sub>	0.77	x	3.8	2	x	118.15	x	0.63	x	0.7	=	137.9	(77)
Southeast <sub>0.9x</sub>	0.77	x	3.8	2	x	113.91	×	0.63	x	0.7	_ =	132.95	(77)
Southeast <sub>0.9x</sub>	0.77	x	3.8	2	x	104.39	×	0.63	x	0.7	=	121.84	(77)
Southeast <sub>0.9x</sub>	0.77	x	3.8	2	x	92.85	×	0.63	x	0.7	=	108.37	(77)
Southeast <sub>0.9x</sub>	0.77	x	3.8	2	x	69.27	×	0.63	x	0.7	_ =	80.84	(77)
Southeast <sub>0.9x</sub>	0.77	x	3.8	2	x	44.07	×	0.63	x	0.7	=	51.44	(77)
Southeast <sub>0.9x</sub>	0.77	x	3.8	2	x	31.49	×	0.63	x	0.7	=	36.75	(77)
Solar gains in (83)m= 69.36 Total gains – i	126.92 1	96.97	283.12	352.77	365		<del>``</del>	n = Sum(74)m . .88 226.42	(82)m 146.56	6 84.68	58.32	 	(83)
(84)m= 392.9	449.13	507.9	575.56	625.76	620	.73 589.67	539	.03 483.42	422.18	381.69	372.04		(84)
7. Mean inte	rnal temper	ature	(heating	season	)								
Temperature	during hea	ating p	eriods ir	the livi	ng ai	ea from Ta	able 9,	, Th1 (°C)				21	(85)
Utilisation fac	ctor for gair	ns for I	iving are	ea, h1,m	(see	e Table 9a)							
Jan	Feb	Mar	Apr	May	Jı	ın Jul	A	ug Sep	Oct	Nov	Dec		
(86)m= 1	1	0.99	0.97	0.91	0.7	76 0.59	0.6	66 0.9	0.99	1	1		(86)
Mean interna	al temperatu	ure in I	iving are	ea T1 (fo	ollow	steps 3 to	7 in T	able (le)					
(87)m= 19.7	19.84 2	20.09	20.43			i		able 30)					(87)
		20.03	20.43	20.74	20.	93 20.99	20.		20.43	20.01	19.68		(0.)
Temperature	during hea							97 20.83	20.43	20.01	19.68		(0.)
Temperature (88)m= 19.96	1 - T					ling from T		97 20.83 9, Th2 (°C)	20.43		19.68		(88)
(88)m= 19.96	19.96	ating p	eriods ir 19.98	19.98	dwe	ling from T	able 9	97 20.83 9, Th2 (°C)	1		ļ		, ,
(88)m= 19.96 Utilisation fac	19.96	ating p 19.97	eriods ir 19.98 est of d	rest of 19.98 welling,	dwe 19. h2,m	ling from T	able 9	97 20.83 9, Th2 (°C) 99 19.99	19.98		ļ		, ,
(88)m= 19.96  Utilisation factors (89)m= 1	19.96 ctor for gair	ating p 19.97 ns for r	eriods ir 19.98 est of do	n rest of 19.98 welling, 0.87	dwe 19. h2,m	ling from T 99 19.99 1 (see Table 57 0.46	able 9 19. e 9a)	97 20.83 9, Th2 (°C) 99 19.99	19.98	19.98	19.97		(88)
(88)m= 19.96  Utilisation factors (89)m= 1  Mean internal	19.96 1 ctor for gair 1 ltemperatu	ating p 19.97 ns for r 0.99	eriods ir 19.98 rest of d 0.96	n rest of 19.98 welling, 0.87 of dwelli	dwe 19. h2,m 0.6	ling from T 99 19.99 (see Table 67 0.46 2 (follow st	Table 9 19.0 19.0 19.0 19.0 19.0 19.0 19.0 19	97 20.83 9, Th2 (°C) 99 19.99 33 0.84 to 7 in Table	19.98 0.98 le 9c)	19.98	19.97		(88)
(88)m= 19.96  Utilisation factors (89)m= 1	19.96 1 ctor for gair 1 ltemperatu	ating p 19.97 ns for r	eriods ir 19.98 est of do	n rest of 19.98 welling, 0.87	dwe 19. h2,m	ling from T 99 19.99 (see Table 67 0.46 2 (follow st	able 9 19. e 9a)	97 20.83 9, Th2 (°C) 99 19.99 53 0.84 to 7 in Table 99 19.89	19.98 0.98 le 9c) 19.52	19.98	19.97	0.22	(88)
(88)m= 19.96  Utilisation fact (89)m= 1  Mean internation (90)m= 18.77	19.96 1 ctor for gair 1 ltemperatu 18.91 1	ating p 19.97 ns for r 0.99 ure in 1	eriods ir 19.98 est of do 0.96 the rest	n rest of 19.98 welling, 0.87 of dwelli	dwe 19. h2,m 0.6 ing T	ling from T 99 19.99 1 (see Table 67 0.46 2 (follow st 96 19.99	Table 9 19.5 0.5 19.5 19.5 19.5 19.5 19.5 19.5 19.5 19	97 20.83 9, Th2 (°C) 99 19.99 63 0.84 to 7 in Table 99 19.89	19.98 0.98 le 9c) 19.52	19.98	19.97	0.32	(88)
Utilisation fact (89)m= 1  Mean internation [90)m= 18.77	19.96 1 ctor for gair 1 ltemperate 18.91	ating p 19.97 ns for r 0.99 ure in 1 19.16	eriods in 19.98 est of do 0.96 the rest 19.51 r the wh	n rest of 19.98 welling, 0.87 of dwelli 19.8	dwe 19. h2,m 0.6 ing T 19.	ling from T 99	fable 9 19.1 19.1 19.1 19.1 19.1 19.1 19.1 1	97 20.83 9, Th2 (°C) 99 19.99 63 0.84 to 7 in Table 99 19.89 - fLA) × T2	19.98 0.98 le 9c) 19.52 fLA = Liv	19.98 1 19.09 ving area ÷ (-	19.97 1 18.76 4) =	0.32	(88) (89) (90) (91)
(88)m= 19.96  Utilisation fact (89)m= 1  Mean internation (90)m= 18.77	19.96 1 ctor for gair 1 ltemperatu 18.91 1	ating p 19.97 ns for r 0.99 ure in t 19.16 ure (fo	eriods ir 19.98 rest of do 0.96 the rest 19.51 r the wh	n rest of 19.98 welling, 0.87 of dwelli 19.8	dwe 19. h2,m 0.6 ing T 19. Illing)	ling from T 99	fable 9 19. 19. 19. 19. 19. 19. 19. 19. 19. 1	97   20.83 9, Th2 (°C) 99   19.99 63   0.84 to 7 in Table 99   19.89 	19.98 0.98 le 9c) 19.52 fLA = Liv	19.98 1 19.09 ving area ÷ (4	19.97	0.32	(88)

(93)m=	19.07	19.21	19.46	19.81	20.1	20.27	20.31	20.3	20.19	19.81	19.38	19.05		(93)
` '		tina real	uirement		-	-								. ,
			ernal ter		re obtair	ed at st	ep 11 of	Table 9	o, so tha	t Ti.m=(	76)m an	d re-calc	culate	
			or gains	•			- F		o, ooa	(	. 0,			
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisa	ation fac	tor for g	ains, hm	):	•	•					•		l	
(94)m=	1	1	0.99	0.96	0.88	0.7	0.5	0.57	0.85	0.98	1	1		(94)
Usefu	l gains,	hmGm	, W = (94	4)m x (8	4)m	•	•				•			
(95)m=	392.08	447.16	502.02	553.08	548.23	431.6	297.45	308.69	410.87	412.62	380.08	371.46		(95)
Month	nly avera	age exte	rnal tem	perature	from Ta	able 8							l	
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat I	loss rate	for me	an intern	al temp	erature,	Lm , W =	=[(39)m :	x [(93)m	– (96)m	]			l	
(97)m=	1244.44	1202.41	1085.88	902.06	693.28	462.43	302.21	317.47	498.67	759.73	1018.58	1237.99		(97)
Space	e heatin	g require	ement fo	r each n	nonth, k\	Wh/mon	th = 0.02	24 x [(97)	)m – (95	)m] x (4	1)m			
(98)m=	634.15	507.53	434.39	251.26	107.92	0	0	0	0	258.25	459.72	644.7		
'				•			•	Tota	l per year	(kWh/yeaı	r) = Sum(9	8)15,912 =	3297.93	(98)
Space	heatin	a requir	ement in	kWh/m²	²/vear								44.99	(99)
•		• •			/ycai								44.99	
			quiremer		_									
Calcu			July and											
11	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
		<u> </u>	lculated		i e	<del> </del>					i e		1	(400)
(100)m=		0	0	0	0	766.66	603.54	618.52	0	0	0	0		(100)
		tor for lo					0.00	0.00						(101)
(101)m=		0	0	0	(4.2.4)	0.86	0.92	0.89	0	0	0	0		(101)
1		,	Vatts) = (	<u>`</u>	<del>`</del>	r	550.00	550.00					1	(402)
(102)m=		. 0	0	0	0	660.01	556.63	552.23	0	0	0	0		(102)
			lculated		i e	·							1	(402)
(103)m=		0	0	0	0	812.25	774.21	716.56	0	0	0	0	( )	(103)
			<i>ement fo</i> (104)m <			dwelling,	continue	ous ( KW	(h) = 0.0	24 x [(10	)3)m – (	102)m ] :	x (41)m	
(104)m=		0	0	0	0	109.61	161.88	122.26	0	0	0	0		
(101)						100.01	101.00	122.20		= Sum(		 =	393.75	(104)
Cooled	I fraction	1									area ÷ (4		1	(105)
			able 10b	)						000.00		.,		
(106)m=		0	0	0	0	0.25	0.25	0.25	0	0	0	0		
I									Total	l = Sum(	(104)	=	0	(106)
Space	cooling	requirer	ment for	month =	: (104)m	× (105)	× (106)r	n		,	,		<u> </u>	
(107)m=		0	0	0	0	27.4	40.47	30.56	0	0	0	0		
							•		Total	= Sum(	107)	=	98.44	(107)
Space	coolina	reauirer	ment in k	(Wh/m²/v	vear				(107)	÷ (4) =			1.34	(108)
		•	iency (ca			der spec	cial cond	litions s	` '	` '			1.04	`
		/ Efficier	,	<del>mourate</del> c	Lorny an	aor opc	siai ooric	H410110, 31		+ (108) :	=		46.33	(109)
			•	no:/T	:EE\				(00)	. (100)				╡`
rarge	et rapri	∟nerg	y Efficie	ency (11	-CC)								53.28	(109)

