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 14:54:40

Project Information:

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

Dwelling Details:

NEW DWELLING DESIGN STAGE Total Floor Area: 63.82m² Plot Reference: Site Reference : Hermitage Lane Plot 21

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))

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

Dwelling Carbon Dioxide Emission Rate (DER) 10.16 kg/m² OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE) 39.6 kWh/m²

Dwelling Fabric Energy Efficiency (DFEE) 32.0 kWh/m²

OK

2 Fabric U-values

Element Average Highest External wall 0.14 (max. 0.30) 0.15 (max. 0.70) OK

Floor (no floor) Roof (no roof)

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

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals 3.00 (design value)

OK Maximum 10.0

4 Heating efficiency

Main Heating system: Community heating schemes - mains gas

Secondary heating system: None

5 Cylinder insulation

Hot water Storage: No cylinder

6 Controls

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

programmer and at least two room thermostats

Hot water controls: No cylinder thermostat

No cylinder

OK

Regulations Compliance Report

7 Low energy lights		
Percentage of fixed lights with low-energy fittings	100.0%	
Minimum	75.0%	OK
8 Mechanical ventilation		
Continuous supply and extract system		
Specific fan power:	0.91	
Maximum	1.5	OK
MVHR efficiency:	93%	
Minimum	70%	OK
9 Summertime temperature		
Overheating risk (Thames valley):	Medium	OK
Based on:		
Overshading:	Average or unknown	
Windows facing: South West	2.03m ²	
Windows facing: North West	6.1m²	
Ventilation rate:	4.00	
10 Key features		
Air permeablility	3.0 m³/m²h	
External Walls U-value	0.13 W/m ² K	
Community heating, heat from boilers – mains gas		
Photovoltaic array		

		l le	ser Details:								
Access an Names	Zabid Ashrof	0.		NI			CTDO	004000			
Assessor Name: Software Name:	Zahid Ashraf Stroma FSAP 2012	2		na Num are Ve				001082 n: 1.0.5.9			
Contware Hame.	01101110 1 07 11 2012		erty Address				VOIOIO	11. 1.0.0.0			
Address :		·	, and the second								
1. Overall dwelling dime	ensions:										
Ground floor		Г	Area(m²)	7(10) v		ight(m)	(2a) =	Volume(m³	(3a)		
	a) . (4 b) . (4 a) . (4 d) . (4 a)	_ (4) [63.82	(1a) x		2.5	(2a) =	159.56	(3a)		
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e))+(1n) [63.82	(4)	\	I) (O)	(0.)		_		
Dwelling volume				(3a)+(3b)+(3c)+(3c	d)+(3e)+	.(3n) =	159.56	(5)		
2. Ventilation rate:	main se	condary	other		total			m³ per hou	r		
Number of allignments	heating	eating		r			40 =	-	_		
Number of chimneys				_	0			0	(6a)		
Number of open flues	0 +	0	+ 0	┚╺┖	0		20 =	0	(6b)		
Number of intermittent fa				Ĺ	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 changes per hour											
Infiltration due to chimneys, flues and fans = $(6a)+(6b)+(7a)+(7b)+(7c) =$ $0 $											
	peen carried out or is intended			continue fi			. (0) –	U			
Number of storeys in the	he dwelling (ns)							0	(9)		
Additional infiltration						[(9)	-1]x0.1 =	0	(10)		
	.25 for steel or timber for resent, use the value corresp			•	ruction			0	(11)		
deducting areas of openi		oriding to the	greater wan ar	oa (anoi							
If suspended wooden	floor, enter 0.2 (unseale	ed) or 0.1 (s	sealed), else	enter 0				0	(12)		
If no draught lobby, en								0	(13)		
· ·	s and doors draught str	ripped	0.05.10	0 (44)	1001			0	(14)		
Window infiltration				2 x (14) ÷ 1	_	. (45)		0	(15)		
Infiltration rate	arro augusta and in augi) + (11) + (, , ,	, ,		0	(16)		
If based on air permeabil	q50, expressed in cubi	-	•	•	ietre oi e	envelope	area	3	$= \begin{pmatrix} (17) \\ (49) \end{pmatrix}$		
	es if a pressurisation test has				is being u	sed		0.15	(18)		
Number of sides sheltere				•	J			3	(19)		
Shelter factor			(20) = 1	[0.075 x (19)] =			0.78	(20)		
Infiltration rate incorporate	ting shelter factor		(21) = (1	8) x (20) =				0.12	(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	eed from Table 7										
(22)m= 5.1 5	4.9 4.4 4.3	3.8	3.8 3.7	4	4.3	4.5	4.7				
Wind Factor (22a)m = (2.	2)m ÷ 4										
	1.23 1.1 1.08	0.95 0	0.95 0.92	1	1.08	1.12	1.18				
				-				I			

Adjusted infiltra	ation rat	e (allowi	na for sh	nelter an	d wind s	speed) =	(21a) x	(22a)m					
0.15	0.15	0.14	0.13	0.12	0.11	0.11	0.11	0.12	0.12	0.13	0.14]	
Calculate effec		_	rate for t	he appli	cable ca	se	Į.		<u> </u>	!	!		
If mechanica			l' N. (0		\ - (/	15// (1	. (00)	\ (00 \			0.5	(23a)
If exhaust air he		•	•	, ,	,	•	,,	,) = (23a)			0.5	(23b)
If balanced with		-	-	_							4 (00)	79.05	(23c)
a) If balance				i	i			<u> </u>	 		· ` ′	i ÷ 100] I	(24a)
(24a)m= 0.25	0.25	0.25	0.23	0.23	0.22	0.22	0.21	0.22	0.23	0.24	0.24	J	(24a)
b) If balance	ea mecha	anicai ve	ntilation	without	neat red	overy (i	//V) (24b	0 m = (22)	2b)m + (2 0	236)	0	1	(24b)
(1/	<u> </u>	<u> </u>		ļ	ļ		<u> </u>		0		0	J	(240)
c) If whole h if (22b)n				-					5 × (23b	o)			
(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24c)
d) If natural				•	•				0.51			•	
if (22b)n (24d)m= 0	0	0	0	0	o o	0	0.5 + [(2	20)III- X	0.5]	0	0]	(24d)
Effective air				<u> </u>	<u> </u>		<u> </u>		0		0	J	(213)
(25)m= 0.25	0.25	0.25	0.23	0.23	0.22	0.22	0.21	0.22	0.23	0.24	0.24	1	(25)
` ′						J 0.22	V.21	0.22	0.20	1 0.2 1	0.21	J	(==)
3. Heat losse		·											
ELEMENT	Gros area	-	Openin m		Net Ar A ,r		U-valı W/m2		A X U (W/I		k-value kJ/m²·l		A X k kJ/K
Doors					2	Х	1.4	=	2.8				(26)
Windows Type	1				2.025	x1.	/[1/(1.4)+	0.04] =	2.68				(27)
Windows Type	2				6.097	₇ χ1,	/[1/(1.4)+	0.04] =	8.08	$\overline{}$			(27)
Walls Type1	20.9	95	8.12	2	12.83	3 x	0.15	=	1.92	= [(29)
Walls Type2	29.6	52	2		27.62	<u>x</u>	0.14	=	3.91				(29)
Walls Type3	18.6	64	0		18.64	x t	0.13	=	2.46	Ħ i		7 F	(29)
Total area of e	lements	, m²			69.21								(31)
* for windows and ** include the area						ated using	formula 1	/[(1/U-valu	ie)+0.04] a	as given in	paragraph	1 3.2	
Fabric heat los				is and pan	inions		(26)(30)	+ (32) =				21.86	(33)
Heat capacity		•	• ,				, , , , ,	((28)	.(30) + (32	2) + (32a).	(32e) =	827.23	(34)
Thermal mass	,	,	P = Cm ÷	: TFA) ir	n kJ/m²K				tive Value	, , ,	(= = 7	100	(35)
For design assess	sments wh	ere the de	tails of the	,			ecisely the	indicative	values of	TMP in Ta	able 1f	100	(00)
can be used instead Thermal bridge				usina An	nandiy l							F 05	(36)
if details of therma	,	,			•	`						5.65	(30)
Total fabric he		a. o	····· (00)	0,000,11	.,			(33) +	(36) =			27.52	(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= 13.32	13.17	13.01	12.25	12.1	11.33	11.33	11.18	11.64	12.1	12.4	12.71		(38)
Heat transfer of	coefficier	nt, W/K						(39)m	= (37) + (37)	38)m			
(39)m= 40.84	40.68	40.53	39.77	39.61	38.85	38.85	38.69	39.15	39.61	39.92	40.22		
									Average =	Sum(39) ₁	12 /12=	39.73	(39)

Heat loss para	ameter (I	HLP), W	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 0.64	0.64	0.64	0.62	0.62	0.61	0.61	0.61	0.61	0.62	0.63	0.63		
	!							,	Average =	Sum(40) ₁ .	12 /12=	0.62	(40)
Number of da	<u> </u>	- ` 					_	_	I -				
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water hea	ating ene	rgy requi	rement:								kWh/ye	ar:	
Assumed occ if TFA > 13. if TFA £ 13.	.9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (⁻	TFA -13		09		(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 o		.19		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage							,	- *F					
(44)m= 97	93.48	89.95	86.42	82.89	79.37	79.37	82.89	86.42	89.95	93.48	97		
	!	<u> </u>		<u> </u>		ļ.			Total = Su	m(44) ₁₁₂ =	=	1058.22	(44)
Energy content o	f hot water	used - cal	culated mo	onthly = 4.	190 x Vd,r	n x nm x C	Tm / 3600) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m= 143.85	125.82	129.83	113.19	108.61	93.72	86.85	99.66	100.85	117.53	128.29	139.31		
16 ' ((-6 (()		h (40		Total = Su	m(45) ₁₁₂ =	= [1387.5	(45)
If instantaneous	1		,		storage),	·	` ′	,			· · · · · · · · · · · · · · · · · · ·		
(46)m= 21.58 Water storage	18.87	19.47	16.98	16.29	14.06	13.03	14.95	15.13	17.63	19.24	20.9		(46)
Storage volun		includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community	` '					_					<u> </u>		(,
Otherwise if n	_			_			` '	ers) ente	er '0' in (47)			
Water storage	e loss:												
a) If manufac	turer's d	eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Temperature	factor fro	m Table	2b								0		(49)
Energy lost fro		•					(48) x (49)) =		1	10		(50)
b) If manufact Hot water stor			-								00		(51)
If community	•			IC 2 (KVV)	ii/iiti C/GC	·y /				0.	02		(31)
Volume factor	_									1.	03		(52)
Temperature	factor fro	m Table	2b							0	.6		(53)
Energy lost from	om water	storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =	1.	03		(54)
Enter (50) or	(54) in (5	55)								1.	03		(55)
Water storage	loss cal	culated f	or each	month			((56)m = (55) × (41)ı	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	ns 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	хН	
(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 circui	t loss (ar	nual) fro	m Table	e 3							0		(58)
Primary circui	,	,			59)m = ((58) ÷ 36	55 × (41)	m					
(modified by				,		. ,	, ,		r thermo	stat)			
(59)m= 23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)

Combi loss ca	lculated	for each	month (′61)m =	(60) ÷ '	365 🗴 (41)m						
(61)m= 0	0	0	0	0	0	0	0	0	0	0	0	1	(61)
	uired for	water he	eating ca	alculated	l for ea	 ch month	(62)n	1 = 0.85 ×	(45)m +	(46)m +	(57)m +	- (59)m + (61)m	
(62)m= 199.13		185.11	166.68	163.88	147.21		154.9		172.8	181.78	194.59	1	(62)
Solar DHW input	calculated	using App	endix G oı	· Appendix	: H (nega	tive quantity	y) (ente	r '0' if no sola	ar contribu	tion to wate	er heating))	
(add additiona	al lines if	FGHRS	and/or \	WWHRS	applie	s, see Ap	pendi	x G)					
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(63)
Output from w	ater hea	ter											
(64)m= 199.13	175.74	185.11	166.68	163.88	147.21	142.12	154.9	3 154.34	172.8	181.78	194.59]	_
·							C	utput from v	vater heate	er (annual)	112	2038.34	(64)
Heat gains fro	m water	heating,	kWh/m	onth 0.2	5 ´ [0.8	5 × (45)m	n + (61)m] + 0.8	x [(46)m	+ (57)m	+ (59)m	<u>ı</u>]	
(65)m= 92.05	81.78	87.39	80.43	80.33	73.96	73.1	77.3	6 76.33	83.3	85.45	90.54]	(65)
include (57)	m in calc	culation of	of (65)m	only if c	ylinder	is in the	dwellir	ng or hot w	vater is f	rom com	munity l	neating	
5. Internal g	ains (see	Table 5	and 5a):									
Metabolic gair	ns (Table	5), Wat	ts									_	
Jan	Feb	Mar	Apr	May	Jun	Jul	Au	g Sep	Oct	Nov	Dec]	
(66)m= 104.37	104.37	104.37	104.37	104.37	104.37	104.37	104.3	7 104.37	104.37	104.37	104.37]	(66)
Lighting gains	(calcula	ted in Ap	pendix	L, equat	ion L9	or L9a), a	also se	e Table 5					
(67)m= 17.82	15.83	12.87	9.75	7.29	6.15	6.65	8.64	11.6	14.72	17.18	18.32]	(67)
Appliances ga	ins (calc	ulated in	Append	dix L, eq	uation	L13 or L1	3a), a	lso see Ta	able 5		-	-	
(68)m= 182.48	184.37	179.6	169.44	156.62	144.56	136.51	134.6	2 139.39	149.55	162.37	174.42]	(68)
Cooking gains	(calcula	ted in A	ppendix	L, equat	ion L1	or L15a), also	see Table	e 5	-		-	
(69)m= 33.44	33.44	33.44	33.44	33.44	33.44	33.44	33.4	33.44	33.44	33.44	33.44]	(69)
Pumps and fa	ns gains	(Table 5	ōa)			•		•				-	
(70)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(70)
Losses e.g. ev	vaporatio	n (negat	tive valu	es) (Tab	le 5)				-		-	-	
(71)m= -83.5	-83.5	-83.5	-83.5	-83.5	-83.5	-83.5	-83.	-83.5	-83.5	-83.5	-83.5]	(71)
Water heating	gains (T	able 5)		-	-				-	-	-	-	
(72)m= 123.73	121.69	117.46	111.71	107.98	102.72	98.25	103.9	7 106.01	111.96	118.68	121.7]	(72)
Total internal	gains =				(6	6)m + (67)n	n + (68)	m + (69)m +	(70)m + (71)m + (72)m	-	
(73)m= 378.34	376.2	364.24	345.21	326.19	307.74	295.72	301.5	311.31	330.54	352.55	368.75]	(73)
6. Solar gain	s:												
Solar gains are	calculated	using sola	r flux from	Table 6a	and asso	ciated equa	ations to	convert to t	he applica	ble orienta	tion.		
Orientation:			Area			ux		g_ Table 6b	. 7	FF		Gains	
_	Table 6d		m²			able 6a	, ,	Table of	·	able 6c		(W)	,
Southwest _{0.9x}	0.77	Х	2.0)3	x	36.79	ļĻ	0.63	x	0.7	=	22.77	(79)
Southwest _{0.9x}	0.77	X	2.0)3	x	62.67	ŢĒ	0.63	x	0.7	=	38.79	(79)
Southwest _{0.9x}	0.77	X	2.0)3	x	85.75	ŢĒ	0.63	x	0.7	=	53.07	(79)
Southwest _{0.9x}	0.77	Х	2.0)3	x	106.25	Ţ	0.63	x	0.7	=	65.76	(79)
Southwest _{0.9x}	0.77	X	2.0)3	X	119.01		0.63	X	0.7	=	73.65	(79)