		Hea	er Details:						
Access at Name.	Zahid Ashraf	USE		a Mirros	<b>b</b> a v .		CTDO	001000	
Assessor Name: Software Name:	Stroma FSAP 2012	2	Stroma Softwa					001082 on: 1.0.5.9	
			ty Address:						
Address :									
1. Overall dwelling dime	ensions:	_							
Ground floor		A	rea(m²)	(1a) x		<b>ight(m)</b> 2.5	(2a) =	Volume(m³	(3a)
	0) ((1b) ((10) ((1d) ((10)					2.5	(2α) -	103.20	
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)-	+(111)	73.31	(4)	) . (2-) . (2-	4) . (2 -) .	(2-)		_
Dwelling volume				(3a)+(3b	)+(3C)+(3C	d)+(3e)+	.(3h) =	183.28	(5)
2. Ventilation rate:	main sec	condary	other		total			m³ per hou	r
Number of chimneys	heating he	ating		7 = [			40 =	-	_
Number of chimneys		<del>-</del>	0	]	0		20 =	0	(6a)
Number of open flues	0 +	0 +	0	] = [	0			0	(6b)
Number of intermittent fa				Ļ	0		10 =	0	(7a)
Number of passive vents				Ĺ	0		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	o)+(7c) =	Г	0		÷ (5) =	0	(8)
	peen carried out or is intended			ontinue fr			. (0) –	0	
Number of storeys in the	he dwelling (ns)							0	(9)
Additional infiltration			_			[(9)	-1]x0.1 =	0	(10)
	.25 for steel or timber fragressent, use the value correspond			•	uction			0	(11)
deducting areas of openi		oriding to the gr	reater wan are	a (anoi					
If suspended wooden	floor, enter 0.2 (unseale	d) or 0.1 (se	ealed), else	enter 0				0	(12)
If no draught lobby, en								0	(13)
· ·	s and doors draught stri	pped	0.05 10.0	(4.4)	001			0	(14)
Window infiltration			0.25 - [0.2			. (45)		0	(15)
Infiltration rate	aro avaraged in subject		(8) + (10)					0	(16)
If based on air permeabil	q50, expressed in cubic	•	•	•	etre or e	rivelope	area	3	$= \begin{pmatrix} (17) \\ (49) \end{pmatrix}$
	es if a pressurisation test has l				is beina u	sed		0.15	(18)
Number of sides sheltere			<b>9</b>	,	3			2	(19)
Shelter factor			(20) = 1 -	(0.0 <b>75</b> x (1	l9)] =			0.85	(20)
Infiltration rate incorporate	ting shelter factor		(21) = (18)	x (20) =				0.13	(21)
Infiltration rate modified f	for monthly wind speed							_	
Jan Feb	Mar Apr May	Jun Ju	l Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	peed from Table 7							_	
(22)m= 5.1 5	4.9 4.4 4.3	3.8 3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (2.	2)m ∸ 4								
<u> </u>	1.23 1.1 1.08	0.95 0.99	5 0.92	1	1.08	1.12	1.18		
					<u> </u>	Ц	I	J	

0.16	0.16	0.16	0.14	0.14	d wind s	0.12	0.12	0.13	0.14	0.14	0.15		
Calculate effe					1			00	•	<b>U</b>	00		
If mechanica												0.5	(23
If exhaust air h		0 11		, ,	,	. ,	,, .	•	) = (23a)			0.5	(23
If balanced with	n heat reco	overy: effic	iency in %	allowing f	or in-use f	actor (fron	n Table 4h	) =				79.05	(23
a) If balance						<del>- ` ` </del>	<del>- ^ ` </del>	<del>``</del>	<u> </u>	23b) × [	1 – (23c)	÷ 100]	
(24a)m= 0.27	0.26	0.26	0.25	0.24	0.23	0.23	0.22	0.23	0.24	0.25	0.25		(24
b) If balance		anical ve	ntilation	without	heat red	covery (N	MV) (24b	m = (22)	2b)m + (2	23b)		Ī	
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
c) If whole h if (22b)r	ouse ex n < 0.5 ×			-	-				5 × (23b	o)			
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
d) If natural	ventilation								0.51	·		l	
24d)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
Effective air	change	rate - er	nter (24a	) or (24b	o) or (24	c) or (24	d) in box	(25)				l	
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		(2
3. Heat losse	s and he	eat loss r	paramete	er:									
ELEMENT	Gros	·	Openin		Net Ar	ea	U-valı	ue	AXU		k-value	e A	Χk
		-											
	area	(m²)	m	l <sup>2</sup>	A ,r	n²	W/m2	!K	(W/I	K)	kJ/m²·l	K k	J/K
Doors	area	(m²)	m	l <sup>2</sup>	A ,r	m² x	W/m2	:K = [	(W/I	K)	kJ/m²-I	K k.	J/K (26
		(m²)	m	<b>)</b> 2		x		= [	`	K)	kJ/m²-I	K k.	
Nindows Type	e 1	(m²)	m	<b>1</b> 2	2	x x1	1.4	0.04] =	2.8	K)	kJ/m²-l	K k	(20
Nindows Type Nindows Type	e 1	(m²)	m	2	7.661	x x1,	1.4	0.04] =	2.8		kJ/m²-l	K k.	(27
Doors Windows Type Windows Type Floor Type 1	e 1	(m²)	m	2	7.661 3.819	x x1. x1. x1. 7 x	1.4 /[1/( 1.4 )+ /[1/( 1.4 )+	0.04] = [ 0.04] = [	2.8 10.16 5.06	4 [	kJ/m²-l	K k.	(26)
Windows Type Windows Type Floor Type 1 Floor Type 2	e 1		m		7.661 3.819 25.83	x x10 x10 x10 x10 x10 x10 x10 x10 x10 x1	1.4 /[1/( 1.4 )+ /[1/( 1.4 )+ 0.12	= [ 0.04] = [ 0.04] = [ = [	2.8 10.16 5.06 3.1004	4 [	kJ/m²-l	K k.	(26)
Windows Type Windows Type Floor Type 1 Floor Type 2 Walls Type1	e 1 e 2	7			2 7.661 3.819 25.83 47.47	x x1.  x1.  x1.  x1.  x1.  x1.  x2.  x2.	1.4 /[1/( 1.4 )+ /[1/( 1.4 )+ 0.12	= [ 0.04] = [ 0.04] = [ = = [	2.8 10.16 5.06 3.1004 5.69688	4 [	kJ/m²-l	K k.	(26)
Windows Type Windows Type Floor Type 1 Floor Type 2 Walls Type1 Walls Type2	48.1 17.6	7 88	11.4		2 7.661 3.819 25.83 47.47 36.69	x x1. 20 x1. 7 x 4 x 20 x 3 x	1.4 /[1/( 1.4 )+ /[1/( 1.4 )+ 0.12 0.12	= [ 0.04] = [ 0.04] = [ = [ = [	2.8 10.16 5.06 3.1004 5.69688 5.5	4 [	kJ/m²-l	K k.	(26 (27 (28 (28 (28 (29)
Windows Type Windows Type Floor Type 1 Floor Type 2 Walls Type1 Walls Type2 Fotal area of e	48.1 17.6 elements	7 68 , m²	11.48	8	2 7.661 3.819 25.83 47.47 36.69 15.68	x x1. x1. x1. x1. x1. x1. x1. x1. x1. x1	1.4 /[1/( 1.4 )+ /[1/( 1.4 )+ 0.12 0.12 0.15	= [ 0.04] = [ 0.04] = [ = [ = [ = [	2.8 10.16 5.06 3.1004 5.69688 5.5 2.22	4 [ ]			(26 (27 (28 (28 (28 (28)
Windows Type Windows Type Floor Type 1 Floor Type 2 Walls Type1 Walls Type2 Fotal area of e	48.1 17.6 1 roof windo	7 58 , m² pws, use e	11.48	B	2 7.661 3.819 25.83 47.47 36.69 15.68 139.1 alue calcul	x x1. x1. x1. x1. x1. x1. x1. x1. x1. x1	1.4 /[1/( 1.4 )+ /[1/( 1.4 )+  0.12  0.12  0.15  0.14	= [ 0.04] = [ 0.04] = [ = [ = [ = [ ] = [	2.8 10.16 5.06 3.1004 5.69688 5.5 2.22	4 [ ]			(26 (27 (28 (28 (28 (28)
Windows Type Windows Type Floor Type 1 Floor Type 2 Walls Type1 Walls Type2 Fotal area of extending the area of include the area Fabric heat los	48.1 17.6 1roof windows on both ss, W/K =	7  38  , m²  ows, use e sides of interest of the sides of	11.48 2 Iffective win	B	2 7.661 3.819 25.83 47.47 36.69 15.68 139.1 alue calcul	x x1. x1. x1. x1. x1. x1. x1. x1. x1. x1	1.4 /[1/( 1.4 )+ /[1/( 1.4 )+ 0.12 0.12 0.15	= [ 0.04] = [ 0.04] = [ = [ = [ = [ ] = [	2.8 10.16 5.06 3.1004 5.69688 5.5 2.22	4 [ ]			(26 (27 (27 (28 (28 (29 (37
Windows Type Windows Type Floor Type 1 Floor Type 2 Walls Type1 Walls Type2 Fotal area of extended the area Fabric heat lost	48.1 17.6 lelements roof winder as on both ss, W/K = Cm = S(	7 58 , m <sup>2</sup> ows, use e sides of in = S (A x (A x k)	11.48 2 Iffective winternal walk	ndow U-vals and pan	2 7.661 3.819 25.83 47.47 36.69 15.68 139.1 alue calculatitions	x x1. x1. 7 x 4 x x 3 x x 7 atted using	1.4 /[1/( 1.4 )+ /[1/( 1.4 )+  0.12  0.12  0.15  0.14		2.8 10.16 5.06 3.1004 5.69688 5.5 2.22	4 [ B [	paragraph	3.2	(26) (27) (28) (29) (29) (30)
Vindows Type Vindows Type Floor Type 1 Floor Type 2 Valls Type1 Valls Type2 Fotal area of e for windows and include the area Fabric heat los Heat capacity Thermal mass	48.1 17.6 elements d roof winder as on both as, W/K = Cm = S(	7 s8 , m² ows, use e sides of in = S (A x k) ter (TMF	11.4t 2  Iffective winternal walk U)  P = Cm ÷	ndow U-va ls and pan	2 7.661 3.819 25.83 47.47 36.69 15.68 139.1 alue calculatitions	x x1 x1 x1 x x1 x x x x x x x x x x x x	1.4 /[1/( 1.4 )+ /[1/( 1.4 )+		2.8 10.16 5.06 3.1004 5.69688 5.5 2.22 re)+0.04] a	4 [ 3 ] [ as given in 2) + (32a).	paragraph (32e) =	34.54	(2) (2) (2) (2) (2) (2) (3)
Windows Type Windows Type Floor Type 1 Floor Type 2 Walls Type1 Walls Type2 Fotal area of extended the area Fabric heat loss Heat capacity Thermal mass	48.1  17.6  Allements  A roof winder  as on both  as on both  Cm = S(  parame  sments wh	7 88 , m² ows, use e sides of in = S (A x k) ter (TMF ere the de	11.44 2  Iffective winternal walk U)  P = Cm ÷	ndow U-va ls and pan	2 7.661 3.819 25.83 47.47 36.69 15.68 139.1 alue calculatitions	x x1 x1 x1 x x1 x x x x x x x x x x x x	1.4 /[1/( 1.4 )+ /[1/( 1.4 )+		2.8 10.16 5.06 3.1004 5.69688 5.5 2.22 re)+0.04] a	4 [ 3 ] [ as given in 2) + (32a).	paragraph (32e) =	34.54 7893.16	(2) (2) (2) (2) (2) (2) (3)
Vindows Type Vindows Type Vindows Type Floor Type 1 Floor Type 2 Valls Type1 Valls Type2 Total area of extended the area Fabric heat loss Heat capacity Thermal mass For design assess The used inste	48.1 17.6 17.6 elements I roof winder as on both as, W/K = Cm = S( a parame aments where and of a decimal of	7  magnetic with the state of the detailed calcular in the state of th	11.48 2  Iffective winternal walk U)  P = Cm ÷ tails of the ulation.	ndow U-vals and pand	2 7.661 3.819 25.83 47.47 36.69 15.68 139.1 alue calcul titions	x x1 x	1.4 /[1/( 1.4 )+ /[1/( 1.4 )+		2.8 10.16 5.06 3.1004 5.69688 5.5 2.22 re)+0.04] a	4 [ 3 ] [ as given in 2) + (32a).	paragraph (32e) =	34.54 7893.16	(2) (2) (2) (2) (2) (3) (3) (3) (3)
Windows Type Windows Type Floor Type 1 Floor Type 2 Walls Type1 Walls Type2 Fotal area of extended the area for windows and for design assess for design asses for design as	48.1 17.6 elements froof winder as on both ss, W/K = Cm = S( parame sments wh ad of a dec es : S (L	7  58  , m²  sides of in  = S (A x  A x k)  ter (TMF)  ere the de tailed calcu x Y) calcu	11.44 2  Iffective winternal walk U)  P = Cm ÷ tails of the ulation. culated to	ndow U-vels and panders and panders constructed using Appendix	2 7.661 3.819 25.83 47.47 36.69 15.68 139.1 alue calculatitions  n kJ/m²K ion are not	x x1 x	1.4 /[1/( 1.4 )+ /[1/( 1.4 )+		2.8 10.16 5.06 3.1004 5.69688 5.5 2.22 re)+0.04] a	4 [ 3 ] [ as given in 2) + (32a).	paragraph (32e) =	34.54 7893.16	(20 (27 (28 (28 (29 (33 (34 (34)
Windows Type Windows Type Floor Type 1 Floor Type 2 Walls Type1 Walls Type2 Fotal area of extended the area for windows and include the area Fabric heat loss Heat capacity Thermal mass For design assess an be used inste	48.1  17.6 elements I roof winder as on both as on both css, W/K = Cm = S( parame sments wh ad of a det es : S (L al bridging	7  58  , m²  sides of in  = S (A x  A x k)  ter (TMF)  ere the de tailed calcu x Y) calcu	11.44 2  Iffective winternal walk U)  P = Cm ÷ tails of the ulation. culated to	ndow U-vels and panders and panders constructed using Appendix	2 7.661 3.819 25.83 47.47 36.69 15.68 139.1 alue calculatitions  n kJ/m²K ion are not	x x1 x	1.4 /[1/( 1.4 )+ /[1/( 1.4 )+	= [ 0.04] = [ 0.04] = [	2.8 10.16 5.06 3.1004 5.69688 5.5 2.22 re)+0.04] a	4 [ 3 ] [ as given in 2) + (32a).	paragraph (32e) =	34.54 7893.16	(26 (27 (28 (28 (29 (29 (33 (34 (34 (34)
Windows Type Windows Type Floor Type 1 Floor Type 2 Walls Type1 Walls Type2 Total area of extended include the area Fabric heat loss Heat capacity Thermal mass For design assess can be used inste Thermal bridge If details of thermal Total fabric he	48.1 17.6 elements froof winder as on both as, W/K = Cm = S( parame sments where ad of a decrease is S (L al bridging at loss	7  58  7  58  7  58  68  60  7  7  7  7  7  88  7  80  7  80  80	11.40 2  Iffective winternal walk U)  P = Cm ÷ tails of the culation. culated to own (36) =	ndow U-vals and pandow to constructe using Ap = 0.05 x (3)	2 7.661 3.819 25.83 47.47 36.69 15.68 139.1 alue calculatitions  n kJ/m²K ion are not	x x1 x	1.4 /[1/( 1.4 )+ /[1/( 1.4 )+	= [ 0.04] = [ 0.04] = [	2.8  10.16  5.06  3.1004  5.69688  5.5  2.22  e)+0.04] a  (30) + (32  tive Values of	as given in  2) + (32a). : Low	paragraph (32e) = able 1f	34.54 7893.16 100	(26 (27 (28 (28 (28 (29 (32 (33 (34 (34 (34)
Vindows Type Vindows Type Vindows Type Floor Type 1 Floor Type 2 Valls Type1 Valls Type2 Fotal area of extended the area Fabric heat loss Heat capacity Thermal mass For design assess Fan be used insteended I fee the second of the the area Fotal fabric heat Total fabric hear Total f	48.1 17.6 elements froof winder as on both as, W/K = Cm = S( parame sments where ad of a decrease is S (L al bridging at loss	7  58  7  58  7  58  68  60  7  7  7  7  7  88  7  80  7  80  80	11.40 2  Iffective winternal walk U)  P = Cm ÷ tails of the culation. culated to own (36) =	ndow U-vals and pandow to constructe using Ap = 0.05 x (3)	2 7.661 3.819 25.83 47.47 36.69 15.68 139.1 alue calculatitions  n kJ/m²K ion are not	x x1 x	1.4 /[1/( 1.4 )+ /[1/( 1.4 )+	= [ 0.04] = [ 0.04] = [	2.8  10.16  5.06  3.1004  5.69688  5.5  2.22  1e)+0.04] a  tive Value  values of  (36) =	as given in  2) + (32a). : Low	paragraph (32e) = able 1f	34.54 7893.16 100	(26 (27 (28 (28 (29 (29 (33 (34 (34) (34)
Windows Type Windows Type Floor Type 1 Floor Type 2 Walls Type1 Walls Type2 Fotal area of extended the area Fabric heat loss Floor design assess For design assess Floor design assess For design assess Floor Type 1 Floor Type 1 Floor Type 2 Floor Type 3 Floor Type 3 Floor Type 3 Floor Type 4 Floor Type 4 Floor Type 2 Floor Type 4 Floor Type 2 Floor Type 4 Floor Type 2 Floor Type 4 Floor Type 4 Floor Type 5 Floor	48.1 17.6 Plements I roof windows on both as, W/K = Cm = S( a parame sments wh ad of a decent of a dec	7  38  , m²  ows, use e sides of interest (TMF)  ere the detailed calculated are not known alculated	11.44 2  Iffective winternal walk U)  P = Cm ÷ tails of the culation. culated to own (36) =	ndow U-vals and pand TFA) ir construction using Ap	2 7.661 3.819 25.83 47.47 36.69 15.68 139.1 alue calcultitions  h kJ/m²K ion are not	x x1 x	1.4 /[1/( 1.4 )+ /[1/( 1.4 )+	= [ 0.04] = [ 0.04] = [	2.8  10.16  5.06  3.1004  5.69688  5.5  2.22  e)+0.04] a  tive Value  values of  (36) =  = 0.33 × (	4 [ 3] [ as given in 2) + (32a). : Low : TMP in Ta	paragraph(32e) =	34.54 7893.16 100	(26
Vindows Type Vindows Type Vindows Type Floor Type 1 Floor Type 2 Valls Type1 Valls Type2 Fotal area of extended the area Fabric heat loss Floor design assess For design asses	48.1 17.6 elements froof winder as on both as, W/K = Cm = S( parame esments where and of a decension of a decen	7 58 , m² ows, use e sides of in = S (A x k) ter (TMF ere the de tailed calculated are not kn alculated Mar 15.78	11.44 2  Iffective winternal walk U)  P = Cm ÷ tails of the ulation. culated to own (36) = I monthly Apr	ndow U-vels and part TFA) ir constructi using Ap 0.05 x (3	2 7.661 3.819 25.83 47.47 36.69 15.68 139.1 alue calcul titions  h kJ/m²K ion are not opendix k 1)  Jun	x x1 x	1.4 /[1/( 1.4 )+ /[1/( 1.4 )+ /[1/( 1.4 )+	= [ 0.04] = [ 0.04] = [	2.8  10.16  5.06  3.1004  5.69688  5.5  2.22  1.(30) + (32)  1.tive Value  1.values of  (36) =  = 0.33 × (  Oct	25)m x (5) Nov	paragraph(32e) = lable 1f	34.54 7893.16 100	(26 (27 (27 (28 (29 (32 (33 (34 (34) (34) (34) (34) (34)

Heat loss para	ameter (I	HLP), W	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 0.87	0.87	0.87	0.86	0.85	0.84	0.84	0.84	0.84	0.85	0.86	0.86		
		!							Average =	Sum(40) <sub>1</sub>	12 /12=	0.85	(40)
Number of day	<u> </u>	<u> </u>	<u> </u>					-					
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		(44)
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water hea	ting ene	rgy requi	irement:								kWh/ye	ar:	
Assumed occurring TFA > 13.1 if TFA £ 13.1	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9	)2)] + 0.0	0013 x (¯	TFA -13		32		(42)
Annual average Reduce the annual not more that 125	al average	hot water	usage by	5% if the $a$	lwelling is	designed t			se target c		.09		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage i								· '	!				
(44)m= 103.5	99.74	95.98	92.21	88.45	84.68	84.68	88.45	92.21	95.98	99.74	103.5		
									Total = Su	m(44) <sub>112</sub> =	=	1129.13	(44)
Energy content of	f hot water	used - cal	culated mo	onthly $= 4$ .	190 x Vd,r	n x nm x D	OTm / 3600	) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m= 153.49	134.25	138.53	120.77	115.88	100	92.66	106.33	107.6	125.4	136.89	148.65		
If instantaneous v	vator booti	'na at naint	of upo (no	bot water	, ataragal	antar O in	haves (46		Total = Su	m(45) <sub>112</sub> =	-	1480.46	(45)
If instantaneous v			·	1	,.		· · ·	, , , I		1	i I		(40)
(46)m= 23.02 Water storage	20.14 loss:	20.78	18.12	17.38	15	13.9	15.95	16.14	18.81	20.53	22.3		(46)
Storage volum		) includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community h	neating a	and no ta	ınk in dw	elling, e	nter 110	litres in	(47)						
Otherwise if no	o stored	hot wate	er (this in	icludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (	(47)			
Water storage													
a) If manufact				or is kno	wn (kWł	n/day):					0		(48)
Temperature f											0		(49)
Energy lost fro		•	•				(48) x (49)	) =		1	10		(50)
<ul><li>b) If manufact</li><li>Hot water stor</li></ul>			-							0	02		(51)
If community h	-			_ (	,,,,,,	-77				0.	02		()
Volume factor	from Ta	ble 2a								1.	03		(52)
Temperature f	actor fro	m Table	2b							0	.6		(53)
Energy lost fro		_	, kWh/ye	ear			(47) x (51)	) x (52) x (	53) =	1.	03		(54)
Enter (50) or	(54) in (	55)								1.	03		(55)
Water storage	loss cal	culated t	for each	month			((56)m = (	(55) × (41)	m				
(56)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(56)
If cylinder contain	s dedicate	d solar sto	rage, (57)ı	m = (56)m	x [(50) – (	H11)] ÷ (5	0), else (5	7)m = (56)	m where (	H11) is fro	m Appendi	хH	
(57)m= 32.01	28.92	32.01	30.98	32.01	30.98	32.01	32.01	30.98	32.01	30.98	32.01		(57)
Primary circuit	t loss (ar	nnual) fro	m Table	<u></u>							0		(58)
Primary circuit	`	,			59)m = (	(58) ÷ 36	65 × (41)	m					
(modified by	/ factor f	rom Tab	le H5 if t	here is s	olar wat	ter heatii	ng and a	cylinde	r thermo	stat)			
(59)m= 23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)