O							٦ .				_		
Southwest _{0.9x}	0.77	X	2.0	03	X L	118.15	_	0.63	×	0.7	=	73.12	(79)
Southwest _{0.9x}	0.77	X	2.0)3	x	113.91	_	0.63	X	0.7	=	70.49	(79)
Southwest _{0.9x}	0.77	Х	2.0)3	x L	104.39	╛	0.63	X	0.7	=	64.6	(79)
Southwest _{0.9x}	0.77	X	2.0)3	X	92.85		0.63	X	0.7	=	57.46	(79)
Southwest _{0.9x}	0.77	X	2.0)3	x	69.27		0.63	X	0.7	=	42.87	(79)
Southwest _{0.9x}	0.77	X	2.0)3	x	44.07		0.63	X	0.7	=	27.27	(79)
Southwest _{0.9x}	0.77	X	2.0)3	x	31.49]	0.63	X	0.7	=	19.49	(79)
Northwest 0.9x	0.77	X	6.	1	x	11.28	x	0.63	X	0.7	=	21.02	(81)
Northwest 0.9x	0.77	Х	6.	1	x	22.97	X	0.63	X	0.7	=	42.79	(81)
Northwest 0.9x	0.77	X	6.	1	x	41.38	x	0.63	X	0.7	=	77.1	(81)
Northwest _{0.9x}	0.77	x	6.	1	x T	67.96	x	0.63	x	0.7		126.62	(81)
Northwest _{0.9x}	0.77	x	6.	1	x T	91.35	X	0.63	x	0.7		170.21	(81)
Northwest 0.9x	0.77	x	6.	1	x T	97.38	X	0.63	x	0.7	<u> </u>	181.46	(81)
Northwest _{0.9x}	0.77	X	6.	1	x T	91.1	X	0.63	x	0.7	=	169.75	(81)
Northwest 0.9x	0.77	X	6.	1	x F	72.63	X	0.63	x	0.7	=	135.33	(81)
Northwest _{0.9x}	0.77	x	6.	1	x [50.42	Īx	0.63	x	0.7		93.95	(81)
Northwest 0.9x	0.77	x	6.	1	x [28.07	X	0.63	x	0.7		52.3	(81)
Northwest 0.9x	0.77	x	6.	1	хГ	14.2	X	0.63	x	0.7		26.45	(81)
Northwest 0.9x	0.77	x	6.	1	x	9.21	j x	0.63	×	0.7		17.17	(81)
•					_		_						_
Solar gains in	watts, cal	lculated	for eacl	h month	l		(83)m	n = Sum(74)m .	(82)m				
(83)m= 43.79	81.58	130.17	192.38	243.86	254	1.58 240.25	199	.93 151.41	95.17	53.73	36.66		(83)
								ı					` '
Total gains – i	nternal ar	nd solar	(84)m =	= (73)m	+ (83	3)m , watts						_	, ,
Total gains – i (84)m= 422.13		nd solar 494.41	(84)m = 537.58	= (73)m 570.05	·	3)m , watts 2.32 535.97	501	.48 462.72	425.71	<u> </u>	405.41]	(84)
	457.78	494.41	537.58	570.05	562		501	.48 462.72			1		` '
(84)m= 422.13	457.78 rnal tempe	494.41 erature (537.58 (heating	570.05	562	2.32 535.97					1	21	` '
(84)m= 422.13 7. Mean inter	457.78 rnal tempe during he	494.41 erature (537.58 (heating	570.05 season the livi	562) ng a	2.32 535.97 rea from Ta					1	21	(84)
(84)m= 422.13 7. Mean inter Temperature	457.78 rnal tempe during he	494.41 erature (537.58 (heating	570.05 season the livi	562 ng a	2.32 535.97 rea from Ta	ble 9			1 406.28	1	21	(84)
(84)m= 422.13 7. Mean inter Temperature Utilisation fac	457.78 rnal tempe during he ctor for ga	494.41 erature (eating polins for li	537.58 (heating eriods in iving are	season the livi	ng a	2.32 535.97 rea from Ta e Table 9a)	ble 9	, Th1 (°C)	425.71	1 406.28	405.41	21	(84)
(84)m= 422.13 7. Mean inter Temperature Utilisation fact Jan (86)m= 0.93	457.78 rnal temper during heator for ga Feb 0.91	erature (eating points for limits of the man	537.58 (heating eriods in iving are Apr	season the livings, h1,m May	562 ng a (see	rea from Ta e Table 9a) un Jul 43 0.32	ble 9	, Th1 (°C) ug Sep	425.71 Oct	1 406.28 Nov	405.41 Dec	21	(84)
(84)m= 422.13 7. Mean intermediate Temperature Utilisation factors Jan	457.78 rnal temper during heator for ga Feb 0.91	erature (eating points for limits of the man	537.58 (heating eriods in iving are Apr	season the livings, h1,m May	ng a (see J	rea from Ta e Table 9a) un Jul 43 0.32	ble 9	, Th1 (°C) ug Sep 35 0.55 Table 9c)	425.71 Oct	Nov 0.9	405.41 Dec	21	(84)
(84)m= 422.13 7. Mean interpretation factors Utilisation factors Jan (86)m= 0.93 Mean internations (87)m= 20.02	457.78 rnal temper during heator for ga Feb 0.91 at tempera 20.19	erature (eating points for lime Mar 0.86 atture in leading 20.44	537.58 (heating eriods ir iving are 0.75 iving are 20.74	season the livings, h1,m May 0.6 ea T1 (for 20.91	562 ng a n (see	2.32 535.97 rea from Ta e Table 9a) un Jul 43 0.32 v steps 3 to 98 21	ble 9 A 0.3 7 in T 20.	s, Th1 (°C) ug Sep 35 0.55 Table 9c) 99 20.95	425.7° Oct 0.79	Nov 0.9	Dec 0.94	21	(84)
(84)m= 422.13 7. Mean interconstruction factors and the second of the s	457.78 rnal temper during heator for ga Feb 0.91 at tempera 20.19	erature (eating points for lime Mar 0.86 atture in leading 20.44	537.58 (heating eriods ir iving are 0.75 iving are 20.74	season the livings, h1,m May 0.6 ea T1 (for 20.91	ng a (see 0) Ollow 20 dwe	2.32 535.97 rea from Ta e Table 9a) un Jul 43 0.32 v steps 3 to 98 21	ble 9 A 0.3 7 in T 20.	s, Th1 (°C) ug Sep 55 0.55 able 9c) 99 20.95 9, Th2 (°C)	425.7° Oct 0.79	Nov 0.9	Dec 0.94	21	(84)
(84)m= 422.13 7. Mean interconstruction factors and the second of the s	457.78 rnal temper during heater for ga Feb 0.91 at tempera 20.19 during heater for ga 20.4	erature (eating points for limits	537.58 (heating eriods in iving are Apr 0.75 iving are 20.74 eriods in 20.41	season the living a, h1,m May 0.6 ea T1 (for 20.91 n rest of 20.41	5622 nng a n (see J J 0 20 dwee 20	rea from Ta e Table 9a) un Jul 43 0.32 steps 3 to .98 21 elling from Ta .42 20.42	ble 9 A 0.3 7 in T 20. able 9	s, Th1 (°C) ug Sep 55 0.55 able 9c) 99 20.95 9, Th2 (°C)	Oct 0.79	Nov 0.9	Dec 0.94	21	(84) (85) (86) (87)
(84)m= 422.13 7. Mean interpretation factors Utilisation factors Jan (86)m= 0.93 Mean internation (87)m= 20.02 Temperature (88)m= 20.39 Utilisation factors	457.78 rnal temper during heater for ga Feb 0.91 al tempera 20.19 during heater for ga ctor for ga	erature (eating points for limits for limits for limits for limits for limits for realizable attention limits for realizable limits	537.58 (heating eriods ir iving are 0.75 iving are 20.74 eriods ir 20.41 est of decrease	season the living has	562 ng a 1 (see J 0.4 collow 20 dwe 20	2.32 535.97 rea from Ta e Table 9a) un	ble 9 A 0.3 7 in T 20. able 9 20.	s, Th1 (°C) ug Sep 35 0.55 Table 9c) 99 20.95 9, Th2 (°C) 42 20.42	Oct 0.79 20.73	Nov 0.9 20.35	Dec 0.94 20 20.4	21	(84) (85) (86) (87) (88)
(84)m= 422.13 7. Mean interpretation factors and the second seco	457.78 rnal temper during he ctor for ga Feb 0.91 al tempera 20.19 during he 20.4 ctor for ga 0.9	erature (eating points for line 1 20.44 eating points for rough 1 20.4 eating points for rough 1 20.85	537.58 (heating eriods ir iving are 20.74 eriods ir 20.41 est of do 0.73	season the living has	5622 ng a a l (see J J 0 collow 20 dwe 20 h2,n 0	2.32 535.97 rea from Ta e Table 9a) un	ble 9 A 0.3 7 in T 20. able 9 20. 99a) 0.3	g Sep 35 0.55 Table 9c) 99 20.95 9, Th2 (°C) 42 20.42	Oct 0.79 20.73 20.41	Nov 0.9	Dec 0.94	21	(84) (85) (86) (87)
(84)m= 422.13 7. Mean intercontrol Temperature Utilisation fact Jan (86)m= 0.93 Mean interna (87)m= 20.02 Temperature (88)m= 20.39 Utilisation fact (89)m= 0.93 Mean interna	457.78 rnal temper during he ctor for ga Feb 0.91 at tempera 20.19 during he 20.4 ctor for ga 0.9 at tempera	erature (eating poins for line of line	537.58 (heating eriods ir iving are 20.75 iving are 20.74 eriods ir 20.41 est of do 0.73 the rest	season the living a, h1,m May 0.6 ea T1 (for 20.91 n rest of 20.41 welling, 0.57 of dwelling	562 ng a in (see J 0.4 collow 20 dwe 20 h2,nn 0.4 ing T	rea from Ta e Table 9a) un Jul 43 0.32 steps 3 to .98 21 elling from Ta .42 20.42 n (see Table .4 0.28	ble 9 A 0.3 7 in T 20. able 9 20. 9a) 0.3 eps 3	y, Th1 (°C) ug Sep 35 0.55 able 9c) 99 20.95 9, Th2 (°C) 42 20.42 31 0.51 to 7 in Table	Oct 0.79 20.73 20.41 0.76 e 9c)	Nov 0.9 20.35 20.41	Dec 0.94 20 20.4	21	(84) (85) (86) (87) (88) (89)
(84)m= 422.13 7. Mean interpretation factors and the second seco	457.78 rnal temper during he ctor for ga Feb 0.91 al tempera 20.19 during he 20.4 ctor for ga 0.9	erature (eating points for line 1 20.44 eating points for rough 1 20.4 eating points for rough 1 20.85	537.58 (heating eriods ir iving are 20.74 eriods ir 20.41 est of do 0.73	season the living has	562 ng a in (see J 0.4 collow 20 dwe 20 h2,nn 0.4 ing T	2.32 535.97 rea from Ta e Table 9a) un	ble 9 A 0.3 7 in T 20. able 9 20. 99a) 0.3	g Sep 35 0.55 Table 9c) 99 20.95 9, Th2 (°C) 42 20.42 31 0.51 1 to 7 in Table 42 20.37	Oct 0.79 20.73 20.41 0.76 e 9c) 20.09	Nov 0.9 20.35 20.41 0.89	Dec 0.94 20 20.4 19.04		(84) (85) (86) (87) (88) (89)
(84)m= 422.13 7. Mean intercontrol Temperature Utilisation fact Jan (86)m= 0.93 Mean interna (87)m= 20.02 Temperature (88)m= 20.39 Utilisation fact (89)m= 0.93 Mean interna	457.78 rnal temper during he ctor for ga Feb 0.91 at tempera 20.19 during he 20.4 ctor for ga 0.9 at tempera	erature (eating poins for line of line	537.58 (heating eriods ir iving are 20.75 iving are 20.74 eriods ir 20.41 est of do 0.73 the rest	season the living a, h1,m May 0.6 ea T1 (for 20.91 n rest of 20.41 welling, 0.57 of dwelling	562 ng a in (see J 0.4 collow 20 dwe 20 h2,nn 0.4 ing T	rea from Ta e Table 9a) un Jul 43 0.32 steps 3 to .98 21 elling from Ta .42 20.42 n (see Table .4 0.28	ble 9 A 0.3 7 in T 20. able 9 20. 9a) 0.3 eps 3	g Sep 35 0.55 Table 9c) 99 20.95 9, Th2 (°C) 42 20.42 31 0.51 1 to 7 in Table 42 20.37	Oct 0.79 20.73 20.41 0.76 e 9c) 20.09	Nov 0.9 20.35 20.41	Dec 0.94 20 20.4 19.04	0.51	(84) (85) (86) (87) (88) (89)
(84)m= 422.13 7. Mean intermand Temperature Utilisation factor	457.78 rnal temper during he ctor for ga Feb 0.91 al tempera 20.19 ctor for ga 0.9 al tempera 19.31	erature (eating points for line 120.44 eating points for rounds fo	537.58 (heating eriods ir iving are 20.74 eriods ir 20.41 est of do 0.73 che rest 20.08	season the living a, h1,m May 0.6 ea T1 (for 20.91 n rest of 20.41 welling, 0.57 of dwelling 20.31	5622	2.32 535.97 rea from Ta e Table 9a) un	ble 9 A 0.3 7 in T 20. able 9 20. 9 9a) 0.3 eps 3	g Sep 35 0.55 Table 9c) 99 20.95 9, Th2 (°C) 42 20.42 31 0.51 45 to 7 in Table 42 20.37	Oct 0.79 20.73 20.41 0.76 e 9c) 20.09	Nov 0.9 20.35 20.41 0.89	Dec 0.94 20 20.4 19.04 4) =		(84) (85) (86) (87) (88) (89)
(84)m= 422.13 7. Mean intermediate Temperature Utilisation fact (86)m= 0.93 Mean internation (87)m= 20.02 Temperature (88)m= 20.39 Utilisation fact (89)m= 0.93 Mean internation (90)m= 19.07	457.78 rnal temper during he ctor for ga Feb 0.91 al tempera 20.19 ctor for ga 20.4 ctor for ga 0.9 al tempera 19.31	erature (eating points for line 120.44 eating points for rounds fo	solutions in the whole control is the whole control	season the living a, h1,m May 0.6 ea T1 (for 20.91 n rest of 20.41 welling, 0.57 of dwelling 20.31	5622	2.32 535.97 rea from Ta e Table 9a) un	ble 9 A 0.3 7 in T 20. able 9 20. 9a) 0.3 eps 3 20. + (1	y, Th1 (°C) ug Sep 35 0.55 Table 9c) 99 20.95 9, Th2 (°C) 42 20.42 31 0.51 42 20.37 f - fLA) × T2 71 20.66	Oct 0.79 20.73 20.41 0.76 e 9c) 20.09 LA = Liv	Nov 0.9 20.35 20.41 0.89 19.56 ving area ÷ (4	Dec 0.94 20 20.4 19.04		(84) (85) (86) (87) (88) (89)

												•	
(93)m= 19.55	19.75	20.06	20.41	20.61	20.7	20.71	20.71	20.66	20.41	19.96	19.52		(93)
8. Space hear													
Set Ti to the r the utilisation			•		ed at ste	ep 11 of	Table 9b	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>					1					
(94)m= 0.92	0.89	0.84	0.73	0.58	0.41	0.3	0.33	0.53	0.76	0.88	0.92		(94)
Useful gains,	hmGm	, W = (9	4)m x (8	4)m									
(95)m= 386.99	407.33	413.57	392.57	331.15	232.62	158.85	165.48	245.65	324.2	357.41	374.91		(95)
Monthly avera	age exte	rnal tem	perature	from Ta	able 8					,		•	
(96)m= 4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat loss rate						-``		<u> </u>				1	(2-)
(97)m= 622.86	604.3	549.7	457.83	353.11	236.83	159.69	166.77	256.99	388.78	513.32	616.38		(97)
Space heating		1	r each n			I				r e	170 CE		
(98)m= 175.49	132.36	101.28	46.98	16.34	0	0	0	0	48.05	112.26	179.65	040.44	7(00)
							rota	l per year	(Kvvn/yeai	r) = Sum(9	8)15,912 =	812.41	(98)
Space heating	g require	ement in	kWh/m²	² /year								12.73	(99)
9b. Energy req	uiremer	nts – Coi	mmunity	heating	scheme								
This part is use										unity sch	neme.		(204)
Fraction of spa			•		•	_	Table T	i) U ii n	one			0	(301)
Fraction of spa	ice heat	from co	mmunity	system	1 – (301	1) =						1	(302)
The community so									up to four	other heat	sources; t	he latter	
includes boilers, h Fraction of hea		-			rom powei	r stations.	See Appei	ndix C.				1	(303a)
Fraction of total			-		oilore				(2	02) x (303	a) –		(304a)
Factor for cont	•			•		r commi	ınity hea	itina eve		02) X (303	a) =	1	(305)
				,	. ,,		-	iting 3y3	CIII				╡`
Distribution los		(I able 1	(2c) for (commun	ity neatir	ng syste	m					1.05	(306)
Space heating		·	1									kWh/yea	r ¬
Annual space I	_	•										812.41	-
Space heat fro	m Comi	munity b	oilers					(98) x (30	04a) x (30	5) x (306) :	=	853.03	(307a)
Efficiency of se	econdar	y/supple	mentary	heating	system	in % (fro	m Table	4a or A	ppendix	E)		0	(308
Space heating	require	ment fro	m secon	dary/su	oplemen	tary syst	tem	(98) x (30	01) x 100 ·	÷ (308) =		0	(309)
Water heating	I												
Annual water h	neating r	equirem	ent									2038.34	
If DHW from co								(64) x (30)3a) x (30:	5) x (306) :	_	2140.25	(310a)
Electricity used		•					0.01	× [(307a).				29.93	(313)
Cooling Syster				0				I(ss sy	(22.2)	(0	(314)
Space cooling	•	•	•		n. if not e	enter 0)		= (107) ÷	(314) =			0	(315)
Electricity for p	,					,		, ,	•				 ` ′
mechanical ve							outside					221.43	(330a)

				_
warm air heating system fans			0	(330b)
pump for solar water heating			0	(330g)
Total electricity for the above, kWh/year	=(330a) + (330	b) + (330g) =	221.43	(331)
Energy for lighting (calculated in Appendix L)			314.76	(332)
Electricity generated by PVs (Appendix M) (negative	e quantity)		-642.21	(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 Efficiency of heat source 1 (%)	g (not CHP) ere is CHP using two fuels repeat (363) to	(366) for the second fu	el 94	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x 100 ÷ (367b) x	0.22	= 687.82	(367)
Electrical energy for heat distribution	[(313) x	0.52	= 15.54	(372)
Total CO2 associated with community systems	(363)(366) + (368)(372	2)	= 703.35	(373)
CO2 associated with space heating (secondary)	(309) x	0	= 0	(374)
CO2 associated with water from immersion heater of	or instantaneous heater (312) x	0.22	= 0	(375)
Total CO2 associated with space and water heating	(373) + (374) + (375) =		703.35	(376)
CO2 associated with electricity for pumps and fans	within dwelling (331)) x	0.52	= 114.92	(378)
CO2 associated with electricity for lighting	(332))) x	0.52	= 163.36	(379)
Energy saving/generation technologies (333) to (33-1) ltem 1	4) as applicable	0.52 × 0.01 =	-333.31	(380)
Total CO2, kg/year sum of (376).	(382) =		648.33	(383)
Dwelling CO2 Emission Rate (383) ÷ (4) =			10.16	(384)

El rating (section 14)

(385)

92.02

SAP 2012 Overheating Assessment

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

Property Details: Plot 21

Dwelling type:FlatLocated in:EnglandRegion:Thames valley

Cross ventilation possible: No Number of storeys: 1

Front of dwelling faces: North East

Overshading: Average or unknown

None

Thermal mass parameter: Indicative Value Low

False

Blinds, curtains, shutters:

Ventilation rate during hot weather (ach): 4 (Windows fully open)

Overheating Details

Night ventilation:

Summer ventilation heat loss coefficient: 210.62 (P1)

Transmission heat loss coefficient: 27.5

Summer heat loss coefficient: 238.13 (P2)

Overhangs:

Overhangs:

Orientation: Ratio: Z_overha	ıngs:
------------------------------	-------

South West (SW) 0 1 North West (NW) 0 1

Solar shading:

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

Solar gains:

Orientation		Area	Flux	g _	FF	Shading	Gains
South West (SW)	0.9 x	2.03	119.92	0.63	0.7	0.9	86.75
North West (NW)	0.9 x	6.1	98.85	0.63	0.7	0.9	215.28
						Total	302.02 (P3/P4)

Internal gains.