Combi loss calculated for each month $(61)m = (60) \div 365 \times (41)m$														
(61)m= 0	0	0	0	01)111 =	00) +	0	) i i	)	0	0	0	0	1	(61)
	<u> </u>								<u> </u>			<u> </u>	J · (59)m + (61)m	(- )
(62)m= 208.77	184.17	193.81	174.27	171.16	153.49		161		161.1	180.68	190.38	203.93	]	(62)
Solar DHW input			<u> </u>	<u> </u>	<u> </u>		ļ						<u></u>	` '
(add additiona												-: ····································		
(63)m= 0	0	0	0	0	0	0	C		0	0	0	0	7	(63)
Output from w	ater hea	ter	ı			-!	!						_	
(64)m= 208.77	184.17	193.81	174.27	171.16	153.49	147.94	161	.61	161.1	180.68	190.38	203.93	]	
			ı	ı				Outp	out from w	ater heate	er (annual)	112	2131.3	(64)
Heat gains fro	m 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= 95.26	84.58	90.28	82.95	82.75	76.04	75.03	79.	58	78.57	85.92	88.31	93.65	]	(65)
include (57)	m in calc	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 ga	ains (see	Table 5	and 5a	):										
Metabolic gair	ns (Table	5), Wat	ts											
Jan	Feb	Mar	Apr	May	Jun	Jul	Α	ug	Sep	Oct	Nov	Dec	]	
(66)m= 139.43	139.43	139.43	139.43	139.43	139.43	139.43	139	.43	139.43	139.43	139.43	139.43	]	(66)
Lighting gains	(calculat	ted in Ap	pendix	L, equat	ion L9	or L9a), a	ılso s	ee -	Table 5				_	
(67)m= 47.85	42.5	34.56	26.17	19.56	16.51	17.84	23.	19	31.13	39.53	46.13	49.18	]	(67)
Appliances ga	ins (calc	ulated ir	Append	dix L, eq	uation	L13 or L1	3a),	alsc	see Ta	ble 5			_	
(68)m= 305.82	308.99	300.99	283.97	262.48	242.28	228.79	225	.61	233.61	250.64	272.13	292.32	]	(68)
Cooking gains	(calcula	ted in A	ppendix	L, equat	ion L1	5 or L15a	), als	o se	ee Table	5				
(69)m= 51.27	51.27	51.27	51.27	51.27	51.27	51.27	51.	27	51.27	51.27	51.27	51.27		(69)
Pumps and fa	ns gains	(Table 5	5a)										_	
(70)m= 0	0	0	0	0	0	0	C	)	0	0	0	0	]	(70)
Losses e.g. ev	/aporatio	n (nega	tive valu	es) (Tab	le 5)								_	
(71)m= -92.95	-92.95	-92.95	-92.95	-92.95	-92.95	-92.95	-92	.95	-92.95	-92.95	-92.95	-92.95	]	(71)
Water heating	gains (T	able 5)											_	
(72)m= 128.03	125.86	121.35	115.21	111.23	105.62	100.85	106	.96	109.13	115.48	122.65	125.87	]	(72)
Total internal	gains =				(6	6)m + (67)n	n + (68	3)m +	+ (69)m +	(70)m + (7	71)m + (72)	)m	_	
(73)m= 579.44	575.09	554.65	523.09	491.01	462.15	445.22	453	.51	471.61	503.38	538.65	565.11		(73)
6. Solar gains														
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)	
_					_		1					_	. ,	1,75
Northeast 0.9x	0.77	X			X	11.28	] X	_	0.63	X	0.7	=	26.42	(75)
Northeast 0.9x	0.77	X			x	22.97	] X ] .,		0.63		0.7	=	53.77	](75) ] <sub>(75)</sub>
Northeast 0.9x	0.77	X	7.6		x	41.38	] X ]	_	0.63	×	0.7	=	96.88	[(75)
Northeast 0.9x	0.77	X	7.6		X	67.96	] X ]		0.63	×	0.7	=	159.11	](75) ] <sub>(75)</sub>
Northeast <sub>0.9x</sub>	0.77	X	7.6	56	X	91.35	X		0.63	X	0.7	=	213.87	(75)

r		_			-			,		_				_
Northeast <sub>0.9x</sub>	0.77	X	7.6	66	×	9	7.38	X	0.63	X	0.7	=	228.01	(75)
Northeast <sub>0.9x</sub>	0.77	X	7.6	66	x	(	91.1	X	0.63	X	0.7	=	213.3	(75)
Northeast <sub>0.9x</sub>	0.77	X	7.6	66	x	7	2.63	X	0.63	X	0.7	=	170.04	(75)
Northeast <sub>0.9x</sub>	0.77	X	7.6	66	x	5	0.42	X	0.63	X	0.7	=	118.05	(75)
Northeast <sub>0.9x</sub>	0.77	x	7.6	66	x	2	8.07	X	0.63	Х	0.7	=	65.71	(75)
Northeast <sub>0.9x</sub>	0.77	X	7.6	66	x	,	14.2	X	0.63	X	0.7	=	33.24	(75)
Northeast 0.9x	0.77	x	7.6	66	x [	(	9.21	X	0.63	X	0.7	=	21.57	(75)
Southeast <sub>0.9x</sub>	0.77	x	3.8	32	x	3	6.79	X	0.63	х	0.7	=	42.94	(77)
Southeast <sub>0.9x</sub>	0.77	x	3.8	32	x	6	2.67	x	0.63	х	0.7	=	73.15	(77)
Southeast 0.9x	0.77	x	3.8	32	x	8	5.75	x	0.63	х	0.7	=	100.08	(77)
Southeast <sub>0.9x</sub>	0.77	×	3.8	32	x	1(	06.25	x	0.63	x	0.7	_ =	124.01	(77)
Southeast <sub>0.9x</sub>	0.77	x	3.8	32	x	1	19.01	x	0.63	x	0.7		138.9	(77)
Southeast <sub>0.9x</sub>	0.77	×	3.8	32	x	1	18.15	x	0.63	x	0.7	=	137.9	(77)
Southeast <sub>0.9x</sub>	0.77	×	3.8	32	x	1	13.91	x	0.63	х	0.7		132.95	(77)
Southeast <sub>0.9x</sub>	0.77	×	3.8	32	x [	1(	04.39	x	0.63	x	0.7		121.84	(77)
Southeast <sub>0.9x</sub>	0.77	×	3.8	32	x [	9	2.85	x	0.63	×	0.7	_ =	108.37	(77)
Southeast <sub>0.9x</sub>	0.77	×	3.8	32	x	6	9.27	x	0.63	x	0.7	_ =	80.84	(77)
Southeast <sub>0.9x</sub>	0.77	×	3.8	32	x	4	4.07	x	0.63	x	0.7		51.44	(77)
Southeast <sub>0.9x</sub>	0.77	= x	3.8	32	x [	3	1.49	X	0.63	x	0.7	<del>-</del>	36.75	(77)
•		_												
Solar gains in	watts, calcu	ulated	for eac	h month	1			(83)m	n = Sum(74)m	(82)m				
(83)m= 69.36		96.97	283.12	352.77	_	65.9	346.24	291	.88 226.42	146.5	6 84.68	58.32	]	(83)
Total gains – i	nternal and	solar	(84)m =	= (73)m	+ (8	33)m	, watts		•	•	•	•	-	
(84)m= 648.8	702.01 75	51.61	806.2	843.78	82	28.06	791.46	745	.39 698.03	649.9	4 623.33	623.44		(84)
7. Mean inter	nal tempera	ature (	heating	seasor	1)									
Temperature	during heat	ting pe	eriods ir	n the livi	ng a	area f	from Tab	ole 9	, Th1 (°C)				21	(85)
Utilisation fac	ctor for gains	s for li	ving are	ea, h1,m	ı (se	ee Ta	ble 9a)							
Jan	Feb I	Mar	Apr	May	T,	Jun	Jul	Α	ug Sep	Oc	Nov	Dec	]	
(86)m= 0.91	0.88 0	0.83	0.74	0.61	0	.45	0.33	0.3	37 0.56	0.76	0.87	0.91	1	(86)
Mean interna	l temperatu	re in I	iving ar	ea T1 (f	ollov	w ste	ns 3 to 7	in T	able 9c)	•	•	•	_	
(87)m= 19.7	<del> </del>	0.19	20.55	20.81	1	0.95	20.98	20.		20.58	3 20.1	19.66	]	(87)
Tomporeture	during boot	ting n	oriodo ir	root of	طيد	مرزال	from To	مام (			Į.		1	
Temperature (88)m= 20.19		0.19	20.21	20.21	1	0.22	20.22	20.	<u> </u>	20.2	20.2	20.2	1	(88)
	<u> </u>			<u> </u>						1 20.2	20.2		J	()
Utilisation fac		- 1			1	<u> </u>		r –	NA	1 0 70	0.05	T 00	1	(90)
(89)m= 0.89	0.87 0	).81	0.71	0.57		0.4	0.28	0.3	31 0.5	0.73	0.85	0.9	]	(89)
Mean interna	l temperatu	re in t	he rest	of dwell	ing	T2 (f	ollow ste	ps 3	to 7 in Tab	le 9c)	- <del>1</del>	1	7	
(90)m= 18.46	18.73	9.16	19.66	20	20	0.17	20.21	20.		19.7		18.42		(90)
										fLA = Li	ving area ÷ (	4) =	0.32	(91)
Mean interna	l temperatu	re (foi	r the wh	ole dwe	lling	g) = fl	_A × T1	+ (1	– fLA) × T2	2			_	
(92)m= 18.86	19.1 19	9.49	19.94	20.26	20	0.42	20.46	20.	45 20.36	19.98	3 19.38	18.82	]	(92)
Apply adjustr	ment to the i	mean	interna	l temper	atu	re fro	m Table	4e,	where appr	opriate	)			