	June	July	August	:
Internal gains	425.22	409.98	417.86	
Total summer gains	748.69	712	674.9	(P5)
Summer gain/loss ratio	3.14	2.99	2.83	(P6)
Mean summer external temperature (Thames valley)	16	17.9	17.8	
Thermal mass temperature increment	1.3	1.3	1.3	
Threshold temperature	20.44	22.19	21.93	(P7)
Likelihood of high internal temperature	Not significant	Medium	Slight	

Assessment of likelihood of high internal temperature:

<u>Medium</u>

			S ('1						
		User L	Details:						
Assessor Name:	Zahid Ashraf			a Num				001082	
Software Name:	Stroma FSAP 2012	Property	Address	are Ve			versic	on: 1.0.5.9	
Address :	·	Toperty	Address	. F 10t Z 1					
1. Overall dwelling dime	ensions:								
		Are	a(m²)	_	Av. He	ight(m)	_	Volume(m³)	<u>) </u>
Ground floor		(63.82	(1a) x	2	2.5	(2a) =	159.56	(3a)
Total floor area TFA = (1a	a)+(1b)+(1c)+(1d)+(1e)+(1	n) (63.82	(4)					
Dwelling volume				(3a)+(3b)+(3c)+(3c	d)+(3e)+	.(3n) =	159.56	(5)
2. Ventilation rate:									
	main seconda heating heating	ry	other		total			m³ per hou	٢
Number of chimneys	0 + 0	+	0	=	0	X 4	40 =	0	(6a)
Number of open flues	0 + 0	- + -	0	<u> </u>	0	x 2	20 =	0	(6b)
Number of intermittent fa	ns				2	x -	10 =	20	(7a)
Number of passive vents				Ī	0	x ·	10 =	0	(7b)
Number of flueless gas fi	res				0	X	40 =	0	
-				L					``
							Air ch	nanges per ho	ur
•	ys, flues and fans = $(6a)+(6b)+(6b)$				20		÷ (5) =	0.13	(8)
If a pressurisation test has b Number of storeys in the	een carried out or is intended, procee	ed to (17),	otherwise (continue fi	rom (9) to	(16)			٦,0)
Additional infiltration	ie dweiling (ris)					[(9)	-1]x0.1 =	0	(9) (10)
	.25 for steel or timber frame o	r 0.35 fo	r mason	ry consti	ruction	1(-)		0	(11)
•••	resent, use the value corresponding to	o the grea	ter wall are	ea (after					_
deducting areas of openir If suspended wooden f	ngs);	.1 (seale	ed). else	enter 0				0	(12)
If no draught lobby, en	,	(/,					0	(13)
Percentage of windows	s and doors draught stripped							0	(14)
Window infiltration			0.25 - [0.2					0	(15)
Infiltration rate			. , . ,	, , ,	12) + (13)	, ,		0	(16)
•	q50, expressed in cubic metre ity value, then $(18) = [(17) \div 20] + (18)$	•	•	•	etre of e	envelope	area	3	(17)
•	es if a pressurisation test has been do				is being u	sed		0.28	(18)
Number of sides sheltere					J			3	(19)
Shelter factor				[0.075 x (19)] =			0.78	(20)
Infiltration rate incorporat	•		(21) = (18	3) x (20) =				0.21	(21)
Infiltration rate modified for	- 1 	11	A	0	0-4	Navi		1	
Jan Feb	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Monthly average wind sp (22)m= 5.1 5	eed from Table / 4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7	1	
(22)111- 3.1 3	7.0 7.7 7.0 0.0	L 3.0] 3.7		4.0	4.5	I 4./	l	
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		

Calculated effective air change rate for the applicable cases If mechanical ventilation: Calculated effective air change rate for the applicable cases If mechanical ventilation: Calculated effective air change rate for the applicable cases If mechanical ventilation: Calculated effective air change rate for the application of the property Calculated effective air change rate Calculated Calculated Calculated effective air change rate Calculated	Adjusted infiltra	ation rat	e (allowi	ng for sh	nelter an	d wind s	speed) =	(21a) x	(22a)m					
If mechanical ventilation:				l		I	ı	0.2	0.21	0.23	0.24	0.25		
If each acts air heat pump using Appendix N, (23b) = (23a) x Frw (equation (NS)), otherwise (23b) = (23b) (23b) (23c)			_	rate for t	he appli	cable ca	se					•	- -	(00-)
It balanced with heat recovery; efficiency in % ellowing for in-use factor (from Table 4h) =				andiv N (2	3h) - (23s	a) v Emy (4	aguation (N	NSN othe	rwisa (23h) – (23a)				
a) If balanced mechanical ventilation with heat recovery (MVHR) (24a)m = (22b)m + (23b) × [1 - (23c) ÷ 100] (24a)m = 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0			0		, ,	,	. `	,, .	,) = (23a)				
24a m			•	-	_					26\m . /	22h) [1 (220)		(230)
b) If balanced mechanical ventilation without heat recovery (MV) (24b)m = (22b)m + (23b) (24b)m = 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		ı —		.			- 	- ^ `	ŕ	 	- 	1 ` '] - 100j	(24a)
(24b)m=0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	(2)	<u> </u>											J	(= : = :)
c) If whole house extract ventilation or positive input ventilation from outside if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b) (24c)m		i		i			- 	- 	i `	r Ó - Ò		Ι ο	1	(24b)
if (22b)m < 0.5 × (23b), then (24c) = (23b); otherwise (24c) = (22b) m + 0.5 × (23b) (24c)m 0		<u> </u>		<u> </u>									J	(-,
d) If natural ventilation or whole house positive input ventilation from loft if (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]	•				-	-				5 × (23b	o)		_	
fr (22b)m = 1, then (24d)m = (22b)m otherwise (24d)m = 0.5 + [(22b)m² x 0.5]	(24c)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(24c)
Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25) Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25) (25)me										0 51				
Effective air change rate - enter (24a) or (24b) or (24c) or (24d) in box (25) (25)ms 0.54 0.54 0.54 0.53 0.53 0.53 0.53 0.52 0.52 0.52 0.52 0.53 0.53 0.53 0.53 0.53 (25) 3. Heat losses and heat loss parameter: ELEMENT Gross area (m²)			<u>`</u>	<u>`</u>		<u> </u>		 		-	0.53	0.53	1	(24d)
Second Case	` '	<u> </u>	<u> </u>	<u> </u>									J	
3. Heat losses and heat loss parameter. ELEMENT Gross area (m²) Openings area (m²) Net Area (W/m2k (W/k) kJ/m²-k kJ/k² kJ/k²-k (W/k) kJ/m²-k kJ/m		<u>_</u>		<u> </u>	<u> </u>	ŕ	´`		``	0.53	0.53	0.53	1	(25)
Part						l	l	l	l				J	
A , m² W/m2K (W/K) kJ/m²-K kJ/K			·			N. (A				A 37.11				A 37.1
Windows Type 1 2.025	ELEMENT		_											
Windows Type 2	Doors					2	X	1.4	= [2.8				(26)
Walls Type1	Windows Type	e 1				2.025	x1.	/[1/(1.4)+	0.04] =	2.68	一			(27)
Walls Type2	Windows Type	2				6.097	7 x1,	/[1/(1.4)+	0.04] =	8.08				(27)
Walls Type3	Walls Type1	20.9	95	8.12	!	12.83	3 x	0.15	=	1.92	= [\neg	(29)
Total area of elements, m² 69.21 * for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2 ** include the areas on both sides of internal walls and partitions Fabric heat loss, W/K = S (A x U) (26)(30) + (32) = (121.86 (33) Heat capacity Cm = S(A x k) (128)(30) + (32) + (32a)(32e) = 827.23 (34) Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K Indicative Value: Low 100 (35) For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation. Thermal bridges: S (L x Y) calculated using Appendix K (33) + (36) = (33) + (36) = (37) Ventilation heat loss calculated monthly (38)m = 0.33 × (25)m × (5) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (38)m = 28.28 28.2 28.13 27.78 27.71 27.41 27.41 27.41 27.35 27.53 27.71 27.84 27.98 Heat transfer coefficient, W/K (39)m = (37) + (38)m (39)m = 55.79 55.72 55.64 55.29 55.23 54.93 54.93 54.87 55.04 55.23 55.36 55.5	Walls Type2	29.6	32	2		27.62	2 x	0.14	<u> </u>	3.91			= =	(29)
** for windows and roof windows, use effective window U-value calculated using formula 1/[(1/U-value)+0.04] as given in paragraph 3.2 *** include the areas on both sides of internal walls and partitions Fabric heat loss, W/K = S (A x U) (26)(30) + (32) = 21.86 (33) Heat capacity Cm = S(A x k) ((28)(30) + (32) + (32a)(32e) = 827.23 (34) Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K Indicative Value: Low 100 (35) For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation. Thermal bridges: S (L x Y) calculated using Appendix K 5.65 (36) if details of thermal bridging are not known (36) = 0.05 x (31) Total fabric heat loss (33) + (36) = 27.52 (37) Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5) Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5) Heat transfer coefficient, W/K (39)m = (37) + (38)m (39)m = 55.79 55.72 55.64 55.29 55.23 54.93 54.93 54.93 54.93 55.04 55.23 55.36 55.5	Walls Type3	18.6	64	0		18.64	1 x	0.13	-	2.46	Ħ i		i i	(29)
** include the areas on both sides of internal walls and partitions Fabric heat loss, W/K = S (A x U) (26)(30) + (32) = 21.86 (33) Heat capacity Cm = S(A x k) ((28)(30) + (32) + (32a)(32e) = 827.23 (34) Thermal mass parameter (TMP = Cm \div TFA) in kJ/m²K Indicative Value: Low 100 (35) For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation. Thermal bridges: S (L x Y) calculated using Appendix K 5.65 (36) if details of thermal bridging are not known (36) = 0.05 x (31) Total fabric heat loss (33) + (36) = 27.52 (37) Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (38)m = 28.28 28.2 28.13 27.78 27.71 27.41 27.41 27.35 27.53 27.71 27.84 27.98 (38) Heat transfer coefficient, W/K (39)m = (37) + (38)m (39)m = 55.79 55.72 55.64 55.29 55.23 54.93 54.93 54.93 54.87 55.04 55.23 55.36 55.5	Total area of e	lements	, m²			69.21								(31)
Fabric heat loss, W/K = S (A x U) (26)(30) + (32) = 21.86 (33) Heat capacity Cm = S(A x k) ((28)(30) + (32) + (32a)(32e) = 827.23 (34) Thermal mass parameter (TMP = Cm \div TFA) in kJ/m²K Indicative Value: Low 100 (35) For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation. Thermal bridges : S (L x Y) calculated using Appendix K 5.65 (36) if details of thermal bridging are not known (36) = 0.05 x (31) Total fabric heat loss (33) + (36) = 27.52 (37) Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5) Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5) Unique (38)m = 27.52 (37) Heat transfer coefficient, W/K (39)m = (37) + (38)m (39)m = (37) + (38)m							lated using	formula 1	/[(1/U-valu	ıe)+0.04] a	as given in	paragrapl	3.2	
Heat capacity Cm = S(A x k) ((28)(30) + (32) + (32a)(32e) = 827.23 (34) Thermal mass parameter (TMP = Cm ÷ TFA) in kJ/m²K Indicative Value: Low 100 (35) For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation. Thermal bridges: S (L x Y) calculated using Appendix K if details of thermal bridging are not known (36) = 0.05 x (31) Total fabric heat loss (33) + (36) = 27.52 (37) Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5) Unique (38)m = 0.33 x (25)m x (5) Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5) Heat transfer coefficient, W/K (39)m = (37) + (38)m (39)m = (37) + (38)m					is and pan	uuons		(26)(30)) + (32) =				21.0	6 (33)
Thermal mass parameter (TMP = Cm \div TFA) in kJ/m²K Indicative Value: Low 100 (35) For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation. Thermal bridges: S (L x Y) calculated using Appendix K 5.65 (36) if details of thermal bridging are not known (36) = 0.05 x (31) Total fabric heat loss (33) + (36) = 27.52 (37) Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5) Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (38)m = 28.28 28.2 28.13 27.78 27.71 27.41 27.41 27.41 27.35 27.53 27.71 27.84 27.98 (38) Heat transfer coefficient, W/K (39)m = (37) + (38)m (39)m = 55.79 55.72 55.64 55.29 55.23 54.93 54.93 54.87 55.04 55.23 55.36 55.5			•	O)						(30) + (32	2) + (32a).	(32e) =		 :::
For design assessments where the details of the construction are not known precisely the indicative values of TMP in Table 1f can be used instead of a detailed calculation. Thermal bridges: S (L x Y) calculated using Appendix K $ 5.65 (36) $ if details of thermal bridging are not known (36) = 0.05 x (31) Total fabric heat loss $ (33) + (36) = $		^	,	P = Cm -	- TFA) ir	n kJ/m²K	•		,	` , , ,	, , ,	(0_0)		<u> </u>
Thermal bridges : S (L x Y) calculated using Appendix K		•	`		,			ecisely the				able 1f		(00)
if details of thermal bridging are not known (36) = 0.05 x (31) Total fabric heat loss	can be used inste	ad of a de	tailed calc	ulation.			-	-						
Total fabric heat loss Ventilation heat loss calculated monthly	J	`	,		О.	•	K						5.65	(36)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec			are not kn	own (36) =	= 0.05 x (3	11)			(33) +	(36) =			27.5	2 (37)
(38)m= 28.28 28.2 28.13 27.78 27.71 27.41 27.41 27.35 27.53 27.71 27.84 27.98 (38) Heat transfer coefficient, W/K (39)m = (37) + (38)m (39)m= 55.79 55.72 55.64 55.29 55.23 54.93 54.93 54.87 55.04 55.23 55.36 55.5	Ventilation hea	at loss ca	alculated	l monthly	y				(38)m	= 0.33 × ([25)m x (5])		
Heat transfer coefficient, W/K (39)m = (37) + (38)m (39)m= 55.79 55.72 55.64 55.29 55.23 54.93 54.93 54.87 55.04 55.23 55.36 55.5	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
(39)m= 55.79 55.72 55.64 55.29 55.23 54.93 54.93 54.87 55.04 55.23 55.36 55.5	(38)m= 28.28	28.2	28.13	27.78	27.71	27.41	27.41	27.35	27.53	27.71	27.84	27.98		(38)
(39)m= 55.79 55.72 55.64 55.29 55.23 54.93 54.93 54.87 55.04 55.23 55.36 55.5	Heat transfer of	coefficier	nt, W/K			ē	ē	ē	(39)m	= (37) + (37)	- 38)m	-	•	
Average = $Sum(39)_{112}/12=$ 55.29 (39)	(39)m= 55.79	55.72	55.64	55.29	55.23	54.93	54.93	54.87	55.04	55.23	55.36	55.5]	
			•			•	•	•		Average =	Sum(39) ₁	12 /12=	55.2	9 (39)

eat loss para	meter (H	HLP), W/	m²K					(40)m	= (39)m ÷	(4)			
0.87	0.87	0.87	0.87	0.87	0.86	0.86	0.86	0.86	0.87	0.87	0.87		
umber of day	rs in mor	nth (Tab	le 1a)					,	Average =	Sum(40) _{1.}	12 /12=	0.87	(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		(4
. Water heat	ing ener	rgy requi	rement:								kWh/yea	ar:	
ssumed 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.		09		(4:
nnual averageduce the annual to more that 125	e hot wa al average	hot water	usage by	5% if the a	lwelling is	designed t			se target o		.19		(4
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
ot water usage ii	n litres per	day for ea	ach month	Vd,m = fa	ctor from T	Table 1c x	(43)						
4)m= 97	93.48	89.95	86.42	82.89	79.37	79.37	82.89	86.42	89.95	93.48	97		-
nergy content of	hot water	used - cal	culated mo	onthly = 4 .	190 x Vd,r	n x nm x E	OTm / 3600			m(44) ₁₁₂ = ables 1b, 1		1058.22	(4
5)m= 143.85	125.82	129.83	113.19	108.61	93.72	86.85	99.66	100.85	117.53	128.29	139.31		
									Total = Su	m(45) ₁₁₂ =		1387.5	(4
nstantaneous w						1							
ater storage	loss:	0	0	0	0	0	0	0	0	0	0		(4
orage volum		includin	g any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(4
community h	eating a	nd no ta	nk in dw	elling, e	nter 110	litres in	(47)						
herwise if no		hot wate	er (this in	cludes i	nstantar	neous co	mbi boil	ers) ente	er '0' in (47)			
ater storage If manufact		aclared l	nee facto	or ie kno	wn (k\//k	v(qəv).							1.
mperature f				טווא כו וכ	wii (Kvvi	i/uay).					0		(4
nergy lost fro				ear			(48) x (49)) =			0		(5
If manufact		•	•		or is not		(-) (-)				<u> </u>		(
ot water stora	Ū			e 2 (kWl	h/litre/da	ıy)					0		(5
community holume factor	_		on 4.3										//
emperature f	-		2b							-	0		(<u>t</u>
nergy lost fro				ar			(47) x (51)) x (52) x (53) =				(!
nter (50) or (-	, KVVII/ y C	zai			(47) X (01)	/ X (02) X (00) =	-	0		(!
ater storage	. , .	,	or each	month			((56)m = (55) × (41):	m		<u> </u>		
6)m= 0	0	0	0	0	0	0	0	0	0	0	0		(5
ylinder contains	·	·					-		_		-	Н	
')m= 0	0	0	0	0	0	0	0	0	0	0	0		(5
	loce (an	nual) fro	m Table	. 3					!		0		(5
imary circuit													, · · · · · · · · · · · · · · · · · · ·
imary circuit imary circuit	•	•			59)m = ((58) ÷ 36	65 × (41)	m					
imary circuit imary circuit (modified by	loss cal	culated f	or each	month (•	. ,	, ,		r thermo	stat)			

Combi loss calculated	l for each	month ((61)m =	(60) ± 3	65 v (41)m						
(61)m= 0 0	0	0	01)111 =	00) - 0	00 x (41)) o	0	0	T 0	0	1	(61)
Total heat required for	r water he	eating ca	alculated	l for eac	h month	ļ	<u> </u>	<u> </u>	Ļ	ļ] · (59)m + (61)m	, ,
(62)m= 122.28 106.94		96.21	92.32	79.66	73.82	84.71	85.72	99.9	109.05	118.42]	(62)
Solar DHW input calculate	d using Appe	endix G oı	r Appendix	L : H (negat	I ive quantity	y) (enter	'0' if no sola	r contribu	tion to wate	er heating)	1	
(add additional lines i										0,		
(63)m= 0 0	0	0	0	0	0	0	0	0	0	0]	(63)
Output from water he	ater						•		•	!	•	
(64)m= 122.28 106.94	110.36	96.21	92.32	79.66	73.82	84.71	85.72	99.9	109.05	118.42]	
	•			•	•	Oı	utput from wa	ater heate	er (annual)	112	1179.37	(64)
Heat gains from wate	r heating,	kWh/m	onth 0.2	5 ´ [0.85	5 × (45)m	ı + (61)	m] + 0.8 x	k [(46)m	+ (57)m	+ (59)m	۱]	
(65)m= 30.57 26.74	27.59	24.05	23.08	19.92	18.45	21.18	21.43	24.97	27.26	29.6]	(65)
include (57)m in ca	lculation of	of (65)m	only if c	ylinder	is in the	dwellin	g or hot w	ater is f	rom com	munity h	neating	
5. Internal gains (se	e Table 5	and 5a):									
Metabolic gains (Tab	e 5), Wat	ts										
Jan Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec]	
(66)m= 104.37 104.37	104.37	104.37	104.37	104.37	104.37	104.37	7 104.37	104.37	104.37	104.37]	(66)
Lighting gains (calcul	ated in Ap	pendix	L, equat	ion L9 c	r L9a), a	lso se	e Table 5				-	
(67)m= 17.82 15.83	12.87	9.75	7.29	6.15	6.65	8.64	11.6	14.72	17.18	18.32]	(67)
Appliances gains (cal	culated in	Append	dix L, eq	uation L	.13 or L1	3a), al	so see Ta	ble 5		_	-	
(68)m= 182.48 184.37	179.6	169.44	156.62	144.56	136.51	134.62	139.39	149.55	162.37	174.42]	(68)
Cooking gains (calcul	ated in Ap	pendix	L, equat	ion L15	or L15a), also	see Table	5	-	-	-	
(69)m= 33.44 33.44	33.44	33.44	33.44	33.44	33.44	33.44	33.44	33.44	33.44	33.44]	(69)
Pumps and fans gain	s (Table 5	ā)									-	
(70)m= 0 0	0	0	0	0	0	0	0	0	0	0]	(70)
Losses e.g. evaporat	on (negat	ive valu	es) (Tab	le 5)							_	
(71)m= -83.5 -83.5	-83.5	-83.5	-83.5	-83.5	-83.5	-83.5	-83.5	-83.5	-83.5	-83.5]	(71)
Water heating gains (Table 5)										_	
(72)m= 41.09 39.79	37.08	33.41	31.02	27.66	24.8	28.46	29.76	33.57	37.86	39.79]	(72)
Total internal gains	=			(66)m + (67)m	n + (68)n	n + (69)m + ((70)m + (7	71)m + (72))m	_	
(73)m= 295.7 294.3	283.86	266.9	249.23	232.69	222.28	226.03	3 235.06	252.15	271.73	286.84]	(73)
6. Solar gains:												
Solar gains are calculated	•				•	ations to		e applica		tion.		
Orientation: Access Table 6		Area m²		Flu Ta	ıx ble 6a		g_ Table 6b	Т	FF able 6c		Gains (W)	
Q 11 1						, –						1,
Southwesto s		2.0		_	36.79] <u> </u>	0.63		0.7	=	22.77	(79)
Southwesto or 0.7		2.0			62.67	ļ	0.63	X	0.7	=	38.79	(79)
Southwesto a 0.7		2.0			85.75	ļ	0.63	X	0.7	=	53.07	[(79)
Southwesto s		2.0		_	06.25	ļ Ļ	0.63		0.7	=	65.76	[(79)
Southwest _{0.9x} 0.7	7 X	2.0)3	X 1	19.01	J L	0.63	X	0.7	=	73.65	(79)