Second   18.86   19.1   19.48   19.94   19.94   20.26   20.42   20.46   20.45   20.36   19.98   19.38   18.92   (93)					•							•		
Set Titl to the mean internal temperature obtained at step 11 of Table 9b, so that Ti,m=(76)m and re-calculate the utilisation factor for gains using Table 9a.    Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec	(93)m= 18.86	19.1	19.49	19.94	20.26	20.42	20.46	20.45	20.36	19.98	19.38	18.82		(93)
the utilisation factor for gains using Table 9a    Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec														
Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec				•		ed at ste	ep 11 of	Table 9	o, so tha	t Ti,m=(	76)m an	d re-calc	culate	
Unitsisation factor for gains, hms.   (94)ms   0.87   0.87   0.7   0.57   0.42   0.3   0.33   0.51   0.72   0.83   0.88   (94)   (95)	_					Jun	Jul	Aua	Sep	Oct	Nov	Dec		
Useful gains, hmGm, W = (94)m x (84)m   Useful gains, hmGm, W = (94)m x (95)m   Useful gains, hmGm, W = (95)m   Useful gains, hmGm, hm			L	· · ·				_ 3						
Septembrook	(94)m= 0.87	0.84	0.79	0.7	0.57	0.42	0.3	0.33	0.51	0.72	0.83	0.88		(94)
Monthly average external temperature from Table 8  (36)me 4.3 4.9 6.5 8.9 11.7 14.6 16.6 16.4 14.1 10.6 7.1 4.2  Heat loss rate for mean intermel temperature, Lm., W = ((39)m x ((93)m - (96)m) x (41)m  (37)me 92.3 90.85 2 826.7 692.41 534.71 537.93 237.27 246.5 387.52 586.43 772.21 924.78  Space heating requirement for each month, kWh/month = 0.024 x ((97)m - (95)m) x (41)m  (38)me 272.02 211.02 171.72 92.6 40.29 0 0 0 0 0 8.819 181.79 278.51  Total per year (kWh/year) = Sum(98)t = 1336.14 (38)  Space heating requirement in kWh/m²/year  3b Energy requirements — Community heating scheme  This part is used for space heating, space cooling or water heating provided by a community scheme.  Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none 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 CHP and up to four other heat sources: the latter includes boiline, heat pumps, geothermal and waste heat from power stations. See Appendix C.  Fraction of total space heat from Community boilers (302) x (303a) = 1 (304a)  Factor for control and charging method (Table 4c(3)) for community heating system 1 (305)  Distribution loss factor (Table 12c) for community heating system 1 (305)  Space heating requirement  Space heating requirement from secondary/supplementary system (98) x (301) x (305) x (306) = 1 (307a)  Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E) 0 (308  Space heating requirement from secondary/supplementary system (98) x (301) x (305) x (306) = 2237.67 (310a)  Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E) 0 (308  Space heating requirement from secondary/supplementary system (98) x (301) x (305) x (306) = 2237.67 (310a)  Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E) 0 (308  Space heating requirement Form Community boilers (64) x (303a) x (305) x (306)	Useful gains,	hmGm	, W = (94	4)m x (84	4)m	•								
(96)   (96)   (96)   (96)   (96)   (96)   (96)   (96)   (96)   (97)   (93)	(95)m= 566.71	592.83	595.89	563.8	480.56	343.71	233.75	243.67	358.75	467.88	519.72	550.44		(95)
Heat loss rate for mean internal temperature, Lm , W = [(39)m x   [(93)m - (96)m ]		age exte	ernal tem	perature	from T	able 8							ı	
Space heating requirement for each month, kWh/month = 0.024 x [(97) m - (95)m] x (41) m (98)m   272.02   211.02   171.72   92.6   40.29   0   0   0   0   8.19   181.79   278.51   18.23   (99)			ļ								7.1	4.2		(96)
Space   heating requirement for each month, kWh/month = 0.024 x [(97)m - (95)m] x (41)m   (98)m   272.02   211.02   171.72   92.6   40.29   0   0   0   0   88.19   181.79   278.51   (98)		i	1	· ·		i	- ,	<u> </u>	<u> </u>				ı	(0)
Space heating requirement in kWh/m²/year   Space tooling or water heating provided by a community scheme.   Space heat from community boilers   Space heating method (Table 4c(3)) for community heating system   1.056   (302) x (303a) =   1.056   (307a)	` '				<u> </u>	ļ						924.78		(97)
Total per year (kWh/year) = Sum(98). sc. 0 = 1336.14   (98) Space heating requirement in kWh/m²/year   18.23   (99)  9b. Energy requirements — Community heating scheme  This part is used for space heating, space cooling or water heating provided by a community scheme. Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none   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 CHP and up to four other heat sources: the latter includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C. Fraction of heat from Community boilers   1   (303a)    Fraction of total space heat from Community boilers   1   (304a)    Fractor for control and charging method (Table 4c(3)) for community heating system   1   (305)    Distribution loss factor (Table 12c) for community heating system   1.05   (306)    Space heating   kWh/year   1336.14    Space heating requirement   1336.14    Space heating requirement   1336.14    Space heating requirement from secondary/supplementary system   (98) x (304a) x (305) x (306) =   1402.95   (307a)    Water heating   2131.3    If DHW from community scheme:   (64) x (303a) x (305) x (305) =   2237.87   (310a)    Electricity used for heat distribution   0.01 x ((307a)(307e) + (310a)(310e)] =   36.41   (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)	-		1		1	I						070.54		
Space heating requirement in kWh/m²/year  9b. Energy requirements — Community heating scheme  This part is used for space heating, space cooling or water heating provided by a community scheme. Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none  (301)  Fraction of space heat from community system 1 — (301) =  The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.  Fraction of total space heat from Community boilers  Fraction of total space heat from Community boilers  Fraction of total space heat from Community boilers  Fraction of total space heat from Community heating system  (302) x (303a) =  1 (304a)  Factor for control and charging method (Table 4c(3)) for community heating system  (305)  Space heating  Space heating requirement  Space heat from Community boilers  (98) x (304a) x (305) x (306) =  1402.95 (307a)  Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)  Space heating requirement from secondary/supplementary system (98) x (301) x 100 + (308) =  0 (309)  Water heating  Annual water heating requirement  If DHW from community scheme:  Water heat from Community boilers  (64) x (303a) x (305) x (306) =  2237.87 (310a)  Electricity used for heat distribution  0.01 x [(307a)(307e) + (310a)(310e)] =  36.41 (313)  Cooling System Energy Efficiency Ratio  5 (301) x (100 + (314)) =  0 (315)  Electricity for pumps and fans within dwelling (Table 4f):	(98)m= 272.02	211.02	1/1./2	92.6	40.29	0	0					<u> </u>	4000.44	7(00)
Sb. Energy requirements — Community heating scheme  This part is used for space heating, space cooling or water heating provided by a community scheme. Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none  The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C. Fraction of heat from Community boilers  Fraction of total space heat from Community boilers  Factor for control and charging method (Table 4c(3)) for community heating system  1 (303)  Factor for control and charging method (Table 4c(3)) for community heating system  1 1.05 (306)  Space heating  Annual space heating requirement  Space heat from Community boilers  (98) x (304a) x (305) x (306) =  Hade 1336.14  Space heating requirement from secondary/supplementary system in % (from Table 4a or Appendix E)  O (308)  Water heating  Annual water heating requirement  If DHW from community scheme:  Water heat from Community boilers  (64) x (303a) x (305) x (306) =  Electricity used for heat distribution  O.01 x ((307a)(307e) + (310a)(310e)] =  36.41 (313)  Cooling System Energy Efficiency Ratio  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):								rota	i per year	(Kvvn/yeai	) = Sum(9	8)15,912 =	1336.14	₫``
This part is used for space heating, space cooling or water heating provided by a community scheme. Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none 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 CHP and up to four other heat sources; the latter includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.  Fraction of heat from Community boilers 1 (303a)  Fraction of total space heat from Community boilers (302) × (303a) = 1 (304a)  Factor for control and charging method (Table 4c(3)) for community heating system 1 (305)  Distribution loss factor (Table 12c) for community heating system 1 (305)  Space heating  Annual space heating requirement (98) × (304a) × (305) × (306) = 1402.95 (307a)  Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E) 0 (308)  Space heating  Annual water heating requirement (98) × (301) × 100 + (308) = 0 (309)  Water heating  Annual water heating requirement (98) × (303a) × (305) × (306) = 2237.87 (310a)  Electricity used for heat distribution 0.01 × ((307a)(307e) + (310a)(310e)] = 36.41 (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):	Space heatin	g requir	ement in	kWh/m²	<sup>2</sup> /year								18.23	(99)
Fraction of space heat from secondary/supplementary heating (Table 11) '0' if none  [301] Fraction of space heat from community system 1 – (301) =  [1] The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.  Fraction of heat from Community boilers  [302] x (303a) =  [303a] Fraction of total space heat from Community boilers  [302] x (303a) =  [303a] Fraction of total space heat from Community boilers  [302] x (303a) =  [303] Fraction of total space heat from Community heating system  [305] Distribution loss factor (Table 12c) for community heating system  [306] Space heating  Annual space heat from Community boilers  [307] Space heat from Community boilers  [308] x (304a) x (305) x (306) =  [308] x (307a)  Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)  [307] Space heating  Annual water heating requirement from secondary/supplementary system  [307]  Water heating  Annual water heating requirement  [307] If DHW from community scheme:  Water heat from Community boilers  [308] x (301) x (305) x (306) =  [309] x (301) x (305) x (306) =  [307] x (307a)  [308]  Space heating requirement  [307] x (307a)  [308] x (307a) x	9b. Energy red	quiremer	nts – Cor	mmunity	heating	scheme	!							
Fraction of space heat from community system 1 – (301) =  The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.  Fraction of heat from Community boilers  Fraction of total space											unity sch	neme.		7(204)
The community scheme may obtain heat from several sources. The procedure allows for CHP and up to four other heat sources; the latter includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.  Fraction of heat from Community boilers  Fraction of total space heat	·			-		-	_	(Table T	1) U II N	one			0	╡`
includes boilers, heat pumps, geothermal and waste heat from power stations. See Appendix C.  Fraction of heat from Community boilers  Fraction of total space heat from Community heating system  I (305)  Distribution loss factor (Table 12c) for community heating system  Space heating  Annual space heating requirement  Space heat from Community boilers  Fraction of total space heating requirement  Space heating  Fraction of total space heat from Community heating system  Space heating  Fraction of total space heat from Community heating system  Space heating  Fraction of total space heat from Community heating system  Space heating  Space heating requirement from Community beating system in % (from Table 4a or Appendix E)  Space heating requirement from secondary/supplementary system  Space heating requirement from secondary/supplementary system  Space heating requirement  Fraction of total space heat from Community boilers  Space heating system heating requirement  Space heating req	Fraction of spa	ace heat	from co	mmunity	system	1 – (30	1) =						1	(302)
Fraction of heat from Community boilers  Fraction of total space heat from Community boilers  Factor for control and charging method (Table 4c(3)) for community heating system  Factor for control and charging method (Table 4c(3)) for community heating system  I.05 (306)  Space heating  Annual space heating requirement  Space heat from Community boilers  (98) x (304a) x (305) x (306) = 1402.95 (307a)  Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)  Space heating requirement from secondary/supplementary system  (98) x (301) x 100 ÷ (308) = 0 (309)  Water heating  Annual water heating requirement  If DHW from community scheme:  Water heat from Community boilers  (64) x (303a) x (305) x (306) = 2237.87 (310a)  Electricity used for heat distribution  0.01 x [(307a)(307e) + (310a)(310e)] = 36.41 (313)  Cooling System Energy Efficiency Ratio  Distribution of total space heating system of the community heating system of the community heating system, if not enter 0) = (107) + (314) = 0 (315)  Electricity for pumps and fans within dwelling (Table 4f):										up to four	other heat	sources; t	he latter	
Fraction of total space heat from Community boilers  Factor for control and charging method (Table 4c(3)) for community heating system  Distribution loss factor (Table 12c) for community heating system  1.05 (306)  Space heating  Annual space heating requirement  Space heat from Community boilers  Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)  Space heating requirement from secondary/supplementary system  Water heating  Annual water heating requirement  If DHW from community scheme:  Water heat from Community boilers  (64) x (303a) x (305) x (306) =  Electricity used for heat distribution  Cooling System Energy Efficiency Ratio  Electricity for pumps and fans within dwelling (Table 4f):			-			rom powei	r stations.	See Appei	naix C.				1	(303a)
Factor for control and charging method (Table 4c(3)) for community heating system  Distribution loss factor (Table 12c) for community heating system  Space heating Annual space heating requirement  Space heat from Community boilers  Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)  Space heating requirement from secondary/supplementary system  (98) x (301) x 100 ÷ (308) =  0  (309)  Water heating Annual water heating requirement  If DHW from community scheme: Water heat from Community boilers  (64) x (303a) x (305) x (306) =  Electricity used for heat distribution  0.01 x [(307a)(307e) + (310a)(310e)] =  36.41  (313)  Cooling System Energy Efficiency Ratio  Electricity for pumps and fans within dwelling (Table 4f):				•		nilers				(3	02) x (303	a) =		╡`
Distribution loss factor (Table 12c) for community heating system  Space heating Annual space heating requirement  Space heat from Community boilers  Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)  Space heating requirement from secondary/supplementary system  (98) × (304a) × (305) × (306) =  1402.95  (307a)  Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)  Space heating requirement from secondary/supplementary system  (98) × (301) × 100 ÷ (308) =  0  (309)  Water heating Annual water heating requirement  If DHW from community scheme:  Water heat from Community boilers  (64) × (303a) × (305) × (306) =  2237.87  (310a)  Electricity used for heat distribution  0.01 × [(307a)(307e) + (310a)(310e)] =  36.41  (313)  Cooling System Energy Efficiency Ratio  5 cooling (if there is a fixed cooling system, if not enter 0)  Electricity for pumps and fans within dwelling (Table 4f):		•			•		r commi	ınity hea	ıtina svst		0 <b>2</b> )	<u>.</u> ,		╡`
Space heating Annual space heating requirement  Space heat from Community boilers  Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)  Space heating requirement from secondary/supplementary system  (98) x (304a) x (305) x (306) =  1402.95  (307a)  Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)  O  (308)  Water heating Annual water heating requirement  If DHW from community scheme:  Water heat from Community boilers  (64) x (303a) x (305) x (306) =  2237.87  (310a)  Electricity used for heat distribution  0.01 x [(307a)(307e) + (310a)(310e)] =  36.41  (313)  Cooling System Energy Efficiency Ratio  Space cooling (if there is a fixed cooling system, if not enter 0) = (107) ÷ (314) =  Electricity for pumps and fans within dwelling (Table 4f):					,	` ''		•	iting sys	CIII				╡`
Annual space heating requirement  Space heat from Community boilers  (98) x (304a) x (305) x (306) = 1402.95 (307a)  Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)  Space heating requirement from secondary/supplementary system  (98) x (301) x 100 ÷ (308) = 0 (309)  Water heating  Annual water heating requirement  If DHW from community scheme:  Water heat from Community boilers  (64) x (303a) x (305) x (306) = 2237.87 (310a)  Electricity used for heat distribution  0.01 x [(307a)(307e) + (310a)(310e)] = 36.41 (313)  Cooling System Energy Efficiency Ratio  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):			(Table	120) 101 (	ommun	ity neatii	ig syste	Ш						
Space heat from Community boilers  (98) × (304a) × (305) × (306) = 1402.95 (307a)  Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)  Space heating requirement from secondary/supplementary system  (98) × (301) × 100 ÷ (308) = 0 (309)  Water heating  Annual water heating requirement  If DHW from community scheme:  Water heat from Community boilers  (64) × (303a) × (305) × (306) = 2237.87 (310a)  Electricity used for heat distribution  0.01 × [(307a)(307e) + (310a)(310e)] = 36.41 (313)  Cooling System Energy Efficiency Ratio  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):	-	_												, ¬
Efficiency of secondary/supplementary heating system in % (from Table 4a or Appendix E)  O (308)  Space heating requirement from secondary/supplementary system  (98) x (301) x 100 ÷ (308) =  0 (309)  Water heating  Annual water heating requirement  If DHW from community scheme:  Water heat from Community boilers  (64) x (303a) x (305) x (306) =  2237.87 (310a)  Electricity used for heat distribution  0.01 x [(307a)(307e) + (310a)(310e)] =  36.41 (313)  Cooling System Energy Efficiency Ratio  Space cooling (if there is a fixed cooling system, if not enter 0)  Electricity for pumps and fans within dwelling (Table 4f):	·	_	·									i		╡
Space heating requirement from secondary/supplementary system $(98) \times (301) \times 100 \div (308) = 0$ $(309)$ Water heating  Annual water heating requirement $2131.3$ If DHW from community scheme:  Water heat from Community boilers $(64) \times (303a) \times (305) \times (306) = 2237.87$ $(310a)$ Electricity used for heat distribution $0.01 \times [(307a)(307e) + (310a)(310e)] = 36.41$ $(313)$ Cooling System Energy Efficiency Ratio $0$ $(314)$ Space cooling (if there is a fixed cooling system, if not enter 0) $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$ $0$	•		•						, , ,	, ,	, , ,	=	1402.95	(307a)
Water heating Annual water heating requirement $2131.3$ If DHW from community scheme: Water heat from Community boilers $(64) \times (303a) \times (305) \times (306) =$ $2237.87$ $(310a)$ Electricity used for heat distribution $0.01 \times [(307a)(307e) + (310a)(310e)] =$ $36.41$ $(313)$ Cooling System Energy Efficiency Ratio $0$ $(314)$ Space cooling (if there is a fixed cooling system, if not enter 0) $= (107) \div (314) =$ $0$ $(315)$ Electricity for pumps and fans within dwelling (Table 4f):	Efficiency of s	econdar	y/supple	mentary	heating	system	in % (fro	om Table	4a or A	ppendix	E)		0	(308
Annual water heating requirement  If DHW from community scheme:  Water heat from Community boilers  (64) $\times$ (303a) $\times$ (305) $\times$ (306) =  2237.87  (310a)  Electricity used for heat distribution  Cooling System Energy Efficiency Ratio  Space cooling (if there is a fixed cooling system, if not enter 0)  Electricity for pumps and fans within dwelling (Table 4f):	Space heating	require	ment fro	m secon	dary/su	oplemen	tary sys	tem	(98) x (30	01) x 100 -	÷ (308) =		0	(309)
If DHW from community scheme:  Water heat from Community boilers  Electricity used for heat distribution  Cooling System Energy Efficiency Ratio  Space cooling (if there is a fixed cooling system, if not enter 0)  Electricity for pumps and fans within dwelling (Table 4f):  (64) $\times$ (303a) $\times$ (305) $\times$ (306) =  2237.87  (310a)  0.01 $\times$ [(307a)(307e) + (310a)(310e)] =  36.41  (313)  (314)  5pace cooling (if there is a fixed cooling system, if not enter 0)  Electricity for pumps and fans within dwelling (Table 4f):	Water heating	3												_
Water heat from Community boilers $ (64) \times (303a) \times (305) \times (306) = 2237.87 $ (310a)	Annual water l	neating i	requirem	ent									2131.3	
Electricity used for heat distribution $0.01 \times [(307a)(307e) + (310a)(310e)] = 36.41$ (313)  Cooling System Energy Efficiency Ratio $0$ (314)  Space cooling (if there is a fixed cooling system, if not enter 0) $= (107) \div (314) = 0$ (315)  Electricity for pumps and fans within dwelling (Table 4f):									(64) v (30	)32) v (30)	5) v (306) :	_	2227 97	7(310a)
Cooling System Energy Efficiency Ratio  Space cooling (if there is a fixed cooling system, if not enter 0) $= (107) \div (314) = 0$ Cooling System Energy Efficiency Ratio $= (107) \div (314) = 0$ Electricity for pumps and fans within dwelling (Table 4f):			•					0.01						╡`
Space cooling (if there is a fixed cooling system, if not enter 0) = $(107) \div (314) =$ 0 (315) Electricity for pumps and fans within dwelling (Table 4f):	•				Ω			0.01	x [(0074).	(0070) 1	(0100)(	0100)] =		╡`
Electricity for pumps and fans within dwelling (Table 4f):		_	-	•		n if not e	anter (1)		- (107) ÷	(314) –				
		•			•		,		- (101) <del>-</del>	(017) -			U	
200.09								outside					285.09	(330a)
				,	Pv									````

warm air heating system fans			0 (330b)
pump for solar water heating			0 (330g)
Total electricity for the above, kWh/yea	ar	=(330a) + (330b) + (330g) =	285.09 (331)
Energy for lighting (calculated in Appe	ndix L)		338.01 (332)
Electricity generated by PVs (Appendix	KM) (negative quantity)		-741.01 (333)
Electricity generated by wind turbine (A	Appendix M) (negative quantity)		0 (334)
10b. Fuel costs – Community heating	scheme		
	<b>Fuel</b> kWh/year	Fuel Price (Table 12)	Fuel Cost £/year
Space heating from CHP	(307a) x	4.24 x 0.	01 = 59.48 (340a)
Water heating from CHP	(310a) x	4.24 x 0.	01 = 94.89 (342a)
		Fuel Price	
Pumps and fans	(331)	13.19 x 0.	01 = 37.6 (349)
Energy for lighting	(332)	13.19 x 0.	01 = 44.58 (350)
Additional standing charges (Table 12)			120 (351)
Energy saving/generation technologies  Total energy cost	S = (340a)(342e) + (345)(354) =		356.56 (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] =		1.27 (357)
SAP rating (section12)			82.34 (358)
12b. CO2 Emissions – Community hea	ating scheme		
			ctor Emissions
COO from other courses of once and		Vh/year kg CO2/kWh	kg CO2/year
CO2 from other sources of space and Efficiency of heat source 1 (%)	<b>3</b> ,	els repeat (363) to (366) for the secon	nd fuel 94 (367a)
CO2 associated with heat source 1	[(307b)+(310b)] x	( 100 ÷ (367b) x 0.22	= 836.61 (367)
Electrical energy for heat distribution	[(313) x	0.52	= 18.9 (372)
Total CO2 associated with community	systems (363)(	366) + (368)(372)	= 855.51 (373)
CO2 associated with space heating (se	econdary) (309) x	0	= 0 (374)
CO2 associated with water from imme	rsion heater or instantaneous he	eater (312) x 0.22	= 0 (375)
Total CO2 associated with space and	water heating (373) + (	374) + (375) =	855.51 (376)
CO2 associated with electricity for pun	nps and fans within dwelling (33	31)) x 0.52	= 147.96 (378)
CO2 associated with electricity for ligh	ting (332))) x	0.52	= 175.43 (379)
Energy saving/generation technologies	s (333) to (334) as applicable		
Item 1		0.52 x 0.	01 = -384.59 (380)
Total CO2, kg/year	sum of (376)(382) =		794.31 (383)

Dwelling CO2 Emission Rate (383) ÷ (4) =				10.83	(384)
El rating (section 14)				91	(385)
13b. Primary Energy – Community heating scheme					
	Energy kWh/year	Primary factor		Energy Vh/year	
Energy from other sources of space and water heating (no Efficiency of heat source 1 (%)	t CHP) P using two fuels repeat (363) to	(366) for the second	l fuel	94	(367a)
Energy associated with heat source 1	807b)+(310b)] x 100 ÷ (367b) x	1.22	= [	4725.31	(367)
Electrical energy for heat distribution	[(313) x		= [	111.77	(372)
Total Energy associated with community systems	(363)(366) + (368)(37	2)	= [	4837.09	(373)
if it is negative set (373) to zero (unless specified otherw	vise, see C7 in Appendix C	C)	[	4837.09	(373)
Energy associated with space heating (secondary)	(309) x	0	= [	0	(374)
Energy associated with water from immersion heater or ins	stantaneous heater(312) x	1.22	= [	0	(375)
Total Energy associated with space and water heating	(373) + (374) + (375) =		[	4837.09	(376)
Energy associated with space cooling	(315) x	3.07	= [	0	(377)
Energy associated with electricity for pumps and fans with	n dwelling (331)) x	3.07	= [	875.22	(378)
Energy associated with electricity for lighting	(332))) x	3.07	= [	1037.69	(379)
Energy saving/generation technologies Item 1		3.07 × 0.0	1 =	-2274.91	(380)
Total Primary Energy, kWh/year sum of	(376)(382) =			4475.08	(383)