_		_					_		_				_
Southwest _{0.9x}	0.77	X	2.0)3	x	118.15	_	0.63	X	0.7	=	73.12	(79)
Southwest _{0.9x}	0.77	X	2.0)3	x	113.91		0.63	X	0.7	=	70.49	(79)
Southwest _{0.9x}	0.77	X	2.0)3	x	104.39]	0.63	X	0.7	=	64.6	(79)
Southwest _{0.9x}	0.77	X	2.0)3	x	92.85		0.63	X	0.7	=	57.46	(79)
Southwest _{0.9x}	0.77	X	2.0)3	x	69.27]	0.63	x	0.7	=	42.87	(79)
Southwest _{0.9x}	0.77	X	2.0)3	x	44.07		0.63	x	0.7	=	27.27	(79)
Southwest _{0.9x}	0.77	X	2.0)3	x	31.49]	0.63	x	0.7	=	19.49	(79)
Northwest _{0.9x}	0.77	X	6.	1	x	11.28	X	0.63	x	0.7	=	21.02	(81)
Northwest _{0.9x}	0.77	X	6.	1	x	22.97	X	0.63	x	0.7	_	42.79	(81)
Northwest 0.9x	0.77	X	6.	1	x	41.38	X	0.63	x	0.7	=	77.1	(81)
Northwest _{0.9x}	0.77	X	6.	1	x	67.96	X	0.63	x	0.7	=	126.62	(81)
Northwest _{0.9x}	0.77	X	6.	1	x	91.35	X	0.63	x	0.7	=	170.21	(81)
Northwest _{0.9x}	0.77	X	6.	1	x	97.38	X	0.63	x	0.7	=	181.46	(81)
Northwest _{0.9x}	0.77	X	6.	1	x	91.1	X	0.63	x	0.7		169.75	(81)
Northwest _{0.9x}	0.77	X	6.	1	x	72.63	X	0.63	x	0.7	=	135.33	(81)
Northwest _{0.9x}	0.77	X	6.	1	x	50.42	j x	0.63	x	0.7		93.95	(81)
Northwest _{0.9x}	0.77	X	6.	1	x	28.07	X	0.63	x	0.7		52.3	(81)
Northwest _{0.9x}	0.77	X	6.	1	x	14.2	X	0.63	x	0.7	=	26.45	(81)
Northwest _{0.9x}	0.77	i x	6.	1	x	9.21	j x	0.63	x	0.7		17.17	(81)
Solar gains in	watte calcu	latad	for oacl	h month			(92)m	n = Sum(74)m .	(92)m				
(83)m= 43.79	· ·	0.17	192.38	243.86	254.	8 240.25	199		95.17		36.66		(83)
Total gains – i	ļ												
(84)m= 339.49	375.88 41	4.04	459.28	493.09	487.2	26 462.52	425	.96 386.47	347.3	2 325.46	323.5		(84)
7. Mean inter	nal tempera	ture (heating	season)	,		,		,			
Temperature	•				′	a from Ta	ble 9	. Th1 (°C)				21	(85)
Utilisation fac	Ū	٠.			•			, , ,					`
Jan		Mar	Apr	May	Ju		Α	ug Sep	Oct	Nov	Dec		
(86)m= 0.97	0.96 0	.94	0.88	0.77	0.62	0.49	0.5		0.91	0.96	0.98		(86)
Mean interna	l temperatui	re in I	iving are	ea T1 (fo	ollow:	stens 3 to	7 in T	able 9c)		_ !	ı	l	
(87)m= 19.14	· ·	9.7	20.17	20.59	20.8	_i	20.		20.19	19.58	19.09		(87)
	during boot	ina n	oriodo in	root of	المينا	na from T	abla (<u> </u>			
Temperature (88)m= 20.19).19	20.2	20.2	20.2	<u> </u>	20		20.2	20.2	20.19		(88)
	l l			!		<u> </u>				1 20.2	20.10		()
Utilisation fac		- 1			1	` 1	T	10 0 7	0.00	0.05	0.07	1	(89)
(89)m= 0.97	0.95 0	.93	0.86	0.74	0.57	0.41	0.4	16 0.7	0.89	0.95	0.97		(69)
Mean interna	 	- 1		i		<u>`</u>	i 				ı	I	
(90)m= 18.46	18.66 19	9.02	19.48	19.87	20.1	20.18	20.	<u> </u>	19.51		18.42		(90) —
	•								LA = Liv	∕ing area ÷ (4) =	0.51	(91)
Mean interna	l temperatui	re (fo	r the wh	ole dwe	lling)	= fLA × T1	+ (1	– fLA) × T2					
Mean interna (92)m= 18.8		re (fo	r the wh	ole dwe 20.23	lling) 20.4	1	+ (1	- 	19.86	19.25	18.76		(92)

(93)m=	18.8	19.01	19.36	19.83	20.23	20.48	20.57	20.55	20.37	19.86	19.25	18.76		(93)
` '			uirement		20.20	20.10	20.01	20.00	20.01	10.00	10.20	10.70		(==)
					re ohtair	ned at st	en 11 of	Tahla Oh	so tha	t Ti m-(76)m an	d re-calc	ulate	
				using Ta		ieu at st	ер 11 ог	Table 31), 30 tria	(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	<u> </u>			Į.		•					
(94)m=	0.96	0.95	0.91	0.85	0.74	0.59	0.45	0.5	0.71	0.88	0.94	0.97		(94)
Usefu	l gains.	hmGm	W = (94	1)m x (8	4)m	<u>!</u>	Į	ļ				<u>[</u>]		
(95)m=	325.98	355.27	378.78	390.67	365.43	286.67	206.66	211.91	275.97	305.87	307.3	312.18		(95)
Month	nlv avera	age exte	rnal tem	perature	from T	umable 8	ļ	ļ						
(96)m=	4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat I	loss rate	for mea	an intern	al tempe	erature,	Lm,W =	=[(39)m :	x [(93)m-	 – (96)m]				
(97)m=	809.22	785.92	715.75	604.51	471.36	323.11	217.91	227.82	344.88	511.2	672.56	807.84		(97)
Space	e heating	g require	ement fo	r each n	nonth, k	Wh/mon	th = 0.02	24 x [(97)	m – (95)m] x (4	L 1)m			
(98)m=	359.53	289.4	250.7	153.96	78.81	0	0	0	0	152.77	262.99	368.77		
						!	ļ	Tota	l per year	(kWh/year) = Sum(9	8) _{15.912} =	1916.94	(98)
Cnaa	, hootin	a roauir	amont in	Id\A/b/m2	2/voor				, , , , , ,	(.,	, (-	· /······ [╡``
Space	eneaun	g require	ement in	kWh/m²	year							l	30.04	(99)
8c. Sp	pace co	oling rec	uiremen	nt										
Calcu	lated fo		luly and	August.	l .	ble 10b								
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
		<u> </u>			1			and exte				r i		
(100)m=	0	0	0	0	0	516.3	406.45	417.01	0	0	0	0		(100)
Utilisa	ation fac	tor for lo	ss hm	1	1	,								
(101)m=		0	0	0	0	0.84	0.89	0.87	0	0	0	0		(101)
1	l loss, h	mLm (V	/atts) = ((100)m x	(101)m		T	1						
(102)m=	0	0	0	0	0	432.27	361.3	360.75	0	0	0	0		(102)
1		gains ca	culated	for appli	cable w			e Table	10)					
(103)m=		0	0	0	0	647.72	617.34	576.03	0	0	0	0		(103)
						dwelling,	continue	ous (kW	h = 0.02	24 x [(10	03)m – (102)m] ɔ	c (41)m	
` 1		Ì		3 × (98	i –	155.40	100.40	400.47	0	0	-			
(104)m=	0	0	0	0	0	155.13	190.49	160.17	0	0	0	0		7
Cooloo	I fraction									= Sum(104) area ÷ (4	=	505.8	(104)
			able 10b	`					10=	coolea	area - (2	+) =	1	(105)
(106)m=		0	0	0	0	0.25	0.25	0.25	0	0	0	0		
(100)111=	U	Ū	U			0.23	0.25	0.23		' = Sum((106)
Snace	cooling	requirer	nent for	month -	· (104)m	× (105)	√ (106)r	m	TOtal	= Sum	1 <u>04</u>)	=	0	(100)
(107)m=	Ť	0	0	0	0	38.78	47.62	40.04	0	0	0	0		
(,	Ů	Ū	Ū			1 303		10.01		= Sum(=	126.45	(107)
0	!!			-\						`	19091	-		┥
•		•		kWh/m²/y					` ′	÷ (4) =			1.98	(108)
				alculated	Tonly un	der spec	cial cond	litions, se		· ·				
Fabrio	Energy	/ Efficier	псу						(99) -	+ (108) =	=		32.02	(109)

SAP Input

Address:

England Located in: Region: Thames valley

UPRN:

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

Assessment type: New dwelling design stage

New dwelling Transaction type: Tenure type: Unknown Related party disclosure: No related party Thermal Mass Parameter: Indicative Value Low

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

PCDF Version: 466

Flat Dwelling type:

Detachment:

2020 Year Completed:

Floor Location: Floor area:

Storey height:

63.823 m² 2.5 m Floor 0

32.253 m² (fraction 0.505) Living area:

North East Front of dwelling faces:

Manufacturer

NE

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

SW Manufacturer Windows double-glazed Yes NW Manufacturer Windows double-glazed Yes

Solid

U-value: No. of Openings: Name: Gap: Frame Factor: g-value: Area: 0 1.4 NE mm SW 0.7 0.63 1.4 2.025 1 16mm or more 0.63 6.097 NW 16mm or more 0.7 1.4 1

Width: Location: Orient: Height: Name: Type-Name: Corridor Wall North East NE 0 **External Wall** South West SW 0 0 NW External Wall North West 0 0

Average or unknown Overshading:

Type:	Gross area:	Openings:	Net area:	U-value:	Ru value:	Curtain wall:	Kappa:
External Element	<u>s</u>						
External Wall	20.954	8.12	12.83	0.15	0	False	N/A
Corridor Wall	29.617	2	27.62	0.15	0.4	False	N/A
Stairwell Wall	18.639	0	18.64	0.15	0.9	False	N/A
Internal Floments	c						

<u>Internal Elements</u> Party Elements

User-defined (individual PSI-values) Y-Value = 0.0817 Thermal bridges:

> Length Psi-value

Other lintels (including other steel lintels) 4.56 0.289 E2

SAP Input

	13.2	0.047	E4	Jamb
	50.794	0.061	E7	Party floor between dwellings (in blocks of flats)
	8.175	0.074	E16	Corner (normal)
	10.9	-0.077	E17	Corner (inverted internal area greater than external area)
	5.45	0.096	E25	Staggered party wall between dwellings
[Approved]	5.45	0.06	E18	Party wall between dwellings
	32.29	0	P3	Intermediate floor between dwellings (in blocks of flats)

Ventilation:

Pressure test: Yes (As designed)

Ventilation: Balanced with heat recovery

Number of wet rooms: Kitchen + 1

Ductwork: Insulation, rigid

Approved Installation Scheme: True

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

Main heating system

Main heating system: Community heating schemes

Heat source: Community boilers

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

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

Boiler interlock: Yes

Main heating Control:

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

thermostats Control code: 2312

Secondary heating system:

Secondary heating system: None

Water heating

Water heating: From main heating system

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

Others:

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

Low energy lights: 100%

Terrain type: Low rise urban / suburban

EPC language: English Wind turbine: No

Photovoltaics: Photovoltaic 1

Installed Peak power: 0.78 Tilt of collector: 30°

Overshading: None or very little Collector Orientation: South West

Assess Zero Carbon Home: No

		l Iser I	Details:						
Assessor Name: Software Name:	Zahid Ashraf Stroma FSAP 2012		Strom Softwa					0001082 on: 1.0.5.9	
A	F	Property	Address	Plot 21					
Address: 1. Overall dwelling dime	ensions:								
The Overall awailing all the		Are	a(m²)		Av. He	ight(m)		Volume(m	³)
Ground floor		(63.82	(1a) x	2	2.5	(2a) =	159.56	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1	n) (63.82	(4)			•		
Dwelling volume				(3a)+(3b)+(3c)+(3c	d)+(3e)+	.(3n) =	159.56	(5)
2. Ventilation rate:									
	main seconda heating heating	ry	other		total			m³ per hou	ır
Number of chimneys		+ [0] = [0	X 4	40 =	0	(6a)
Number of open flues	0 + 0	-	0	j = F	0	x2	20 =	0	(6b)
Number of intermittent fa	ins			,	2	x ′	10 =	20	(7a)
Number of passive vents	;			F	0	x ′	10 =	0	(7b)
Number of flueless gas f	ires			F	0	X 4	40 =	0	(7c)
· ·				L					` ′
							Air ch	nanges per ho	our
	ys, flues and fans = $(6a)+(6b)+($				20		÷ (5) =	0.13	(8)
If a pressurisation test has be Number of storeys in t	peen carried out or is intended, procee he dwelling (ns)	ed to (17),	otherwise o	continue fr	om (9) to ((16)		0	(9)
Additional infiltration	no awaning (115)					[(9)-	-1]x0.1 =	0	(10)
Structural infiltration: 0	.25 for steel or timber frame o	r 0.35 fo	r masoni	y constr	uction			0	(11)
if both types of wall are p deducting areas of openi	resent, use the value corresponding t	o the grea	ter wall are	a (after					
,	floor, enter 0.2 (unsealed) or 0	.1 (seal	ed), else	enter 0				0	(12)
If no draught lobby, en	ter 0.05, else enter 0							0	(13)
Percentage of window	s and doors draught stripped							0	(14)
Window infiltration			0.25 - [0.2	. ,	-	()		0	(15)
Infiltration rate	aEO avaraged in public matri	aa nar b	(8) + (10)				oroo	0	(16)
,	q50, expressed in cubic metro lity value, then $(18) = [(17) \div 20] + (18)$	-		•	etre or e	rivelope	area	0.38	(17)
•	es if a pressurisation test has been do				is being u	sed		0.30	(10)
Number of sides sheltered	ed							3	(19)
Shelter factor	Carabaltas fastas		(20) = 1 -		[9)] =			0.78	(20)
Infiltration rate incorporation	•		(21) = (18) X (20) =				0.29	(21)
Infiltration rate modified f	Mar Apr May Jun	Jul	Aug	Sep	Oct	Nov	Dec	1	
Monthly average wind sp	1 ' 1 ' 1	Jui	Aug	Оер	1 000	INOV	Dec		
(22)m= 5.1 5	4.9 4.4 4.3 3.8	3.8	3.7	4	4.3	4.5	4.7]	
		1	1	<u> </u>	I	1	l	I	
Wind Factor $(22a)m = (2$			1			T	4	1	
(22a)m= 1.27 1.25	1.23 1.1 1.08 0.95	0.95	0.92	1	1.08	1.12	1.18		

0.37	0.36	0.36	0.32	0.31	0.28	0.28	0.27	0.29	0.31	0.33	0.34		
Calculate effe	ctive air	change i			' '								
If mechanica												0	(2
If exhaust air h) = (23a)			0	(2
If balanced with		-	•	_								0	(2
a) If balance						<u> </u>	 	<u> </u>	 		<u>`</u>	÷ 100]	4.
24a)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
b) If balance						- •	- ^ ` 	<u> </u>				1	
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(2
c) If whole h				•	•				.5 × (23b	.\			
24c)m= 0	0.5 7	0	0	0	0	0	0	0	0	0	0]	(2
d) If natural				-								l	`
if (22b)n									0.5]				
24d)m= 0.57	0.57	0.56	0.55	0.55	0.54	0.54	0.54	0.54	0.55	0.55	0.56		(2
Effective air	change	rate - er	iter (24a	or (24b	o) or (24d	c) or (24	d) in box	(25)				•	
25)m= 0.57	0.57	0.56	0.55	0.55	0.54	0.54	0.54	0.54	0.55	0.55	0.56		(2
3. Heat losse	s and he	eat loss r	naramete	ar.									
ELEMENT	Gros	·	Openin		Net Ar	ea	U-valı	ıe	AXU		k-value	.	ΑΧk
	area	_	m		A ,n		W/m2		(W/ł	≺)	kJ/m²-		kJ/K
oors (2	Х	1	=	2				(2
Vindows Type	1				2.025	x1.	/[1/(1.4)+	0.04] =	2.68				(2
Vindows Type	2				6.097	x1.	/[1/(1.4)+	0.04] =	8.08				(2
Valls Type1	20.9	5	8.12		12.83	Х	0.18	= [2.31				(2
Valls Type2	29.6	2	2		27.62	. x	0.18	= [4.97				(2
Valls Type3	18.6	34	0		18.64	. x	0.18	<u> </u>	3.36			$\neg \ \ $	(2
otal area of e	lements	, m²			69.21								(3
for windows and * include the area						ated using	ı formula 1.	/[(1/U-valu	ıe)+0.04] a	s given in	paragrapl	3.2	
abric heat los	ss, W/K =	= S (A x	U)				(26)(30)	+ (32) =				23.4	1 (3
leat capacity	Cm = S(Axk)						((28)	(30) + (32	2) + (32a).	(32e) =	827.2	23 (3
hermal mass	parame	ter (TMF	P = Cm ÷	· TFA) ir	n kJ/m²K			Indica	tive Value:	Medium		250) (3
or design assess an be used inste				constructi	ion are not	known pr	ecisely the	indicative	values of	TMP in Ta	able 1f		
hermal bridge	es : S (L	x Y) cal	culated ı	using Ap	pendix k	<						4.85	5 (3
details of therma	al bridging	are not kn	own (36) =	0.05 x (3	1)								
otal fabric he	at loss							(33) +	(36) =			28.2	6 (3
entilation hea	at loss ca	alculated	monthly	/				(38)m	= 0.33 × (25)m x (5))	1	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
38)m= 29.95	29.81	29.67	29.02	28.9	28.34	28.34	28.23	28.55	28.9	29.15	29.4		(3
leat transfer o	coefficier	nt, W/K						(39)m	= (37) + (3	38)m			
		57.00	57.00	57.40	50.50							I	
89)m= 58.2	58.06	57.93	57.28	57.16	56.59	56.59	56.49	56.81	57.16	57.4	57.66		