		Hee	er Details:						
Access at Name.	Zahid Ashraf	036		a Mirros	<b>b</b> a v .		CTDO	001000	
Assessor Name: Software Name:	Stroma FSAP 2012	2	Stroma Softwa					001082 on: 1.0.5.9	
			ty Address:						
Address :									
1. Overall dwelling dime	ensions:								
Ground floor		A	rea(m²)	(1a) x		<b>ight(m)</b> 2.5	(2a) =	Volume(m³	(3a)
	a) . (1b) . (1a) . (1d) . (1a)	. (1n)				2.5	(2α) -	103.20	
Total floor area TFA = (1	a)+(10)+(10)+(10)+(1e)	+(111)	73.31	(4)	) . (2-) . (2-	1) . (2-) .	(2-)		_
Dwelling volume				(3a)+(3b)	)+(3c)+(3c	d)+(3e)+	.(3h) =	183.28	(5)
2. Ventilation rate:	main se	condary	other		total			m³ per hou	r
Number of chimneys	heating	eating		1 <sub>=</sub> [			40 =	-	_
Number of chimneys			0	<b></b>	0		20 =	0	(6a)
Number of open flues	0 +	0 +	0	] = [	0			0	(6b)
Number of intermittent fa				Ĺ	3		10 =	30	(7a)
Number of passive vents				Ĺ	0		10 =	0	(7b)
Number of flueless gas fi	ires			L	0	X 4	40 =	0	(7c)
							Air ch	nanges per ho	our
Infiltration due to chimne	vs. flues and fans = (6a	)+(6b)+(7a)+(7b	o)+(7c) =	Г	30		÷ (5) =	0.16	(8)
	peen carried out or is intended			ontinue fr			. (0)	0.10	
Number of storeys in the	he dwelling (ns)							0	(9)
Additional infiltration						[(9)	-1]x0.1 =	0	(10)
	.25 for steel or timber fr resent, use the value corresp			•	ruction			0	(11)
deducting areas of openi		onaing to the gi	realer wall are	a (aner					
If suspended wooden	floor, enter 0.2 (unseale	ed) or 0.1 (se	ealed), else	enter 0				0	(12)
If no draught lobby, en	ter 0.05, else enter 0							0	(13)
Percentage of window	s and doors draught str	ipped						0	(14)
Window infiltration			0.25 - [0.2					0	(15)
Infiltration rate			(8) + (10)					0	(16)
•	q50, expressed in cubi	•	•	•	etre of e	envelope	area	5	(17)
If based on air permeabil	•							0.41	(18)
Number of sides sheltere	es if a pressurisation test has	been done or a	degree air pei	meability	is being u	sed	ı		7(40)
Shelter factor	tu .		(20) = 1 -	0.075 x (1	19)] =			0.85	(19)
Infiltration rate incorporate	ting shelter factor		(21) = (18)		,-			0.35	(21)
Infiltration rate modified f	_								` ′
Jan Feb	Mar Apr May	Jun Ju	ıl Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp	peed from Table 7	•	•		•	•		<u>-</u>	
(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 Easter (225) (2	2)m : 4							-	
Wind Factor $(22a)m = (2(22a)m = 1.27)$ 1.25	2)m ÷ 4 1.23	0.95 0.9	5 0.92	1	1.08	1.12	1.18	]	
1.27	1.100	0.90	0.32	'	1.00	L '.'2	1.10	I	

Adjusted infiltr	ation rat	e (allowi	ng for sh	nelter an	d wind s	speed) =	(21a) x	(22a)m					
0.45 Calculate effec	0.44	0.43	0.39	0.38 he appli	0.33	0.33	0.33	0.35	0.38	0.4	0.41	]	
If mechanica		-		по струпп	Julio 10 Juli							0	(23a)
If exhaust air he	eat pump	using Appe	endix N, (2	3b) = (23a	a) × Fmv (e	equation (N	N5)) , othe	rwise (23b	) = (23a)			0	(23b)
If balanced with	heat reco	overy: effic	iency in %	allowing f	or in-use f	actor (fron	n Table 4h	) =				0	(23c)
a) If balance	d mech	anical ve	ntilation	with he	at recove	ery (MVI	HR) (24a	n)m = (22)	2b)m + (	23b) × [	1 – (23c)	÷ 100]	
(24a)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24a)
b) If balance						<u> </u>	r ``	<del>í `</del>	<del>r ´       `</del>	<del>-                                    </del>	1	1	
(24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24b)
c) If whole h if (22b)n		tract ven (23b), t		-	-				.5 × (23b	o)			
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0	]	(24c)
d) If natural if (22b)n		on or wh en (24d)							0.5]				
(24d)m= 0.6	0.6	0.59	0.57	0.57	0.56	0.56	0.55	0.56	0.57	0.58	0.59		(24d)
Effective air	change	rate - er	iter (24a	) or (24b	o) or (24	c) or (24	d) in box	(25)					
(25)m= 0.6	0.6	0.59	0.57	0.57	0.56	0.56	0.55	0.56	0.57	0.58	0.59		(25)
3. Heat losse	s and he	eat loss r	paramete	er:									
ELEMENT	Gros	•	Openin		Net Ar	ea	U-valı	ıe	ΑXU		k-value	e A	Χk
	area	(m²)	m	<sup>2</sup>	A ,r	m²	W/m2	K ,	(W/	K)	kJ/m²-	K k.	J/K
Doors					2	X	1	= [	2	_			(26)
Windows Type					7.661	_	/[1/( 1.4 )+	l l	10.16	_			(27)
Windows Type	2				3.819	x1.	/[1/( 1.4 )+	0.04] =	5.06	╛,			(27)
Floor Type 1					25.83	7 X	0.13	= [	3.3588	<u>1</u> [			(28)
Floor Type 2					47.47	4 X	0.13	= [	6.17161	9 [			(28)
Walls Type1	48.1	7	11.48	3	36.69	) x	0.18	=	6.6	_			(29)
Walls Type2	17.6		2		15.68	3 ×	0.18	=	2.82				(29)
Total area of e					139.1								(31)
* for windows and ** include the area						ated using	ı formula 1	/[(1/U-valu	ie)+0.04] a	as given in	paragraph	1 3.2	
Fabric heat los							(26)(30)	+ (32) =				36.18	(33)
Heat capacity	Cm = S(	(A x k )						((28)	(30) + (32	2) + (32a).	(32e) =	7893.16	(34)
Thermal mass	parame	ter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250	(35)
For design assess can be used inste				construct	ion are no	t known pr	ecisely the	indicative	values of	TMP in Ta	able 1f		
Thermal bridge	es : S (L	x Y) cal	culated ı	using Ap	pendix l	<						11.77	(36)
if details of therma		are not kn	own (36) =	= 0.05 x (3	11)			(33) +	(36) =			47.94	(37)
Ventilation hea		alculated	l monthly	/						(25)m x (5)	)	47.34	(0.)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	]	
(38)m= 36.32	36.08	35.85	34.77	34.56	33.62	33.62	33.44	33.98	34.56	34.97	35.4	1	(38)
Heat transfer of	coefficie	nt, W/K			•	•	•	(39)m	= (37) + (	38)m	•		
(39)m= 84.26	84.03	83.8	82.71	82.51	81.56	81.56	81.38	81.92	82.51	82.92	83.35	]	
					•	•	•	•	Average -	Sum(39) <sub>1</sub>	/12_	82.71	(39)

Heat loss para	ameter (I	HLP), W	/m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 1.15	1.15	1.14	1.13	1.13	1.11	1.11	1.11	1.12	1.13	1.13	1.14		
	!		Į.	Į.	Į.	!	<u> </u>	'	Average =	Sum(40) <sub>1</sub>	12 /12=	1.13	(40)
Number of day	ys in mo	nth (Tab	le 1a)										
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water hea	ting ene	rgy requ	irement:								kWh/ye	ear:	
Assumed occu if TFA > 13.9 if TFA £ 13.9	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9	)2)] + 0.0	0013 x (¯	TFA -13.		32		(42)
Annual average Reduce the annual not more that 125	ge hot wa al average	hot water	usage by	5% if the $a$	lwelling is	designed i			se target o		.39		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage i													
(44)m= 98.33	94.75	91.18	87.6	84.03	80.45	80.45	84.03	87.6	91.18	94.75	98.33		
	!	!	<u> </u>	ļ	<u> </u>	!	<u> </u>		Total = Su	m(44) <sub>112</sub> =	=	1072.67	(44)
Energy content of	f hot water	used - cal	culated m	onthly $= 4$ .	190 x Vd,ı	m x nm x E	OTm / 3600	) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m= 145.82	127.53	131.6	114.73	110.09	95	88.03	101.02	102.22	119.13	130.04	141.22		
									Total = Su	m(45) <sub>112</sub> =	=	1406.44	(45)
If instantaneous v	vater heatı	ng at point	of use (no	not water	storage),	enter 0 in	boxes (46)	to (61)	1				
(46)m= 21.87	19.13	19.74	17.21	16.51	14.25	13.2	15.15	15.33	17.87	19.51	21.18		(46)
Water storage Storage volum		) includir	na anv sa	alar or M	WHRS	etorana	within es	ama vas	امء		450		(47)
If community h	` .	•				•		airio voo	001		150		(47)
Otherwise if no	•			-			, ,	ers) ente	er '0' in (	(47)			
Water storage			(					,		, ,			
a) If manufact	turer's d	eclared l	oss facto	or is kno	wn (kWł	n/day):				1.	39		(48)
Temperature f	actor fro	m Table	2b							0.	54		(49)
Energy lost fro	m wate	r storage	, kWh/ye	ear			(48) x (49)	) =		0.	75		(50)
b) If manufact			-										
Hot water stor	•			e 2 (kW	h/litre/da	ay)					0		(51)
If community he Volume factor	•		on 4.3										(52)
Temperature f			2b								0		(52)
Energy lost fro				ar			(47) x (51)	) x (52) x (	53) =		0		(54)
Enter (50) or		_	, IXVVII/ y	Jai			(11) X (01)	) X (02) X (	<i>-</i>	-	75		(55)
Water storage	` , ` `	,	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												ix H	(30)
				· · ·									(57)
(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		, ,
Primary circuit	,	•									0		(58)
Primary circuit				,	•	• •	, ,		41	-4-1\			
(modified by			ı —	ı —	ı —		<del></del>	<u> </u>		<del>'</del>	00.00		(EO)
(59)m= 23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)

Combiless	o louloto d	for oach	manth /	(61)m	(CO) + 2(	SE (41)	١,,,,						
Combi loss of (61)m= 0	alculated	or each	month (	0 1)m =	(6U) ÷ 30	05 × (41)	0	0	0	0	0	]	(61)
							ļ	<u> </u>		<u> </u>	<u> </u>	(50) = . (64) = .	(01)
(62)m= 192.4	<u> </u>	178.2	159.83	156.69	140.09	134.63	147.61	147.32	(45)III + 165.73	175.13	187.81	(59)m + (61)m	(62)
` '								1				I	(02)
Solar DHW inputation									r contribut	ion to wate	er neaung)		
(63)m= 0	0	0	0	0	0	) 300 Ap	0	)   0	0	0	0	1	(63)
Output from	_											I	()
(64)m= 192.4		178.2	159.83	156.69	140.09	134.63	147.61	147.32	165.73	175.13	187.81	]	
	_!	l .				<u> </u>	Out	put from w	ater heate	<u>ı                                    </u>	12	1955.06	(64)
Heat gains fr	om water	heating,	kWh/mo	onth 0.2	5 ′ [0.85	× (45)m	+ (61)r	n] + 0.8 x	k [(46)m	+ (57)m	+ (59)m	1	-
(65)m= 85.76	1	81.03	74.22	73.88	67.66	66.55	70.86	70.06	76.89	79.31	84.23	اً	(65)
include (57	7)m in cal	culation o	of (65)m	onlv if c	vlinder i	s in the o	dwelling	or hot w	ater is f	om com	munitv h	ı neating	
5. Internal	<u> </u>			•							· ,	<u> </u>	
Metabolic ga													
Jan	T '	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(66)m= 116.1	9 116.19	116.19	116.19	116.19	116.19	116.19	116.19	116.19	116.19	116.19	116.19	]	(66)
Lighting gain	s (calcula	ted in Ap	pendix	L, equati	on L9 o	r L9a), a	lso see	Table 5				-	
(67)m= 19.14	17	13.82	10.47	7.82	6.61	7.14	9.28	12.45	15.81	18.45	19.67		(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5										•			
(68)m= 204.9	207.02	201.67	190.26	175.86	162.33	153.29	151.16	156.52	167.93	182.32	195.86		(68)
Cooking gair	ns (calcula	ted in A	ppendix	L, equat	ion L15	or L15a)	, also s	ee Table	5	•	•	•	
(69)m= 34.62	34.62	34.62	34.62	34.62	34.62	34.62	34.62	34.62	34.62	34.62	34.62		(69)
Pumps and f	ans 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	tive valu	es) (Tab	le 5)		•		•	•		•	
(71)m= -92.9	-92.95	-92.95	-92.95	-92.95	-92.95	-92.95	-92.95	-92.95	-92.95	-92.95	-92.95		(71)
Water heating	g gains (1	able 5)				•			•	•		•	
(72)m= 115.2	7 113.2	108.92	103.09	99.3	93.97	89.44	95.25	97.31	103.34	110.16	113.21	]	(72)
Total interna	al gains =				(66)	)m + (67)m	+ (68)m	+ (69)m +	(70)m + (7	'1)m + (72)	m	•	
(73)m= 400.1	6 398.08	385.26	364.67	343.84	323.76	310.73	316.54	327.14	347.94	371.79	389.6	]	(73)
6. Solar gai	ns:												
Solar gains are	e calculated	using sola	r flux from	Table 6a	and assoc	iated equa	tions to c	onvert to th	ne applicat	ole orientat	ion.		
Orientation:			Area		Flu		_	g_ -	_	FF		Gains	
	Table 6d		m²		I al	ble 6a		Table 6b	_ '	able 6c		(W)	
Northeast 0.9		X	7.6	66	x 1	1.28	x	0.63	x	0.7	=	26.42	(75)
Northeast 0.9	0.77	X	7.6	66	x 2	22.97	х	0.63	x	0.7	=	53.77	(75)
Northeast 0.9	<b>U</b> 1111	X	7.6	66	x	11.38	x	0.63	x	0.7	=	96.88	(75)
Northeast 0.9		Х	7.6	66	x 6	67.96	x	0.63	x	0.7	=	159.11	(75)
Northeast 0.9	0.77	X	7.6	66	x g	91.35	X	0.63	x	0.7	=	213.87	(75)