eat loss para	meter (H	HLP), W/	m²K	,	,			(40)m	= (39)m ÷	(4)			
0.91	0.91	0.91	0.9	0.9	0.89	0.89	0.89	0.89	0.9	0.9	0.9		_,
umber of day	/s in moi	nth (Tabl	le 1a)					,	Average =	Sum(40) ₁	12 /12=	0.9	(4
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		(4
							•		•	•			
. Water hea	ting ene	rgy requi	rement:								kWh/ye	ar:	
ssumed occu	ıpancy, l	N								2.	.09		(4
if TFA > 13.9		+ 1.76 x	[1 - exp	(-0.0003	849 x (TF	FA -13.9)2)] + 0.0	0013 x (TFA -13.	.9)			
if TFA £ 13.9 nnual averag	•	ater usac	ae in litre	s per da	av Vd.av	erage =	(25 x N)	+ 36		83	3.78		(4
educe the annua	al average	hot water	usage by	5% if the a	lwelling is	designed t			se target o				•
t more that 125													
Jan ot water usage i	Feb	Mar day for ea	Apr	Vd m = fa	Jun	Jul Table 1c x	Aug (43)	Sep	Oct	Nov	Dec		
4)m= 92.15	88.8	85.45	82.1	78.75	75.4	75.4	78.75	82.1	85.45	88.8	92.15		
+)111= 92.13	00.0	05.45	02.1	70.73	73.4	75.4	76.75		<u> </u>	m(44) ₁₁₂ =		1005.31	
ergy content of	hot water	used - cal	culated mo	onthly $= 4$.	190 x Vd,r	n x nm x E	OTm / 3600			· /	L		`
i)m= 136.66	119.52	123.34	107.53	103.18	89.03	82.5	94.67	95.8	111.65	121.88	132.35		
									Total = Su	m(45) ₁₁₂ =	=	1318.12	(
nstantaneous w	ater heatıı	ng at point		hot water	storage),	enter 0 ın	boxes (46)			1			
o)m= 0 ater storage	0	0	0	0	0	0	0	0	0	0	0		(
orage volum		includin	a anv so	olar or W	/WHRS	storage	within sa	ame ves	sel		150		(
community h	, ,		•			•							`
therwise if no								ers) ente	er '0' in (47)			
ater storage													
) If manufact				or is kno	wn (kWh	n/day):					0		(
emperature f											0		(-
nergy lost fro		_	-		!+		(48) x (49)	=			0		(
) If manufact ot water stor			-								0		(
community h	-			0 = (, 0, 00	•97					0		
olume factor	_										0		(
emperature f	actor fro	m Table	2b								0		(
nergy lost fro	m water	storage	, kWh/ye	ear			(47) x (51)	x (52) x (53) =		0		(
nter (50) or	(54) in (5	55)									0		(
ater storage	loss cal	culated f	or each	month			((56)m = (55) × (41)	m				
6)m= 0	0	0	0	0	0	0	0	0	0	0	0		(
ylinder 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	
")m= 0	0	0	0	0	0	0	0	0	0	0	0		(
	loss (an	nual) fro	m Table	. 2			-				0		(
imary circuit			,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	: .)									٠,
imary circuit imary circuit	•	•			59)m = ((58) ÷ 36	65 × (41)	m			<u> </u>		`
•	loss cal	culated f	or each	month (. ,	, ,		r thermo		<u> </u>		

Combi loss calculated for each month (61)m = (60) ÷ 365 × (41)m (61)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
Total heat required for water heating calculated for each month (62)m = 0.85 × (45)m + (46)m + (57)m + (59)m + (61)m (62)m = 116.16
(62)m=
Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating) (add additional lines if FGHRS and/or WWHRS applies, see Appendix G) (63)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
(add additional lines if FGHRS and/or WWHRS applies, see Appendix G) (63)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
(63)m= 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
Output from water heater (64)m= 116.16 101.6 104.84 91.4 87.7 75.68 70.13 80.47 81.43 94.9 103.59 112.5 Output from water heater (annual) 112 1120.4 (64) Heat gains from water heating, kWh/month 0.25 [0.85 × (45)m + (61)m] + 0.8 × [(46)m + (57)m + (59)m] (65)m= 29.04 25.4 26.21 22.85 21.93 18.92 17.53 20.12 20.36 23.73 25.9 28.12 (65) include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating 5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)m= 104.37 104.37 104.37 104.37 104.37 104.37 104.37 104.37 104.37 104.37 104.37 104.37 104.37 (66) Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5 (67)m= 17.82 15.83 12.87 9.75 7.29 6.15 6.65 8.64 11.6 14.72 17.18 18.32 (67) Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
(64)m= 116.16 101.6 104.84 91.4 87.7 75.68 70.13 80.47 81.43 94.9 103.59 112.5 Output from water heater (annual) 112 1120.4 (64) Heat gains from water heating, kWh/month 0.25 ′ [0.85 × (45)m + (61)m] + 0.8 × [(46)m + (57)m + (59)m] (65)m= 29.04 25.4 26.21 22.85 21.93 18.92 17.53 20.12 20.36 23.73 25.9 28.12 (65) include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating 5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)m= 104.37 104.37 104.37 104.37 104.37 104.37 104.37 104.37 104.37 104.37 104.37 104.37 104.37 104.37 104.37 104.37 (66) Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5 (67)m= 17.82 15.83 12.87 9.75 7.29 6.15 6.65 8.64 11.6 14.72 17.18 18.32 (67) Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
Output from water heater (annual) ₁₁₂ 1120.4 (64) Heat gains from water heating, kWh/month 0.25 ′ [0.85 × (45)m + (61)m] + 0.8 × [(46)m + (57)m + (59)m] (65)m= 29.04 25.4 26.21 22.85 21.93 18.92 17.53 20.12 20.36 23.73 25.9 28.12 (65) include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating 5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)m= 104.37 104.37 104.37 104.37 104.37 104.37 104.37 104.37 104.37 104.37 104.37 104.37 104.37 104.37 (66) Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5 (67)m= 17.82 15.83 12.87 9.75 7.29 6.15 6.65 8.64 11.6 14.72 17.18 18.32 (67) Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
Heat gains from water heating, kWh/month 0.25 ′ [0.85 × (45)m + (61)m] + 0.8 × [(46)m + (57)m + (59)m] (65)m= 29.04 25.4 26.21 22.85 21.93 18.92 17.53 20.12 20.36 23.73 25.9 28.12 (65) include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating 5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)m= 104.37 104.37 104.37 104.37 104.37 104.37 104.37 104.37 104.37 104.37 104.37 104.37 (66) Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5 (67)m= 17.82 15.83 12.87 9.75 7.29 6.15 6.65 8.64 11.6 14.72 17.18 18.32 (67) Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
(65)m= 29.04 25.4 26.21 22.85 21.93 18.92 17.53 20.12 20.36 23.73 25.9 28.12 include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating 5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)m= 104.37 104.37 104.37 104.37 104.37 104.37 104.37 104.37 104.37 104.37 104.37 104.37 104.37 104.37 (66) Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5 (67)m= 17.82 15.83 12.87 9.75 7.29 6.15 6.65 8.64 11.6 14.72 17.18 18.32 (67) Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
include (57)m in calculation of (65)m only if cylinder is in the dwelling or hot water is from community heating 5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)m= 104.37 104.37 104.37 104.37 104.37 104.37 104.37 104.37 104.37 104.37 104.37 104.37 (66) Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5 (67)m= 17.82 15.83 12.87 9.75 7.29 6.15 6.65 8.64 11.6 14.72 17.18 18.32 (67) Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
5. Internal gains (see Table 5 and 5a): Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)m= 104.37 104.37 104.37 104.37 104.37 104.37 104.37 104.37 104.37 104.37 104.37 104.37 104.37 104.37 (66) Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5 (67)m= 17.82 15.83 12.87 9.75 7.29 6.15 6.65 8.64 11.6 14.72 17.18 18.32 (67) Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
Metabolic gains (Table 5), Watts Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)m= 104.37
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec (66)m= 104.37
(66)m= 104.37 104.37 104.37 104.37 104.37 104.37 104.37 104.37 104.37 104.37 104.37 104.37 104.37 104.37 104.37 (66) Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5 (67)m= 17.82 15.83 12.87 9.75 7.29 6.15 6.65 8.64 11.6 14.72 17.18 18.32 (67) Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
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(67)m= 17.82 15.83 12.87 9.75 7.29 6.15 6.65 8.64 11.6 14.72 17.18 18.32 (67) Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5
(68)m= 182.48 184.37 179.6 169.44 156.62 144.56 136.51 134.62 139.39 149.55 162.37 174.42 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5
(69)m= 33.44 33.44 33.44 33.44 33.44 33.44 33.44 33.44 33.44 33.44 33.44 (69)
Pumps and fans gains (Table 5a)
(70)m =
Losses e.g. evaporation (negative values) (Table 5)
(71)m= -83.5 -83.5 -83.5 -83.5 -83.5 -83.5 -83.5 -83.5 -83.5 -83.5 -83.5 (71)
Water heating gains (Table 5)
(72)m= 39.03 37.8 35.23 31.74 29.47 26.28 23.56 27.04 28.28 31.89 35.97 37.8 (72)
Total internal gains = $(66)m + (67)m + (68)m + (69)m + (70)m + (71)m + (72)m$
(73)m= 293.64 292.31 282.01 265.23 247.68 231.3 221.04 224.61 233.57 250.47 269.84 284.86 (73)
6. Solar gains:
Solar gains are calculated using solar flux from Table 6a and associated equations to convert to the applicable orientation.
Orientation: Access Factor Area Flux g_ FF Gains
Table 6d m² Table 6a Table 6b Table 6c (W)
Southwest _{0.9x} 0.77 x 2.03 x 36.79 0.63 x 0.7 = 22.77 (79)
Southwest _{0.9x} 0.77 x 2.03 x 62.67 0.63 x 0.7 = 38.79 (79)
Southwest _{0.9x} 0.77 x 2.03 x 85.75 0.63 x 0.7 = 53.07 (79)
Southwest _{0.9x} 0.77 x 2.03 x 106.25 0.63 x 0.7 = 65.76 (79)
Southwest _{0.9x} 0.77 x 2.03 x 119.01 0.63 x 0.7 = 73.65 (79)

		_								_						_
Southwest _{0.9x}	0.77	X	2.0	3	X	1	18.15]	0.63		X	0.7		=	73.12	(79)
Southwest _{0.9x}	0.77	X	2.0	13	X	1	13.91]	0.63		x	0.7		=	70.49	(79)
Southwest _{0.9x}	0.77	X	2.0	13	X	1	04.39]	0.63		x	0.7		=	64.6	(79)
Southwest _{0.9x}	0.77	X	2.0	3	X	9	2.85		0.63		x	0.7		=	57.46	(79)
Southwest _{0.9x}	0.77	X	2.0	13	X	6	9.27]	0.63		x	0.7		=	42.87	(79)
Southwest _{0.9x}	0.77	X	2.0	13	X	4	14.07]	0.63		x	0.7		=	27.27	(79)
Southwest _{0.9x}	0.77	X	2.0	13	x	3	31.49]	0.63		x	0.7		=	19.49	(79)
Northwest _{0.9x}	0.77	X	6.	1	x	1	1.28	X	0.63		x	0.7		=	21.02	(81)
Northwest _{0.9x}	0.77	X	6.	1	x	2	22.97	x	0.63		x	0.7		=	42.79	(81)
Northwest 0.9x	0.77	X	6.	1	X	4	1.38	x	0.63		x	0.7		=	77.1	(81)
Northwest _{0.9x}	0.77	X	6.	1	x	6	7.96	x	0.63		x	0.7		=	126.62	(81)
Northwest _{0.9x}	0.77	X	6.	1	x	9	1.35	x	0.63		x	0.7		=	170.21	(81)
Northwest _{0.9x}	0.77	x	6.	1	x	9	7.38	x	0.63		x	0.7		=	181.46	(81)
Northwest _{0.9x}	0.77	X	6.	1	x	,	91.1	x	0.63		x	0.7		=	169.75	(81)
Northwest _{0.9x}	0.77	X	6.	1	x	7	72.63	x	0.63		x	0.7		=	135.33	(81)
Northwest _{0.9x}	0.77	X	6.	1	x	5	50.42	x	0.63		x	0.7		=	93.95	(81)
Northwest _{0.9x}	0.77	X	6.	1	x	2	28.07	x	0.63		x	0.7		=	52.3	(81)
Northwest _{0.9x}	0.77	X	6.	1	x		14.2	x	0.63		x	0.7		=	26.45	(81)
Northwest _{0.9x}	0.77	Īx	6.	1	x	,	9.21	x	0.63		x	0.7	一	=	17.17	(81)
Solar gains in	· ·	-					i	<u> </u>	n = Sum(74)			T				(00)
(83)m= 43.79		0.17	192.38	243.86		54.58	240.25	199	.93 151.4	1 95	5.17	53.73	36.6	6		(83)
Total gains – i		2.18	. ,	491.54	·	35.88		124	.54 384.9	0 24	5.64	222.56	321.	E 4		(84)
(84)m= 337.44			457.61		_	00.00	461.28	424	.54 364.8	9 348	5.64	323.56	321.	3 I		(04)
7. Mean inter			`													7
Temperature	•	•			_			ole 9	, Th1 (°C)						21	(85)
Utilisation fac		$\overline{}$			Ť							 				
Jan		/lar	Apr	May	+	Jun	Jul	_	ug Se		Oct	Nov	De	C		(00)
(86)m= 1	1 0.	.99	0.97	0.89	Γ_{c}).71	0.53	0.0	6 0.87	0.	.98	1	1			(86)
Mean interna	· ·			`	1		i –	1		1						
(87)m= 20.02	20.14 20	.34	20.62	20.86	2	0.97	21	20.	99 20.9	1 20).61	20.27	20			(87)
Temperature	during heat	ing p	eriods ir	rest of	dw	elling	from Ta	ble 9	9, Th2 (°C	;)						
(88)m= 20.16	20.16 20	.16	20.17	20.17	2	0.18	20.18	20.	18 20.18	3 20).17	20.17	20.1	6		(88)
Utilisation fac	tor for gains	for r	est of d	welling,	h2,	m (se	ee Table	9a)								
(89)m= 1	1 0.	.99	0.96	0.85	0	0.63	0.44	0.	5 0.81	0.	.98	1	1			(89)
Mean interna	l temperatur	e in t	he rest	of dwell	ing	T2 (f	ollow ste	eps 3	to 7 in Ta	able 9d	c)					
(90)m= 19.26	· ·	.57	19.85	20.07	Ť	0.17	20.18	20.			9.85	19.51	19.2	4		(90)
	<u> </u>	!			•		•			fLA =	: Liv	ing area ÷ (4	4) =		0.51	(91)
Mean interna	l temperatur	e (fo	r the wh	ole dwe	llin	n) = fl	I A ∵ T1	+ (1	_ fl Δ\ ∵ ∃	Γ2				,		_
(92)m= 19.64		0.96	20.24	20.47	_	9) – 1 0.57	20.59	20.).23	19.89	19.6	3		(92)
Apply adjustn					<u> </u>		l									•
				•					•							

(93)m= 19.64	19.76	19.96	20.24	20.47	20.57	20.59	20.59	20.52	20.23	19.89	19.63		(93)
8. Space hea	L		L		20.01	20.00	20.00	20.02		10.00	10.00		,
Set Ti to the	· ·			re obtair	ad at st	an 11 of	Table 0	h so tha	t Ti m-(76)m an	d re-calc	ulata	
the utilisation			•		ieu ai sii	-р п ог	Table 3	0, 50 tila	it 11,111—(r Ojiii aii	u re-caic	uiale	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fac			<u> </u>							!			
(94)m= 1	1	0.99	0.96	0.87	0.67	0.49	0.55	0.84	0.98	1	1		(94)
Useful gains,	hmGm	. W = (94	4)m x (8	4)m	Į	<u> </u>	!		<u> </u>	!	<u>I</u>		
(95)m= 336.87	372.58	408.16	440.58	427.01	326.5	224.52	233.88	322.21	338.09	322.39	321.11		(95)
Monthly aver	age exte	rnal tem	perature	from Ta	able 8								
(96)m= 4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat loss rate	e for me	an intern	al tempe	erature,	Lm , W =	=[(39)m :	x [(93)m	– (96)m	1	Į.			
(97)m= 893.08	862.63	779.6	649.49	501.17	338.12	225.88	236.66	364.84	550.56	734.3	889.44		(97)
Space heatin	g require	ement fo	r each n	nonth, k\	Nh/mont	th = 0.02	24 x [(97)m – (95)m] x (4	1)m			
(98)m= 413.82	329.31	276.35	150.42	55.17	0	0	0	0	158.08	296.58	422.84		
	ļ	<u> </u>	ļ		<u> </u>	<u> </u>	I Tota	l per year	L (kWh/yeaı) = Sum(9	8) _{15.912} =	2102.56	(98)
Space bootin	a roquir	omont in	k\A/b/m²	2/voor									
Space heatin	•			-/уеаі								32.94	(99)
8c. Space co	oling red	quiremen	nt										
Calculated fo	Ĭ		Ĭ			ı			ı		ı	1	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Heat loss rate	· ` `			i				i	·	i e		1	
(100)m= 0	0	0	0	0	531.98	418.79	429.32	0	0	0	0		(100)
Utilisation fac	tor for lo	ss hm		1	1	1			1		1	İ	
(101)m= 0	0	0	0	0	0.93	0.97	0.95	0	0	0	0		(101)
Useful loss, h	mLm (V	Vatts) = ((100)m >	(101)m	1	1	1		1	1	1	İ	
(102)m= 0	0	0	0	0	494.85	405.85	409.22	0	0	0	0		(102)
Gains (solar	gains ca	lculated	for appli	cable w	eather re	gion, se	e Table	10)			•	•	
(103)m= 0	0	0	0	0	646.34	616.1	574.61	0	0	0	0		(103)
Space cooling					lwelling,	continue	ous (kW	h = 0.0	24 x [(10	03)m – (102)m]:	x (41)m	
set (104)m to	· ·	'	- `	í	100.07	150.40	100.05					1	
(104)m= 0	0	0	0	0	109.07	156.43	123.05	0	0	0	0		
Cooled freeties	_								= Sum(=	388.55	(104)
Cooled fraction Intermittency for		abla 10b	`					10=	cooled	area ÷ (4	+) =	1	(105)
(106)m= 0	0	0	0	0	0.25	0.25	0.25	0	0	0	0		
(100)111=0					0.20	0.20	0.25		 = Sum(0	(106)
Space cooling	requirer	ment for	month -	: (104)m	x (105)	x (106)r	m	i Ulai	– Juiii(16 <u>06</u> T)	=	0	(100)
(107)m= 0	0	0	0	0	27.27	39.11	30.76	0	0	0	0		
· · · / · · _ ·						L			l = Sum(=	97.14	(107)
Space acalina	roquiro	mont in l	ΛΛh/~2/-	ıoor						-omo* /			= '
Space cooling				•				` ') ÷ (4) =			1.52	(108)
8f. Fabric Ene		, i	alculated	only un	der spec	cial cond	litions, s		· ·				
Fabric Energy	y Efficiei	псу						(99)	+ (108) =	=		34.47	(109)
Target Fabri	c Energ	y Efficie	ency (TF	EE)								39.64	(109)
											'		

		User F)etails: _						
Assessor Name: Software Name:	Tress: Property Address: Plot 21 Press: Area(m²) Av. Height(m) 63.82 (1a) × 2.5 If floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n) 63.82 (4) Alling volume (aa)+(3b)+(3c)+(3d)+(3e)+(Area(m²) Av. Height(m) 63.82 (1a) × 2.5 If floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)+(1n) 63.82 (4) Areating (aa)+(3b)+(3c)+(3d)+(3e)+(Areating (aa)+(3b)+(3c)+(3d)+(Areating (aa)+(3b)+(3c)+(3d)+(3e)+(Areating (aa)+(3b)+(3c)+(3d)+(3e)+(Areating (aa)+(3b)+(3c)+(3d)+(3e)+(Areating (aa)+(3b)+(3c)+(3d)+(3e)+(Areating (aa)+(3b)+(3c)+(3d)+(3e)+(Areating (aa)+(3b)+(3c)+(3d)+(3e)+(Areating (aa)+(3b)+(3c)+(3d)+(Areating (aa)+(3b)+(3c)+(3d)+(Areating (aa)+(3b)+(3c)+(3d)+(Areating (aa)+(3c)+(3c)+(Areating (aa)+(3c)+(3c)+(Areating (aa)+		001082 on: 1.0.5.9						
Address :	F	Property	Address	Plot 21					
	ensions:								
<u> </u>		Are	a(m²)		Av. He	ight(m)		Volume(m ³	3)
Ground floor		6	63.82	(1a) x	2	2.5	(2a) =	159.56	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e)+(1	n) 6	63.82	(4)					
Dwelling volume				(3a)+(3b)+(3c)+(3c	d)+(3e)+	.(3n) =	159.56	(5)
2. Ventilation rate:									
		ry	other		total			m³ per hou	ır
Number of chimneys		+	0] = [0	x 4	40 =	0	(6a)
Number of open flues	0 + 0	- + -	0	Ī - [0	x 2	20 =	0	(6b)
Number of intermittent fa	ns				0	x 1	10 =	0	(7a)
Number of passive vents				Ē	0	x 1	10 =	0	(7b)
Number of flueless gas fi	res			F	0	x 4	40 =	0	(7c)
				L					
							Air ch	nanges per ho	our
•	•						÷ (5) =	0	(8)
		ea 10 (17),	ourierwise	onunue ir	om (9) to ((16)		0	(9)
Additional infiltration	3 (2)					[(9)-	-1]x0.1 =	0	(10)
Structural infiltration: 0	.25 for steel or timber frame o	r 0.35 fo	r masoni	y constr	uction			0	(11)
		o the grea	ter wall are	a (after					
,	• /-).1 (seale	ed), else	enter 0				0	(12)
If no draught lobby, en	ter 0.05, else enter 0							0	(13)
Percentage of windows	s and doors draught stripped							0	(14)
Window infiltration			-	. ,	-			0	(15)
Infiltration rate	50							0	(16)
•	•	•		•	etre of e	envelope	area	3	(17)
· ·	•				is being u	sed		0.15	(18)
Number of sides sheltere					-			3	(19)
Shelter factor					19)] =			0.78	(20)
•	•		(21) = (18) x (20) =				0.12	(21)
	- 1 		· .			l	_	1	
L	1 ' 1 ' 1	Jul	Aug	Sep	Oct	Nov	Dec		
	 	1 20	2.7		1 42	4.5	4.7	1	
(22)m= 5.1 5	4.5 4.4 4.3 3.8	3.8	3./	4	4.3	4.5	4.7		
Wind Factor $(22a)m = (22a)m $	2)m ÷ 4					,		•	
(22a)m= 1.27 1.25	1.23 1.1 1.08 0.95	0.95	0.92	1	1.08	1.12	1.18		

Adjusted infiltr	ation rat	e (allowi	ng for sh	nelter an	d wind s	peed) =	(21a) x	(22a)m						
0.15	0.15	0.14	0.13	0.12	0.11	0.11	0.11	0.12	0.12	0.13	0.14			
Calculate effe		•	rate for t	he appli	cable ca	se	•		•	•	•			٦,,,
If mechanica			andin NL (O	ah) (00-	· \	(N	\ 	: (00h	\ (00-)			0.	5	(23
If exhaust air h		0		, ,	,	. ,	,, .	•) = (23a)			0.		<u> </u> (23
If balanced with		-	-	_					Dls \ /	005) [4 (00-)	79.	05	(23
a) If balance (24a)m= 0.25	0.25	anicai ve	o.23	0.23	at recove	0.22	1R) (24a 0.21	0.22	2b)m + (0.23	23b) × [0.24	1 – (23c) 0.24	÷ 100] I		(24
· ·	<u> </u>	<u> </u>	<u> </u>		<u> </u>	<u> </u>	ļ		l	ļ	0.24			(2-
b) If balance	o mech	anicai ve	ntilation	without 0	neat rec	overy (i	0	$\int_{0}^{\infty} \int_{0}^{\infty} dt = (22)$	2D)m + (. 0	230)	0	l		(24
	<u> </u>	<u> </u>	ļ		<u> </u>	ļ			0		0			(2
c) If whole h		tract ver k (23b), t		•	-				5 × (23h	o)				
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0			(24
d) If natural	ventilatio	n or wh	ole hous	e positiv	/e input	L ventilatio	n from l	oft		<u>!</u>	ļ	l		
,		en (24d)		•	•				0.5]					
24d)m= 0	0	0	0	0	0	0	0	0	0	0	0			(2
Effective air	change	rate - er	nter (24a	or (24b	o) or (24	c) or (24	d) in box	(25)	-	-				
25)m= 0.25	0.25	0.25	0.23	0.23	0.22	0.22	0.21	0.22	0.23	0.24	0.24			(2
3. Heat losse	s and he	at loss r	naramet	or.										
ELEMENT	Gros	_	Openin		Net Ar	ea	U-valı	IE	AXU		k-value	۵	Α)	X k
	area		r		A ,r		W/m2		(W/	K)	kJ/m²·l		kJ/	
Doors					2	X	1.4	= [2.8					(20
Windows Type	e 1				2.025	x1.	/[1/(1.4)+	0.04] =	2.68	一				(2
Windows Type	2				6.097	x1.	/[1/(1.4)+	0.04] =	8.08					(2
Nalls Type1	20.9	95	8.12		12.83	3 x	0.15	i	1.92	= [(2
Walls Type2	29.6	52	2		27.62	2 x	0.14	<u> </u>	3.91	₹ i		7 F		
Walls Type3	18.6	64	0		18.64	×	0.13	<u> </u>	2.46	T i		-		- (29
Γotal area of ε	lements	, m²			69.21		<u> </u>							` (3
for windows and			effective wi	ndow U-va			formula 1	/[(1/U-valu	ıe)+0.04] a	as given in	paragraph	3.2		•
** include the area	as on both	sides of in	nternal wal	ls and par	titions									
abric heat los	ss, W/K	= S (A x	U)				(26)(30)	+ (32) =				21.	86	(3:
Heat capacity	Cm = S((Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	827	.23	(3
Thermal mass	parame	ter (TMF	P = Cm -	- TFA) ir	n kJ/m²K			Indica	tive Value	: Low		10	0	(3
For design assess				construct	ion are no	t known pr	ecisely the	indicative	values of	TMP in T	able 1f			
can be used inste Thermal bridge				ısina Δr	nandiy l	<i>(</i>						-	\	(30
f details of therma	•	,			•	`						5.0	55	(3
Total fabric he		aro not nii	01111 (00) -	- 0.00 x (0	1)			(33) +	(36) =			27.	 52	(3
entilation hea	at loss ca	alculated	l monthl	/				(38)m	= 0.33 × ([25)m x (5])			┛`
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
38)m= 13.32	13.17	13.01	12.25	12.1	11.33	11.33	11.18	11.64	12.1	12.4	12.71			(3
 leat transfer	coefficie	nt. W/K	ļ.	<u> </u>	!	<u> </u>		(39)m	= (37) + (38)m	!	1		
39)m= 40.84	40.68	40.53	39.77	39.61	38.85	38.85	38.69	39.15	39.61	39.92	40.22			

Heat loss para	ameter (I	HLP), W	′m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 0.64	0.64	0.64	0.62	0.62	0.61	0.61	0.61	0.61	0.62	0.63	0.63		
	!							,	Average =	Sum(40) ₁ .	12 /12=	0.62	(40)
Number of da	<u> </u>	- ` 					_	_	I -				
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
4. Water hea	ating ene	rgy requi	rement:								kWh/ye	ar:	
Assumed occ if TFA > 13. if TFA £ 13.	.9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (⁻	TFA -13		09		(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 o		.19		(43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage							,	- *F					
(44)m= 97	93.48	89.95	86.42	82.89	79.37	79.37	82.89	86.42	89.95	93.48	97		
	!	<u> </u>		<u> </u>		ļ.		-	Total = Su	m(44) ₁₁₂ =	=	1058.22	(44)
Energy content o	f hot water	used - cal	culated mo	onthly = 4.	190 x Vd,r	n x nm x C	Tm / 3600) kWh/mor	nth (see Ta	ables 1b, 1	c, 1d)		
(45)m= 143.85	125.82	129.83	113.19	108.61	93.72	86.85	99.66	100.85	117.53	128.29	139.31		
16 ' ((-6 (()		h (40		Total = Su	m(45) ₁₁₂ =	= [1387.5	(45)
If instantaneous	1		,		storage),	·	` ′	,			· · · · · · · · · · · · · · · · · · ·		
(46)m= 21.58 Water storage	18.87	19.47	16.98	16.29	14.06	13.03	14.95	15.13	17.63	19.24	20.9		(46)
Storage volun		includir	ng any so	olar or W	/WHRS	storage	within sa	ame ves	sel		0		(47)
If community	` '					_					<u> </u>		(,
Otherwise if n	_			_			` '	ers) ente	er '0' in (47)			
Water storage	e loss:												
a) If manufac	turer's d	eclared I	oss facto	or is kno	wn (kWł	n/day):					0		(48)
Temperature	factor fro	m Table	2b								0		(49)
Energy lost fro		•					(48) x (49)) =		1	10		(50)
b) If manufact Hot water stor			-								00		(51)
If community	•			IC 2 (KVV)	ii/iiti C/GC	·y /				0.	02		(31)
Volume factor	_									1.	03		(52)
Temperature	factor fro	m Table	2b							0	.6		(53)
Energy lost from	om water	storage	, kWh/ye	ear			(47) x (51)) x (52) x (53) =	1.	03		(54)
Enter (50) or	(54) in (5	55)								1.	03		(55)
Water storage	loss cal	culated f	or each	month			((56)m = (55) × (41)ı	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	ns 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	хН	
(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 circui	t loss (ar	nual) fro	m Table	e 3							0		(58)
Primary circui	,	,			59)m = ((58) ÷ 36	55 × (41)	m					
(modified by				,		. ,	, ,		r thermo	stat)			
(59)m= 23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)

Combi loss	calculated	for oach	month	(61)m –	(60) ·	265 v (41	\m						
(61)m= 0	0	0	0	0 1)111 =	00) +	0) o		0	0	0	1	(61)
											<u> </u>	J · (59)m + (61)m	(-)
(62)m= 199.1		185.11	166.68	163.88	147.2		154.9		172.8	181.78	194.59]	(62)
Solar DHW inp		<u> </u>			<u> </u>							<u> </u>	(-)
(add additio										iioii to wat	or riodairig,		
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0	1	(63)
Output from	water hea	ter	!				ļ.		ļ.	ļ	!	J	
(64)m= 199.1		185.11	166.68	163.88	147.2	1 142.12	154.9	3 154.34	172.8	181.78	194.59	1	
		<u>!</u>	!	l .			C	utput from w	ater heate	er (annual)	l12	2038.34	(64)
Heat gains f	rom water	heating,	, kWh/m	onth 0.2	5 ′ [0.8	35 × (45)m	า + (61)m] + 0.8	x [(46)m	+ (57)m	+ (59)m	 n]	_
(65)m= 92.0		87.39	80.43	80.33	73.96		77.30		83.3	85.45	90.54	1	(65)
include (5	7)m in cal	culation	of (65)m	only if c	ylinde	r is in the	dwellir	ng or hot w	ater is f	rom com	munity h	neating	
5. Internal	gains (see	e Table 5	and 5a):	-								
Metabolic ga	ains (Table	e 5), Wat	ts										
Jar	n Feb	Mar	Apr	May	Jun	Jul	Au	g Sep	Oct	Nov	Dec]	
(66)m= 125.2	24 125.24	125.24	125.24	125.24	125.2	4 125.24	125.2	4 125.24	125.24	125.24	125.24]	(66)
Lighting gair	ns (calcula	ted in Ap	opendix	L, equat	ion L9	or L9a), a	ılso se	e Table 5					
(67)m= 44.5	6 39.58	32.19	24.37	18.21	15.38	16.62	21.6	28.99	36.81	42.96	45.8]	(67)
Appliances	gains (calc	ulated in	Append	dix L, eq	uation	L13 or L1	3a), a	lso see Ta	ble 5				
(68)m= 272.3	35 275.18	268.06	252.89	233.76	215.7	7 203.75	200.9	2 208.05	223.21	242.35	260.33		(68)
Cooking gai	ns (calcula	ited in A	ppendix	L, equat	ion L1	5 or L15a), also	see Table	5				
(69)m= 49.6	1 49.61	49.61	49.61	49.61	49.61	49.61	49.6	1 49.61	49.61	49.61	49.61		(69)
Pumps and	fans gains	(Table 5	5a)										
(70)m= 0	0	0	0	0	0	0	0	0	0	0	0]	(70)
Losses e.g.	evaporatio	n (nega	tive valu	es) (Tab	le 5)							_	
(71)m= -83.	5 -83.5	-83.5	-83.5	-83.5	-83.5	-83.5	-83.5	-83.5	-83.5	-83.5	-83.5]	(71)
Water heating	ng gains (T	able 5)										_	
(72)m= 123.7	73 121.69	117.46	111.71	107.98	102.7	2 98.25	103.9	7 106.01	111.96	118.68	121.7]	(72)
Total intern	al gains =	:			(6	66)m + (67)n	n + (68)	m + (69)m +	(70)m + (7	71)m + (72))m	_	
(73)m= 532	527.8	509.06	480.33	451.3	425.2	2 409.98	417.8	6 434.4	463.34	495.35	519.19		(73)
6. Solar ga													
Solar gains a		•				•	ations to		ne applical		tion.		
Orientation:	Access F Table 6d		Area m²			ilux able 6a		g_ Table 6b	Т	FF able 6c		Gains (W)	
Southwest _{0.9}					_		1 6				_	. ,	1(70)
Southwest _{0.9}		X			x	36.79	┆╶┝	0.63		0.7	=	22.77	(79)
Southwest _{0.9}		×			×	62.67] 	0.63		0.7	╡ -	38.79](79)] ₍₇₀₎
Southwest _{0.9}		×			x	85.75] -	0.63	×	0.7	_ =	53.07](79)] ₍₇₀₎
Southwest _{0.9}		X	2.0		x	106.25] -	0.63	×	0.7	=	65.76](79)] ₍₇₀₎
Southwest(),9	X 0.77	X	2.0)3	X	119.01	J L	0.63	X	0.7	=	73.65	(79)