		_			_		, ,						_
Northeast <sub>0.9x</sub>	0.77	X	7.6	6	X _	97.38	X	0.63	×	0.7	=	228.01	(75)
Northeast <sub>0.9x</sub>	0.77	X	7.6	66	x	91.1	X	0.63	X	0.7	=	213.3	(75)
Northeast <sub>0.9x</sub>	0.77	X	7.6	66	X	72.63	X	0.63	X	0.7	=	170.04	(75)
Northeast <sub>0.9x</sub>	0.77	X	7.6	66	x	50.42	X	0.63	X	0.7	=	118.05	(75)
Northeast <sub>0.9x</sub>	0.77	X	7.6	66	x	28.07	X	0.63	X	0.7	=	65.71	(75)
Northeast <sub>0.9x</sub>	0.77	X	7.6	66	x	14.2	x	0.63	X	0.7	=	33.24	(75)
Northeast <sub>0.9x</sub>	0.77	x	7.6	66	x	9.21	x	0.63	x	0.7	=	21.57	(75)
Southeast <sub>0.9x</sub>	0.77	X	3.8	32	x	36.79	x	0.63	X	0.7	=	42.94	(77)
Southeast <sub>0.9x</sub>	0.77	X	3.8	32	x	62.67	x	0.63	x	0.7	=	73.15	(77)
Southeast 0.9x	0.77	x	3.8	32	x	85.75	x	0.63	x	0.7	=	100.08	(77)
Southeast <sub>0.9x</sub>	0.77	x	3.8	32	x	106.25	×	0.63	x	0.7		124.01	(77)
Southeast <sub>0.9x</sub>	0.77	x	3.8	32	x	119.01	×	0.63	x	0.7		138.9	(77)
Southeast <sub>0.9x</sub>	0.77	x	3.8	32	x	118.15	×	0.63	x	0.7		137.9	(77)
Southeast <sub>0.9x</sub>	0.77	x	3.8	32	x	113.91	×	0.63	x	0.7		132.95	(77)
Southeast <sub>0.9x</sub>	0.77	x	3.8	32	x	104.39	X	0.63	x	0.7	=	121.84	(77)
Southeast <sub>0.9x</sub>	0.77	x	3.8	32	x	92.85	X	0.63	x	0.7	=	108.37	(77)
Southeast <sub>0.9x</sub>	0.77	x	3.8	32	x	69.27	X	0.63	x	0.7	<del>-</del>	80.84	(77)
Southeast <sub>0.9x</sub>	0.77	x	3.8	32	x	44.07	X	0.63	x	0.7	=	51.44	(77)
Southeast <sub>0.9x</sub>	0.77	x	3.8	32	×	31.49	X	0.63	x	0.7	<del>-</del>	36.75	(77)
Solar gains in watts, calculated for each month (83)m = Sum(74)m(82)m													
(83)m= 69.36	126.92 1	96.97	283.12	352.77	365	9 346.24	291	.88 226.42	146.56	84.68	58.32		(83)
Total gains – i	nternal and	d solar	(84)m =	= (73)m	+ (83)	m , watts							
(84)m= 469.52	525.01 5	82.23	647.78	696.61	689.	656.97	608	.42 553.56	494.49	456.47	447.92		(84)
7. Mean inter	nal temper	ature	(heating	seasor	1)								
Temperature	during hea	ating p	eriods ir	the livi	ng ar	ea from Ta	ble 9,	, Th1 (°C)				21	(85)
Utilisation fac	tor for gain	ns for I	iving are	ea, h1,m	ı (see	Table 9a)							
Jan	Feb	Mar	Apr	May	Ju	n Jul	A	ug Sep	Oct	Nov	Dec		
(86)m= 1	0.99	0.99	0.96	0.87	0.7	0.54	0.0	6 0.85	0.97	0.99	1		(86)
Mean interna	l temperatu	ure in I	iving ar	ea T1 (f	ollow	steps 3 to	7 in T	able 9c)	_	-	-		
(87)m= 19.8	r - r	20.18	20.51	20.8	20.9	i	20.	<del></del>	20.52	20.1	19.78		(87)
Temperature	during hea	atina n	eriods ir	rest of	dwell	ing from T	ahle (	Th2 (°C)					
(88)m= 19.96		19.97	19.98	19.98	19.9	<del>-</del>	19.		19.98	19.98	19.97		(88)
` ′	<u> </u>				<u> </u>				<u> </u>				
Utilisation fac		0.98	0.94	0.83	<u>n∠,m</u> 0.6	` 1	9a) 0.4	7 0.77	0.96	0.99	1		(89)
(09)111=	0.99				<u> </u>				<u> </u>	0.99			(00)
	_		ho roct	of dwell	ina T2	2 (follow st	eps 3	to 7 in Tab	e 9c)			_	
Mean interna		- 1		1	T -	<u> </u>	<del>- i</del>	00 40 00	40.40	1 40 00	40.04		(00)
Mean interna (90)m= 18.36		ure in 1 18.92	19.4	19.78	19.9	<u> </u>	19.		19.42		18.34	2.22	(90)
		- 1		1	T -	<u> </u>	<del>- i</del>		<u> </u>	18.82 ring area ÷ (	<u> </u>	0.32	(90) (91)
(90)m= 18.36  Mean interna	18.57 1	18.92 ure (fo	19.4 r the wh	19.78 ole dwe	19.9	6 19.99 = fLA × T1	+ (1	– fLA) × T2	LA = Liv	ring area ÷ (	<u> </u>	0.32	(91)
(90)m= 18.36	18.57 1 I temperatu	18.92 ure (fo 19.32	19.4 r the wh	19.78 ole dwe 20.1	19.9 elling)	$= fLA \times T1$ 8 20.31	+ (1	- fLA) × T2 .3 20.2	19.77	ring area ÷ (	<u> </u>	0.32	<b>_</b> ` ′

Space	heating	tuel use	ed, main	system	1								3058	_
	l totals	_								k'	Wh/year	•	kWh/year	- -
			<u> </u>				<u> </u>	Tota	I = Sum(2	19a) <sub>112</sub> =			2318.39	(219)
	1 = (64)r 219.87	194.34	205.4	186.88	188.28	175.55	168.7	184.98	184.61	193.94	201.44	214.39		
	or water h													
(217)m=		87.28	86.76	85.52	83.22	79.8	79.8	79.8	79.8	85.45	86.94	87.6		(217)
Efficier	ncy of wa	ater hea	ter										79.8	(216)
	192.41		ter (calc 178.2	ulated al	oove) 156.69	140.09	134.63	147.61	147.32	165.73	175.13	187.81		
Water	heating												L	
· -/···-		-	-	-	-				I (kWh/yea				0	(215)
•	e heating )m x (20	• •		• •	month 0	0	0	0	0	0	0	0	l	
								Tota	I (kWh/yea	ar) =Sum(2	211) <sub>15,1012</sub>	<b>=</b>	3058	(211)
	601.84	477.85	401.52	223.03	89.18	0	0	0	0	225.13	426.34	613.11		_
(211)m	n = {[(98)	m x (20	4)] } x 1	00 ÷ (20	6)									(211)
, 5.3	562.72	446.79	375.42	208.53	83.38	0	0	0	0	210.5	398.63	573.25		
Space	Jan e heating						Jul	<sub>L</sub> Aug	Sep	OCI	INOV	Dec	kvvn/yea	al .
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	L	┙`
Efficiency of main space heating system in Efficiency of secondary/supplementary heating system, %									0	(208)				
Fraction of total heating from main system 1 (204) = (202) × [1 – (203)] =  Efficiency of main space heating system 1									93.5	](204) ](206)				
(a)									1	$\frac{1}{204}$				
	ion of spa			•		шешагу	-	(202) = 1 -	- (201) =				0	(201)
•	e heatin	_	t from a	000040-	//ounnie	montor	ovoto»					1		7(204
9a. En	ergy req	uiremer	nts – Indi	vidual h	eating sy	/stems i	ncluding	micro-C	HP)					
Space	e heating	g require	ement in	kWh/m²	/year								39	(99)
								Tota	l per year	(kWh/yeai	r) = Sum(9	8)15,912 =	2859.23	(98)
(98)m=	562.72	446.79	375.42	208.53	83.38	0	0	0	0	210.5	398.63	573.25		_
` ′	e heating							24 x [(97)	)m – (95			I	1	
(97)m=		1185.01	1074.44	897.94	693.39	462.94	302.36	317.76	499.84	756.38	1005.61	1216.64		(97)
(96)m=	4.3 loss rate	4.9	6.5	8.9	11.7	14.6	16.6 -[(39)m	16.4	14.1 _ (96)m	10.6	7.1	4.2		(96)
	nly avera	_						ı			i	i	l	
(95)m=	467.17	520.13	569.84	608.32	581.31	441.67	299.36	312.38	438.24	473.44	451.97	446.14		(95)
	ıl gains,													, ,
(94)m=	ation fact	0.99	0.98	0.94	0.83	0.64	0.46	0.51	0.79	0.96	0.99	1		(94)
1.1611	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	ilisation			•			эр 11 OI		5, 50 tha			a ro oaic	, alato	
	ace heat i to the n			mperatur	o obtain	ad at et	on 11 of	Table 0	o so tha	t Ti m-/	76)m an	d re-calc	vulato	
0.0	18.82	19	19.32	19.76	20.1	20.28	20.31	20.3	20.2	19.77	19.23	18.8		(93)

Water heating fuel used			2318.39
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			338.01 (232)
12a. CO2 emissions – Individual heating systems	s including micro-CHP		
	<b>Energy</b> kWh/year	Emission factor kg CO2/kWh	<b>Emissions</b> kg CO2/year
Space heating (main system 1)	(211) x	0.216 =	660.53 (261)
Space heating (secondary)	(215) x	0.519 =	0 (263)
Water heating	(219) x	0.216 =	500.77 (264)
Space and water heating	(261) + (262) + (263) + (264) =		1161.3 (265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519 =	38.93 (267)
Electricity for lighting	(232) x	0.519 =	175.43 (268)
Total CO2, kg/year	sum	of (265)(271) =	1375.65 (272)
TER =			18.76 (273)