_					_									
Southwest _{0.9x}	0.77	X	2.0	13	x	11	18.15		0.63	X	0.7	=	73.12	(79)
Southwest _{0.9x}	0.77	x	2.0	13	x	11	13.91		0.63	X	0.7	=	70.49	(79)
Southwest _{0.9x}	0.77	x	2.0	13	x	10	04.39		0.63	X	0.7	=	64.6	(79)
Southwest _{0.9x}	0.77	x	2.0	13	x	9:	2.85		0.63	X	0.7	=	57.46	(79)
Southwest _{0.9x}	0.77	x	2.0	13	x	6	9.27		0.63	x	0.7	=	42.87	(79)
Southwest _{0.9x}	0.77	x	2.0	13	x	4	4.07		0.63	X	0.7	=	27.27	(79)
Southwest _{0.9x}	0.77	x	2.0	13	x	3	1.49		0.63	x	0.7	=	19.49	(79)
Northwest _{0.9x}	0.77	x	6.	1	x	1	1.28	x	0.63	X	0.7	=	21.02	(81)
Northwest _{0.9x}	0.77	x	6.	1	x	2	2.97	x	0.63	x	0.7	=	42.79	(81)
Northwest 0.9x	0.77	x	6.	1	x	4	1.38	x	0.63	X	0.7	=	77.1	(81)
Northwest _{0.9x}	0.77	x	6.′	1	x	6	7.96	x	0.63	x	0.7	=	126.62	(81)
Northwest _{0.9x}	0.77	x	6.′	1	x	9	1.35	x	0.63	x	0.7	=	170.21	(81)
Northwest _{0.9x}	0.77	x	6.	1	x	9	7.38	x	0.63	X	0.7	=	181.46	(81)
Northwest _{0.9x}	0.77	x	6.	1	x	9	91.1	x	0.63	x	0.7	=	169.75	(81)
Northwest _{0.9x}	0.77	x	6.′	1	x	7:	2.63	x	0.63	x	0.7	=	135.33	(81)
Northwest _{0.9x}	0.77	x	6.	1	x	5	0.42	x	0.63	x	0.7	=	93.95	(81)
Northwest _{0.9x}	0.77	x	6.′	1	x	2	8.07	x	0.63	X	0.7	=	52.3	(81)
Northwest _{0.9x}	0.77	x	6.′	1	x	1	4.2	x	0.63	X	0.7	=	26.45	(81)
Northwest _{0.9x}	0.77	x	6.	1	x	9).21	x	0.63	x	0.7	=	17.17	(81)
Solar gains in								(83)m	= Sum(74)m .	(82)m			Ī	
(83)m= 43.79		30.17	192.38	243.86		54.58	240.25	199	.93 151.41	95.17	53.73	36.66		(83)
Total gains – i			` 		Ò	.					1		I	(0.4)
(84)m= 575.79	609.38 63	39.23	672.71	695.16	6	79.8	650.22	617	.79 585.82	558.5	549.08	555.84		(84)
7. Mean inter	nal tempera	ature (heating	season)									_
Temperature	_	•			-			ole 9,	Th1 (°C)				21	(85)
Utilisation fac					(se	ee Ta	ble 9a)				_		1	
Jan		Mar	Apr	May	_	Jun	Jul	Αι		Oct	+	Dec		(00)
(86)m= 0.86	0.82).76	0.65	0.51	0).36	0.26	0.2			0.8	0.87		(86)
Mean interna	l tamparatu							0.2	9 0.45	0.66	0.0			
		re in I	iving are	ea T1 (fo	ollo	w ste	os 3 to 7				_			
(87)m= 20.36		re in I 0.66	iving are	20.95	1	w ste 0.99	os 3 to 7 21		able 9c)	20.86	_	20.34		(87)
(87)m= 20.36 Temperature	20.48 2	0.66	20.85	20.95	20	0.99	21	' in T	able 9c)		_		 	(87)
	20.48 20	0.66	20.85	20.95	20 dwe	0.99	21	' in T	able 9c) 1 20.98 9, Th2 (°C)		20.61			(87)
Temperature	20.48 20 during hear 20.4 2	0.66 ting pe	20.85 eriods ir 20.41	20.95 rest of 20.41	20 dwe	0.99 elling 0.42	21 from Ta 20.42	' in T	able 9c) 1 20.98 9, Th2 (°C)	20.86	20.61	20.34		, ,
Temperature (88)m= 20.39	20.48 2 during hear 20.4 2 tor for gains	0.66 ting pe	20.85 eriods ir 20.41	20.95 rest of 20.41	20 dwe 20 h2,i	0.99 elling 0.42	21 from Ta 20.42	' in T	able 9c) 1 20.98 9, Th2 (°C) 42 20.42	20.86	20.61	20.34		, ,
Temperature (88)m= 20.39 Utilisation fac (89)m= 0.84	20.48 20.4 20.4 20.4 20.81 0.81 0.81	0.66 ting pe 20.4 s for r	20.85 eriods ir 20.41 est of do	20.95 n rest of 20.41 welling, 0.48	20 dwe 20 h2,i	0.99 elling 0.42 m (se	21 from Ta 20.42 e Table 0.23	7 in T 2° ble 9 20.4 9a)	Fable 9c) 1 20.98 20, Th2 (°C) 42 20.42 5 0.41	20.86	20.61	20.34		(88)
Temperature (88)m= 20.39 Utilisation fac	20.48 20 during hear 20.4 2 tor for gains 0.81 0	0.66 ting pe 20.4 s for r	20.85 eriods ir 20.41 est of do	20.95 n rest of 20.41 welling, 0.48	20 dwe 20 h2,i	0.99 elling 0.42 m (se	21 from Ta 20.42 e Table 0.23	7 in T 2° ble 9 20.4 9a)	Table 9c) 1 20.98 2), Th2 (°C) 42 20.42 5 0.41 to 7 in Table	20.86	20.61	20.34		(88)
Temperature (88)m= 20.39 Utilisation factors (89)m= 0.84 Mean internal	20.48 20 during hear 20.4 2 tor for gains 0.81 0	ting per 20.4 s for r	20.85 eriods ir 20.41 est of do 0.63 he rest	20.95 n rest of 20.41 welling, 0.48 of dwelli	20 dwe 20 h2,i	0.99 elling 0.42 m (se 0.33 T2 (fc	from Ta 20.42 e Table 0.23 bllow ste	7 in T 20.4 9a) 0.2 eps 3	Fable 9c) 1 20.98 20, Th2 (°C) 42 20.42 5 0.41 to 7 in Tabl 42 20.4	20.86 20.41 0.64 e 9c) 20.24	20.61	20.34 20.4 0.86	0.51	(88)
Temperature (88)m= 20.39 Utilisation fac (89)m= 0.84 Mean interna (90)m= 19.54	20.48 20 during hear 20.4 2 tor for gains 0.81 0 temperatu 19.71 19	0.66 ting po 20.4 s for r 0.74 re in t	20.85 eriods ir 20.41 est of dv 0.63 he rest	20.95 n rest of 20.41 welling, 0.48 of dwelli 20.36	20 dwe 20 h2,i 0	0.99 elling 0.42 m (se 0.33 T2 (fc	from Ta 20.42 e Table 0.23 ollow ste 20.42	' in T 2' able 9 20.4 9a) 0.2 eps 3	fable 9c) 1 20.98 2, Th2 (°C) 42 20.42 5 0.41 to 7 in Table 42 20.4	20.86 20.41 0.64 e 9c) 20.24	20.61 20.41 0.78	20.34 20.4 0.86	0.51	(88) (89) (90)
Temperature (88)m= 20.39 Utilisation fact (89)m= 0.84 Mean internation (90)m= 19.54 Mean internation	20.48 20.48 20.4 20.4 20.4 20.81 00.81 00.81 19.71 19.	0.66 ting po 20.4 s for r 0.74 re in t 9.96 re (for	20.85 eriods ir 20.41 est of do 0.63 he rest 20.22	20.95 n rest of 20.41 welling, 0.48 of dwelli 20.36	dwe 20 h2,1 0 ing 20	0.99 elling 0.42 m (se 0.33 T2 (fc 0.41 g) = fL	21 from Ta 20.42 e Table 0.23 bllow ste 20.42 A × T1	' in T 2' bble \$ 20 9a) 0.2 pps 3 20	fable 9c) 1 20.98 2), Th2 (°C) 42 20.42 5 0.41 to 7 in Tabl 42 20.4 f fLA) × T2	20.86 20.41 0.64 e 9c) 20.24 LA = Liv	20.61 20.41 0.78 19.91 ring area ÷ (-	20.34 20.4 0.86 19.52 4) =	0.51	(88) (89) (90) (91)
Temperature (88)m= 20.39 Utilisation fac (89)m= 0.84 Mean interna (90)m= 19.54	20.48 20 during hear 20.4 2 tor for gains 0.81 0 I temperatu 19.71 15 I temperatu 20.1 20	0.66 ting per 10.4 s for r 10.74 re in t 19.96 re (for 0.31	20.85 eriods ir 20.41 est of dv 0.63 he rest 20.22 r the wh 20.54	20.95 n rest of 20.41 welling, 0.48 of dwelli 20.36 ole dwe 20.66	20 20 20 10 10 20 20	0.99 elling 0.42 m (se 0.33 T2 (fc 0.41 g) = fL 0.71	21 from Ta 20.42 e Table 0.23 bllow ste 20.42 A × T1 20.71	' in T 2' bble § 20.4 9a) 0.2 eps 3 20.4 + (1	fable 9c) 1 20.98 2), Th2 (°C) 42 20.42 5 0.41 to 7 in Table 42 20.4 f	20.86 20.41 0.64 e 9c) 20.24 LA = Liv	20.61 20.41 0.78 19.91 ring area ÷ (-	20.34 20.4 0.86	0.51	(88) (89) (90)

												•	
(93)m= 19.96	20.1	20.31	20.54	20.66	20.71	20.71	20.71	20.69	20.55	20.26	19.93		(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	L		iviay	Our	Oui	/ rug	ОСР	000	1101	D00		
(94)m= 0.84	0.8	0.74	0.63	0.49	0.35	0.25	0.27	0.43	0.64	0.78	0.85		(94)
Useful gains,	hmGm	, W = (9	4)m x (8	4)m	!	<u> </u>	!			<u> </u>	<u> </u>		
(95)m= 480.83	488.68	473.45	424.09	342.44	234.96	159.34	166.27	252.55	359.15	428.51	470.1		(95)
Monthly aver	age exte	ernal tem	perature	from T	able 8								
(96)m= 4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat loss rate	1	1	 		i		· · ·	– (96)m				Ī	
(97)m= 639.31	618.39	559.79	462.8	354.79	237.16	159.76	166.88	257.99	394.32	525.37	632.91		(97)
Space heatin		1	1		I					r -		Ī	
(98)m= 117.91	87.16	64.23	27.88	9.19	0	0	0	0	26.17	69.73	121.13		7 (20)
							Tota	l per year	(kWh/yeai	r) = Sum(9	8) _{15,912} =	523.41	(98)
Space heatin	g requir	ement in	kWh/m²	/year								8.2	(99)
9b. Energy red	quireme	nts – Coi	mmunity	heating	scheme	!							
This part is us										unity sch	neme.		_
Fraction of spa	ace heat	from se	condary	/supplen	nentary I	neating ((Table 1	1) '0' if n	one			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; t	he latter	
includes boilers, here		-			rom powe	r stations.	See Appei	ndix C.				1	(303a)
			•						(0	(╡`
Fraction of tota				•						02) x (303	a) =	1	(304a)
Factor for con				,	` ''		•	iting syst	tem			1	(305)
Distribution los	ss factor	(Table 1	12c) for (commun	ity heatii	ng syste	m					1.05	(306)
Space heating	g											kWh/yea	<u>r_</u>
Annual space	heating	requiren	nent									523.41	
Space heat fro	om Com	munity b	oilers					(98) x (30	04a) x (30	5) x (306) :	=	549.58	(307a)
Efficiency of s	econdar	y/supple	mentary	heating	system	in % (fro	m Table	4a or A	ppendix	E)		0	(308
Space heating	require	ment fro	m secon	dary/su	oplemen	tary syst	tem	(98) x (30	01) x 100 ·	÷ (308) =		0	(309)
Water heating	,												
Annual water l		requirem	ent									2038.34	\neg
If DHW from c	ommuni	ty schen	ne:										_
Water heat fro	m Comr	nunity bo	oilers					(64) x (30	03a) x (30	5) x (306) :	=	2140.25	(310a)
Electricity use	d for hea	at distrib	ution				0.01	× [(307a).	(307e) +	(310a)([310e)] =	26.9	(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	oumps a	nd fans	within dv	velling (Γable 4f)	:							
mechanical ve	entilation	- balanc	ed, extra	act or po	sitive in	out from	outside					221.43	(330a)

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) =	221.43	(331)
Energy for lighting (calculated in Appe	ndix L)		314.76	(332)
Electricity generated by PVs (Appendix	x M) (negative quantity)		-642.21	(333)
Electricity generated by wind turbine (A	Appendix M) (negative quantity)		0	(334)
10b. Fuel costs – Community heating	scheme			
	Fuel kWh/year	Fuel Price (Table 12)	Fuel Cost £/year	
Space heating from CHP	(307a) x	4.24 x 0.01 =	23.3	(340a)
Water heating from CHP	(310a) x	4.24 x 0.01 =	90.75	(342a)
		Fuel Price		
Pumps and fans	(331)	13.19 x 0.01 =	20.21	(349)
Energy for lighting	(332)	13.19 x 0.01 =	41.52	(350)
Additional standing charges (Table 12)			120	(351)
Energy saving/generation technologies				
Total energy cost	= (340a)(342e) + (345)(354) =		304.77	(355)
11b. SAP rating - Community heating	scheme			
Energy cost deflator (Table 12)			0.42	(356)
Energy cost factor (ECF)	$[(355) \times (356)] \div [(4) + 45.0] =$			(357)
SAP rating (section12)	sting a school		83.59	(358)
12b. CO2 Emissions – Community hea		ergy Emission factor	Emissions	
		h/year kg CO2/kWh	kg CO2/year	
CO2 from other sources of space and Efficiency of heat source 1 (%)		s repeat (363) to (366) for the second fu	el 94	(367a)
CO2 associated with heat source 1	[(307b)+(310b)] x ²	100 ÷ (367b) x 0.22	= 618.09	(367)
Electrical energy for heat distribution	[(313) x	0.52	= 13.96	(372)
Total CO2 associated with community	systems (363)(36	66) + (368)(372)	= 632.05	(373)
CO2 associated with space heating (se	econdary) (309) x	0	= 0	(374)
CO2 associated with water from imme	rsion heater or instantaneous hea	ater (312) x 0.22	= 0	(375)
Total CO2 associated with space and	water heating (373) + (3	74) + (375) =	632.05	(376)
CO2 associated with electricity for pur	nps and fans within dwelling (331)) x 0.52	= 114.92	(378)
CO2 associated with electricity for light	ting (332))) x	0.52	= 163.36	(379)
Energy saving/generation technologies	s (333) to (334) as applicable	0.52 x 0.01 =		(000)
Item 1	sum of (376)(382) =	0.52 X 0.01 =	000.01	(380)
Total CO2, kg/year	3um or (3/0)(302) =		577.02	(383)

Dwelling CO2 Emission Rate (383) ÷ (4) =			9.04	(384)
El rating (section 14)			92.8	9 (385)
13b. Primary Energy – Community heating scheme				
	Energy kWh/year	Primary factor	P.Energy kWh/year	
Energy from other sources of space and water heating (not CF Efficiency of heat source 1 (%) If there is CHP usi	HP) ng two fuels repeat (363) to	(366) for the second f	fuel 94	(367a)
Energy associated with heat source 1 [(307b)	+(310b)] x 100 ÷ (367b) x	1.22	= 3491.	06 (367)
Electrical energy for heat distribution	[(313) x		= 82.5	8 (372)
Total Energy associated with community systems	(363)(366) + (368)(37	2)	= 3573.	64 (373)
if it is negative set (373) to zero (unless specified otherwise,	see C7 in Appendix C	C)	3573.	64 (373)
Energy associated with space heating (secondary)	(309) x	0	= 0	(374)
Energy associated with water from immersion heater or instan	taneous heater(312) x	1.22	= 0	(375)
Total Energy associated with space and water heating	(373) + (374) + (375) =		3573.	64 (376)
Energy associated with space cooling	(315) x	3.07	= 0	(377)
Energy associated with electricity for pumps and fans within do	welling (331)) x	3.07	= 679.7	78 (378)
Energy associated with electricity for lighting	(332))) x	3.07	= 966.3	(379)
Energy saving/generation technologies Item 1		3.07 × 0.01	-1971	.59 (380)
Total Primary Energy, kWh/year sum of (376)	(382) =		3248.	14 (383)

			Jser D	etails:						
Access Nove	Zabid Ashret				- NI	L		OTDO	004000	
Assessor Name: Software Name:	Zahid Ashraf Stroma FSAP 2012	a Num ire Vei				001082 on: 1.0.5.9				
Software Hame.	Otroma r O/tr 2012			Address:		31011.		V C1310	71.0.0.0	
Address :										
1. Overall dwelling dime	ensions:									
Ground floor				a(m²)	(4.5)		ight(m)] ₍₀₋₎	Volume(m³	<u>^</u>
					(1a) x	2	2.5	(2a) =	159.56	(3a)
Total floor area TFA = (1	a)+(1b)+(1c)+(1d)+(1e))+(1n)	6:	3.82	(4)					_
Dwelling volume					(3a)+(3b))+(3c)+(3c	d)+(3e)+	.(3n) =	159.56	(5)
2. Ventilation rate:	main se	condary		other		total			m³ per hou	r
N. selven of all leaves a	heating he	eating	_		, ,			40 I		_
Number of chimneys	0 +	0	+ _	0] = [0		40 =	0	(6a)
Number of open flues	0 +	0	+	0] = [0		20 =	0	(6b)
Number of intermittent fa					L	2	X '	10 =	20	(7a)
Number of passive vents	3				L	0	X '	10 =	0	(7b)
Number of flueless gas fi	ires					0	X 4	40 =	0	(7c)
								Air ch	nanges per ho	our
Infiltration due to chimne	vs_flues and fans = (6a	ı)+(6b)+(7a)+	+(7b)+(7	7c) =	Г	20		÷ (5) =	0.13	(8)
	peen carried out or is intended				ontinue fr			- (0) =	0.13	
Number of storeys in the	he dwelling (ns)								0	(9)
Additional infiltration							[(9)	-1]x0.1 =	0	(10)
	.25 for steel or timber for resent, use the value corresp				•	uction			0	(11)
deducting areas of openi		oriding to the	e greate	er wan are	a (anter					
If suspended wooden	floor, enter 0.2 (unseale	ed) or 0.1	(seale	d), else	enter 0				0	(12)
If no draught lobby, en									0	(13)
· ·	s and doors draught str	ripped							0	(14)
Window infiltration				0.25 - [0.2			. (45)		0	(15)
Infiltration rate	aro avaraged in subi			(8) + (10)					0	(16)
If based on air permeabil	q50, expressed in cubi	-		•	•	etre or e	envelope	area	5	(17)
	es if a pressurisation test has					is beina u	sed		0.38	(18)
Number of sides sheltere				, ,	,	J			3	(19)
Shelter factor				(20) = 1 - [0.075 x (1	9)] =			0.78	(20)
Infiltration rate incorporate	ting shelter factor			(21) = (18)	x (20) =				0.29	(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	eed from Table 7								_	
(22)m= 5.1 5	4.9 4.4 4.3	3.8	3.8	3.7	4	4.3	4.5	4.7		
Wind Factor (22a)m = (2.	2)m ÷ 4									
	1.23 1.1 1.08	0.95	0.95	0.92	1	1.08	1.12	1.18		
<u> </u>						ь			I	

Adjusted infiltra	0.36	0.36	0.32	0.31	0.28	0.28	0.27	0.29	0.31	0.33	0.34	1	
Calculate effec							0.27	0.29	0.51	0.55	0.54	J	
If mechanica	al ventila	tion:										0	(23
If exhaust air he	eat pump i	using Appe	endix N, (2	3b) = (23a	a) × Fmv (e	equation (N	N5)), othe	rwise (23b) = (23a)			0	(23
If balanced with	heat reco	very: effic	iency in %	allowing f	or in-use f	actor (from	Table 4h) =				0	(23
a) If balance	d mecha	anical ve	ntilation	with he	at recove	ery (MVI	HR) (24a	m = (22)	2b)m + (23b) × [1 – (23c)	÷ 100]	
24a)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
b) If balance	d mecha	anical ve	ntilation	without	heat rec	overy (N	ЛV) (24b	m = (22)	2b)m + (2	23b)			
24b)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
c) If whole h				-									
if (22b)n		<u> </u>		, ,		· ` `	ŕ	ŕ	· · ·	í – –	ı	1	1
24c)m= 0	0	0	0	0	0	0	0	0	0	0	0		(24
d) If natural if (22b)m				•	•				0.5]				
24d)m= 0.57	0.57	0.56	0.55	0.55	0.54	0.54	0.54	0.54	0.55	0.55	0.56		(24
Effective air	change	rate - er	iter (24a	or (24b	o) or (24	c) or (24	d) in box	(25)				_	
25)m= 0.57	0.57	0.56	0.55	0.55	0.54	0.54	0.54	0.54	0.55	0.55	0.56		(25
3. Heat losse	s and he	eat loss r	paramete	er:									
ELEMENT	Gros	•	Openin		Net Ar	ea	U-valı	ıe	AXU		k-value	€	ΑΧk
	area	(m^2)	· m		A ,r	m²	W/m2	K	(W/I	K)	kJ/m²-l	K	kJ/K
Doors					2	Х	1	= [2				(26
Vindows Type	: 1				2.025	x1,	/[1/(1.4)+	0.04] =	2.68				(27
Vindows Type	2				6.097	y X1	/[1/(1.4)+	0.04] =	8.08				(27
Valls Type1	20.9	5	8.12		12.83	3 x	0.18	=	2.31	\neg			(29
Valls Type2	29.6	2	2		27.62	<u>x</u>	0.18	=	4.97	= [$\neg $	(29
Valls Type3	18.6	34	0		18.64	x	0.18	<u> </u>	3.36			= =	(29
otal area of e	lements	, m²			69.21								(31
for windows and * include the area						ated using	formula 1	/[(1/U-valu	re)+0.04] a	as given in	paragraph	1 3.2	
abric heat los	s, W/K =	= S (A x	U)				(26)(30)	+ (32) =				23.4	(33
leat capacity	Cm = S(Axk)						((28)	.(30) + (32	2) + (32a).	(32e) =	827.2	23 (34
hermal mass	parame	ter (TMF	P = Cm ÷	- TFA) ir	n kJ/m²K			Indica	tive Value	: Medium		250	
For design assess	ments wh	ere the de	tails of the	construct	ion are not	t known pr	ecisely the	indicative	values of	TMP in Ta	able 1f		
an be used instea													
hermal bridge	,	,		Ο.	•	<						4.85	(36
details of thermater otal fabric he		are not kn	own (36) =	= 0.05 x (3	11)			(33) ±	(36) =				
entilation hea		alculatos	l monthly	,						25\m v (5)	\	28.26	6 (37
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	= 0.33 × (Nov	Dec	1	
38)m= 29.95	29.81	29.67	29.02	28.9	28.34	28.34	28.23	28.55	28.9	29.15	29.4	1	(38
,			20.02	20.0	20.04			<u> </u>		<u> </u>		J	,00
Heat transfer of 58.2	58.06	nt, W/K 57.93	57.28	57.16	56.59	F0 F0	56.49	(39)m 56.81	= (37) + (37)	38)m 57.4		1	
	28 UK	- 5/U3	ι ト/ ')Ω	h/16	1 56 5U	56.59	. hk/(0		57.16	/ /	57.66		

Heat loss para	meter (l	HLP), W/	m²K					(40)m	= (39)m ÷	- (4)			
(40)m= 0.91	0.91	0.91	0.9	0.9	0.89	0.89	0.89	0.89	0.9	0.9	0.9		
NI selected a		- (I. / T - I. I	l = 4 = \					,	Average =	Sum(40) ₁ .	12 /12=	0.9	(40)
Number of day Jan	Feb	Mar	e 1a) Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
(41)m= 31	28	31	30	31	30	31	31	30	31	30	31		(41)
(,		<u> </u>					<u> </u>						()
4. Water heat	ting ene	rgy requi	rement:								kWh/ye	ear:	
if TFA > 13.9 if TFA £ 13.9	9, N = 1		[1 - exp	(-0.0003	349 x (TF	FA -13.9)2)] + 0.0	0013 x (¯	ΓFA -13.		09		(42)
Annual averag	e hot wa										.78		(43)
Reduce the annua not more that 125	_				-	-	o acnieve	a water us	se target o	Ť			
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Hot water usage in	n litres pei			<u>_</u>		Table 1c x				!			
(44)m= 92.15	88.8	85.45	82.1	78.75	75.4	75.4	78.75	82.1	85.45	88.8	92.15		
Energy content of	hot water	used - cal	culated m	onthly – 1	100 v Vd r	n v nm v F	Tm / 3600			m(44) ₁₁₂ =	L	1005.31	(44)
(45)m= 136.66	119.52	123.34	107.53	103.18	89.03	82.5	94.67	95.8	111.65	121.88	132.35		
(43)111= 130.00	119.52	123.34	107.55	103.10	09.03	02.3	94.07			m(45) ₁₁₂ =		1318.12	(45)
If instantaneous w	ater heati	ng at point	of use (no	hot water	storage),	enter 0 in	boxes (46			(- /	L		`
(46)m= 20.5	17.93	18.5	16.13	15.48	13.36	12.38	14.2	14.37	16.75	18.28	19.85		(46)
Water storage Storage volum		\ includin	a anv e	alar or M	/\//HRS	storage	within es	ama vas	دما		450		(47)
If community h	` ′		•			Ū		ATTIC VOO.	001		150		(47)
Otherwise if no	•			•			` '	ers) ente	er '0' in (47)			
Water storage													
a) If manufact				or is kno	wn (kWh	n/day):				1.	39		(48)
Temperature fa										0.	54		(49)
Energy lost fro b) If manufact		_	-		or is not		(48) x (49)) =		0.	75		(50)
Hot water stora			-								0		(51)
If community h	_		on 4.3										
Volume factor			0.1								0		(52)
Temperature fa											0		(53)
Energy lost fro Enter (50) or (_	, kWh/ye	ear			(47) x (51)) x (52) x (53) =		0		(54)
Water storage	. , .	,	or each	month			((56)m = (55) × (41):	m	0.	75		(55)
(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	(00)
(57)m= 23.33	21.07	23.33	22.58	23.33	22.58	23.33	23.33	22.58	23.33	22.58	23.33		(57)
Primary circuit	loss (ar	nual) fro	m Table	3							0		(58)
Primary circuit	•	•			59)m = ((58) ÷ 36	65 × (41)	m					. ,
(modified by	factor f	rom Tabl	e H5 if t	here is s	solar wat	er heatii	ng and a	cylinde	r thermo	stat)			
(59)m= 23.26	21.01	23.26	22.51	23.26	22.51	23.26	23.26	22.51	23.26	22.51	23.26		(59)

Combi loss calculated for each month $(61)m = (60) \div 365 \times (41)m$													
(61)m= 0	0	0	0	01)111 =	00) +	0 7 (41) o	0	0	0	0	1	(61)
	!										<u> </u>	J · (59)m + (61)m	(-)
(62)m= 183.2	-i	169.93	152.62	149.77	134.13		141.2		158.25	166.97	178.94]	(62)
` '		<u> </u>		<u> </u>			<u> </u>					<u> </u>	(-)
Solar DHW input calculated using Appendix G or Appendix H (negative quantity) (enter '0' if no solar contribution to water heating) (add additional lines if FGHRS and/or WWHRS applies, see Appendix G)													
(63)m= 0	0	0	0	0	0	0	0	0	0	0	0	1	(63)
Output from	water hea	ter	!	ļ.		-1	!		ļ.	ļ	!	J	
(64)m= 183.2		169.93	152.62	149.77	134.13	129.1	141.2	7 140.9	158.25	166.97	178.94	1	
	L	<u>!</u>	<u> </u>	<u> </u>	<u> </u>		0	utput from w	ater heate	er (annual)	l12	1866.74	(64)
Heat gains f	rom water	heating,	, kWh/m	onth 0.2	5 ´ [0.8	5 × (45)m	n + (61)m] + 0.8	x [(46)m	+ (57)m	+ (59)m	 n]	_
(65)m= 82.72		78.29	71.83	71.58	65.68	64.71	68.75		74.4	76.6	81.28	1	(65)
include (5	7)m in cal	culation	of (65)m	only if c	ylinder	is in the	dwellir	g or hot w	ater is f	rom com	munity h	neating	
5. Internal	gains (see	e Table 5	and 5a):	-								
Metabolic ga	ains (Table	e 5), Wat	ts										
Jar	r Feb	Mar	Apr	May	Jun	Jul	Aug	g Sep	Oct	Nov	Dec]	
(66)m= 104.3	7 104.37	104.37	104.37	104.37	104.37	104.37	104.3	7 104.37	104.37	104.37	104.37]	(66)
Lighting gair	ns (calcula	ted in Ap	opendix	L, equat	ion L9	or L9a), a	ılso se	e Table 5					
(67)m= 17.82	2 15.83	12.87	9.75	7.29	6.15	6.65	8.64	11.6	14.72	17.18	18.32]	(67)
Appliances (gains (calc	ulated ir	Append	dix L, eq	uation	L13 or L1	3a), al	so see Ta	ble 5			_	
(68)m= 182.4	8 184.37	179.6	169.44	156.62	144.56	136.51	134.6	2 139.39	149.55	162.37	174.42]	(68)
Cooking gair	ns (calcula	ited in A	ppendix	L, equat	ion L1	or L15a), also	see Table	5				
(69)m= 33.44	33.44	33.44	33.44	33.44	33.44	33.44	33.44	33.44	33.44	33.44	33.44		(69)
Pumps and	fans gains	(Table 5	5a)										
(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= -83.5	-83.5	-83.5	-83.5	-83.5	-83.5	-83.5	-83.5	-83.5	-83.5	-83.5	-83.5]	(71)
Water heatir	ng gains (T	able 5)										_	
(72)m= 111.1	8 109.24	105.22	99.76	96.21	91.22	86.97	92.41	94.35	100	106.38	109.25]	(72)
Total intern	al gains =	:			(6	6)m + (67)n	n + (68)r	m + (69)m +	(70)m + (7	71)m + (72))m	_	
(73)m= 368.7	9 366.75	355.01	336.26	317.43	299.25	287.44	292.9	8 302.64	321.58	343.25	359.3		(73)
6. Solar ga													
Solar gains ar		•				•	ations to		ne applical		tion.		
Orientation:	Access F Table 6d		Area m²			ux able 6a		g_ Table 6b	т	FF able 6c		Gains (W)	
Couthworte o					_		, ,				_	. ,	1,-0
Southwesto e		X			X	36.79		0.63	×	0.7	=	22.77	(79)
Southwest _{0.9}	<u> </u>	X			X	62.67	ļ	0.63	X	0.7	=	38.79	[(79)]
	<u> </u>	X			x	85.75	ļ	0.63	X	0.7	=	53.07](79)
Southwesto e		X	2.0		X	106.25	ļ	0.63	×	0.7	_ =	65.76](79)] ₍₇₀₎
Southwest _{0.9}	× 0.77	X	2.0)3	Х	119.01	J L	0.63	X	0.7	=	73.65	(79)

_							_		_				
Southwest _{0.9x}	0.77	X	2.0)3	x	118.15] [0.63	X	0.7	=	73.12	(79)
Southwest _{0.9x}	0.77	X	2.0)3	x	113.91] [0.63	x	0.7	=	70.49	(79)
Southwest _{0.9x}	0.77	X	2.0)3	x	104.39		0.63	X	0.7	=	64.6	(79)
Southwest _{0.9x}	0.77	X	2.0)3	x	92.85] [0.63	X	0.7	=	57.46	(79)
Southwest _{0.9x}	0.77	x	2.0)3	x	69.27] [0.63	x	0.7	=	42.87	(79)
Southwest _{0.9x}	0.77	X	2.0)3	x	44.07] [0.63	X	0.7	=	27.27	(79)
Southwest _{0.9x}	0.77	X	2.0)3	x	31.49		0.63	X	0.7	=	19.49	(79)
Northwest _{0.9x}	0.77	X	6.	1	x	11.28	×	0.63	X	0.7	=	21.02	(81)
Northwest _{0.9x}	0.77	x	6.	1	x	22.97	X	0.63	x	0.7	=	42.79	(81)
Northwest 0.9x	0.77	X	6.	1	x	41.38	x	0.63	X	0.7	=	77.1	(81)
Northwest _{0.9x}	0.77	x	6.	1	x	67.96	x	0.63	x	0.7	=	126.62	(81)
Northwest _{0.9x}	0.77	x	6.	1	x	91.35	x	0.63	x	0.7	=	170.21	(81)
Northwest _{0.9x}	0.77	X	6.	1	x	97.38	x	0.63	X	0.7	=	181.46	(81)
Northwest _{0.9x}	0.77	x	6.	1	x	91.1	X	0.63	x	0.7	=	169.75	(81)
Northwest _{0.9x}	0.77	X	6.	1	x	72.63	X	0.63	x	0.7	=	135.33	(81)
Northwest _{0.9x}	0.77	x	6.	1	x	50.42	x	0.63	X	0.7	=	93.95	(81)
Northwest _{0.9x}	0.77	X	6.	1	x	28.07	X	0.63	X	0.7	=	52.3	(81)
Northwest _{0.9x}	0.77	X	6.	1	x	14.2	X	0.63	x	0.7	=	26.45	(81)
Northwest _{0.9x}	0.77	x	6.	1	x	9.21	x	0.63	x	0.7	=	17.17	(81)
Solar gains in					1	-	Ť	= Sum(74)m .				1	(20)
(83)m= 43.79		30.17	192.38	243.86	254.5		199.	93 151.41	95.17	53.73	36.66		(83)
Total gains – i		85.18	528.64	`	+ (83)		100	91 454.06	416.75	396.98	205.00	1	(84)
(84)m= 412.58				561.28		527.69	492.	91 454.06	410.73	390.96	395.96		(04)
7. Mean inter					<i>'</i>								_
Temperature	•	• .			•		ble 9,	Th1 (°C)				21	(85)
Utilisation fac					` .	<u> </u>	1 .			 		1	
Jan		Mar	Apr	May	Ju		Au		Oct	+	Dec		(00)
(86)m= 1	0.99	0.98	0.95	0.84	0.64	0.47	0.5	2 0.79	0.96	0.99	1		(86)
Mean interna		- 1		· `	T .	i i	1	<u> </u>				1	
(87)m= 20.14	20.25 2	20.44	20.7	20.9	20.9	9 21	21	20.95	20.7	20.38	20.12		(87)
Temperature	during hea	iting p	eriods ir	rest of	dwell	ng from Ta	able 9), Th2 (°C)			-	_	
(88)m= 20.16	20.16 2	20.16	20.17	20.17	20.1	8 20.18	20.	18 20.18	20.17	20.17	20.16		(88)
Utilisation fac	tor for gain	s for r	est of d	welling,	h2,m	(see Table	9a)						
(89)m= 1	0.99	0.98	0.93	0.79	0.56	0.38	0.4	3 0.72	0.95	0.99	1		(89)
Mean interna	l temperatu	ıre in t	he rest	of dwelli	ing T2	! (follow st	eps 3	to 7 in Tabl	e 9c)	-	-		
(90)m= 19		9.45	19.82	20.08	20.1	<u>`</u>	20.	1	19.83	19.36	18.98		(90)
	<u> </u>	!		!			-	f	LA = Liv	ving area ÷ (4) =	0.51	(91)
Moon intorno		uro (foi	. ()	مانده مانده	II:\	(I A T4		(I A) TO					_
	Itamparati		r tna ۱4/5			- fi // 🗸 ' '	エ /1	_ 11 // // // //					
	-							- fLA) × T2	20 27	19.88	19 55	1	(92)
(92)m= 19.58 Apply adjustn	19.71 1	9.95	20.27	20.5	20.5	8 20.59	20.	59 20.55	20.27		19.55		(92)

							1					l	
(93)m= 19.58		19.95	20.27	20.5	20.58	20.59	20.59	20.55	20.27	19.88	19.55		(93)
8. Space he													
Set Ti to the the utilisation			•		ed at ste	ep 11 of	Table 9	b, so tha	t Ti,m=(76)m an	d re-calc	culate	
Jan		Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation fa				iviay	<u> </u>	<u> </u>	_ /wg	Гоор		1101	200		
(94)m= 0.99		0.98	0.93	0.81	0.6	0.43	0.48	0.75	0.95	0.99	1		(94)
Useful gain	s, hmGm	, W = (9 ⁴	4)m x (84	4)m		<u>!</u>			<u>I</u>	<u> </u>	1	l	
(95)m= 410.4	9 444.23	474.64	493.09	454.07	332.19	225.29	235.52	342.52	396.06	392.74	394.37		(95)
Monthly ave	erage exte	ernal tem	perature	from Ta	able 8						•		
(96)m= 4.3	4.9	6.5	8.9	11.7	14.6	16.6	16.4	14.1	10.6	7.1	4.2		(96)
Heat loss ra	ate for me	an intern	al tempe	erature,	Lm , W =	=[(39)m	x [(93)m	– (96)m]				
(97)m= 889.1	7 860.03	779.16	651.13	502.74	338.53	225.95	236.8	366.26	552.71	733.33	885.24		(97)
Space heat		1		nonth, k	Wh/mon	th = 0.02	24 x [(97)m – (95)m] x (4	1)m	,	ı	
(98)m= 356.1	4 279.42	226.56	113.79	36.21	0	0	0	0	116.55	245.22	365.21		_
							Tota	l per year	(kWh/yea	r) = Sum(9	8)15,912 =	1739.1	(98)
Space heat	ing requir	ement in	kWh/m²	² /year								27.25	(99)
9a. Energy r	equiremer	nts – Indi	vidual h	eating s	ystems i	ncluding	micro-C	CHP)					
Space hear	ting:					J		,					
Fraction of	space hea	at from s	econdar	y/supple	mentary	system						0	(201)
Fraction of	space hea	at from m	nain syst	em(s)			(202) = 1	- (201) =				1	(202)
Fraction of	total heati	ng from	main sys	stem 1			(204) = (2	02) x [1 –	(203)] =			1	(204)
Efficiency of main space heating system 1										93.5	(206)		
Efficiency of secondary/supplementary heating system, %										0	(208)		
Jan	<u> </u>	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	kWh/yea	」`
Space heat			•		l	Jui	Aug	Тоер	001	INOV	Dec	KVVII/yea	ai
356.1		226.56	113.79	36.21	0	0	0	0	116.55	245.22	365.21		
(211)m = {[(9	98)m x (20)4)]	00 ÷ (20)6)	<u> </u>	ļ	<u>!</u>		<u> </u>	<u> </u>			(211)
380.8	- í - ` -	242.31	121.71	38.73	0	0	0	0	124.65	262.27	390.6		(=)
					<u> </u>		Tota	l ıl (kWh/yea	ar) =Sum(2	L 211) _{15.1012}	<u> </u> =	1860.01	(211)
Space heat	ina fuel (s	econdar	v) k\//h/	month									
$= \{[(98) \text{m x } ($	•		• •										
(215)m= 0	0	0	0	0	0	0	0	0	0	0	0		
		•			!		Tota	l (kWh/yea	ar) =Sum(2	215) _{15,1012}	<u></u>	0	(215)
Water heati	ng										ı		_
Output from	water hea	ter (calc	ulated a	oove)								ı	
183.2	6 161.61	169.93	152.62	149.77	134.13	129.1	141.27	140.9	158.25	166.97	178.94		_
Efficiency of	water hea	ater										79.8	(216)
(217)m= 86.56	86.26	85.58	84.04	81.68	79.8	79.8	79.8	79.8	84.01	85.84	86.68		(217)
Fuel for water	•												
(219)m = (6)				102.26	160.00	161 70	177.02	176.56	100.00	104.50	206.45		
(219)m= 211.7	2 187.35	198.56	181.6	183.36	168.08	161.78	177.03	176.56 al = Sum(2°	188.36	194.52	206.45	2025.25	7(240)
Appual tata	lo.						1018	– Juiii(2		Mb 4		2235.35	(219)
Annual tota Space heatir		ed. main	system	1					K	Wh/yeaı		kWh/year 1860.01	7
	5	,	,										_

					_
Water heating fuel used				2235.35	
Electricity for pumps, fans and electric keep-hot					
central heating pump:			30]	(230c)
boiler with a fan-assisted flue]	(230e)			
Total electricity for the above, kWh/year	75	(231)			
Electricity for lighting		314.76	(232)		
12a. CO2 emissions – Individual heating systems	s including micro-CH	Р			
	Energy kWh/year	Emission fac kg CO2/kWh	ctor	Emissions kg CO2/yea	
Space heating (main system 1)	(211) x	0.216	=	401.76	(261)
Space heating (secondary)	(215) x	0.519	=	0	(263)
Water heating	(219) x	0.216	=	482.84	(264)
Space and water heating	(261) + (262) + (263) +	· (264) =		884.6	(265)
Electricity for pumps, fans and electric keep-hot	(231) x	0.519	=	38.93	(267)
Electricity for lighting	(232) x	0.519	=	163.36	(268)
Total CO2, kg/year		sum of (265)(271) =		1086.88	(272)

TER =

(273)

17.03